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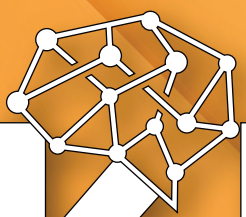

SIRKM 2022

E-PROCEEDINGS OF SEMINAR ON INFORMATION RETRIEVAL AND KNOWLEDGE MANAGEMENT 2022 (SIRKM'22)

MARCH 2 & 3, 2022 (ONLINE)

Organized by:

Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia

Co-organized by:

Society of Information Retrieval and Knowledge Management Malaysia (PECAMP)

ASEAN Workshop on Information Science and Technology (AWIST)

https://www.ftsm.ukm.my/sirkm2022/

E-Proceedings of

Seminar on Information Retrieval and Knowledge Management 2022 (SIRKM'22)

Editors:

Dr Hazura Mohamed
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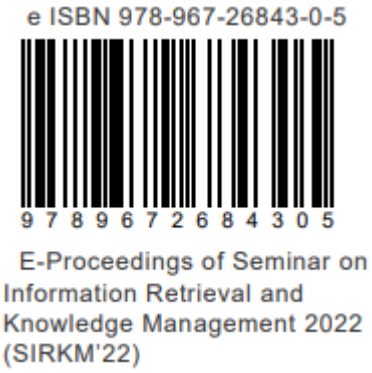
 eISBN 978-967-26843-0-5



Published in Malaysia by
Fakulti Teknologi dan Sains Maklumat
Universiti Kebangsaan Malaysia
43600 UKM Bangi, Selangor Darul Ehsan, MALAYSIA
http://www.ftsm.ukm.my/sirkm22/
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This e-proceeding is published in electronic format.
https://www.ftsm.ukm.my/sirkm2022/

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PREFACE

The E-Proceedings of the SIRKM 2022 (SIRKM'22) volume contains the collection of articles of all the research contributions presented during the Seminar on Information Retrieval and Knowledge Management (SIRKM), held online (via Zoom) on 2 & 3 March 2022. This seminar is organized by the Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia. It is also co-organized by the Society of Information Retrieval and Knowledge Management, Malaysia (Persatuan Capaian Maklumat dan Pengurusan Pengetahuan, PECAMP) and ASEAN Workshop on Information Science and Technology (AWIST).

The seminar provided a platform for the postgraduate students, academics, researchers and industry players to share their knowledge in the forms of research works and opinions in various areas of Information Retrieval and Knowledge Management. However, the seminar also covers various other state-of-the-art research areas such as Data Science, Information Visualisation and Cyber Security. SIRKM'22 served as a good setting for the scientific community where participants met online to share and exchange ideas. The seminar also attracted international submissions from Indonesia (Universitas Bina Darma, and Universitas Ahmad Dahlan). Participants were mainly from the local universities including Universiti Kebangsaan Malaysia, Universiti Malaya, Universiti Teknologi MARA, Universiti Putra Malaysia, Al-Madinah International University, International Islamic University Malaysia, Universiti Utara Malaysia, and Universiti Tunku Abdul Rahman. There are three session in SIRKM'22 where Session 3 is the AWIST Doctoral Consortium. It served as an opportunity for doctoral students to present, explore and develop their research interests with a panel of distinguished researchers in the field. Meanwhile, SIRKM'22 Best Paper Award is established to recognize and promote quality contributions to research among postgraduate students, academics, and researchers.

We would like to thank all the participants for their contributions to the seminar and to this e-proceeding which contains 32 extended abstracts. We also express gratitude to the working committee and our three keynote speakers, Professor Riichiro Mizoguchi (Japan Advanced Institute of Science and Technology), Professor Shahrul Azman Mohd Noah (Universiti Kebangsaan Malaysia), and Professor Alan Smeaton (Dublin City University) for accepting our invitation as the keynotes for the event. Our special thanks to our colleagues from the Faculty of Information Science and Technology and Institute of IR4.0, for their unfailing support towards SIRKM'22. A special thanks to PECAMP for their financial assistance and support. See you in the next SIRKM!

Assoc. Prof. Dr Masnizah Mohd
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A REVIEW ON METHODS OF GENERATING GOOD QUALITY OF RELEVANT DOCUMENTS IN INFORMATION RETRIEVAL EVALUATION PROCESS

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ABSTRACT

The Information Retrieval System Evaluation have done through Cranfield-paradigm in which the test collections provide the foundation of the evaluation process. The test collections consist of document corpus, topics, and a set of relevance judgements. The relevant judgements are the documents which retrieved from the test collections based on the topics. The accuracy of the evaluation process is based on the number of relevant documents in the relevant judgement list. This paper presents a comprehensive study, which discusses the various ways to improve the number of relevant documents in the judgement list inorder to improve the quality of relevant judgments and through that increase the accuracy of evaluation process.

Keywords: Information Retrieval; Evaluation; Pooling; Topics; Human Accessors; Document Similarity

1. INTRODUCTION

There has been massive growth of world wide web every day. Whenever a user tries to search for a particular information from the retrieval systems, a set of documents are retrieved based on the query which entered by the user. These retrieved documents are supposed to be relevant to the user query and it makes the satisfaction for the users to relay on the system again. The ranked list of these retrieved documents is ordered based on the degree of relevance to the query. Each retrieval systems produces different ranked list documents based on their own relevance. The only way of finding out which systems produced more relevant documents can be only through an evaluation process. The evaluation is completely based on a set of test collections which consists of a set of documents called document corpus, a set of queries called topics and a set of relevance judgements. Some of the well know test collection models are TREC and CLEF.

Each participating systems collect a set of relevant documents from the document corpus based on the topics. These documents were ranked based on its relevance and call it as runs. By using some rank aggregation techniques these ranked documents were merged and ready for the judgements. But judging the whole document is practically not possible as it is costly and time consuming. Therefore, the evaluation initiatives have proposed some methods to retrieve the most relevant documents will be sent to the human assessors for judgement. After these judgments we can find out which all systems performed better compared to the other systems. This process can be done through any evaluation measures like precision, mean average precision. Through these evaluation scores we can judge which all systems performed better and can ranked these documents.

The evaluation performance of the Information retrieval systems is not only by considering their efficiency but also through their effectiveness, that is their ability to produce as much of relevant documents and rank them in a better way by rejecting the irrelevant ones. As the number of relevant documents get increase in the judgement list, the quality of the list will get increase and through that the evaluation accuracy also get increase. Various methods are there to retrieve the relevant documents from the document corpus.

2. IMPROVING RELEVANT JUDGEMENT BASED ON POOLING

In pooling, set of documents to be judged for a topic is constructed by taking the top k documents from the multiple runs which created by the different systems. Each document in the pooled list considered as relevant and documents not in the pooled list is assumed as irrelevant. The quality of the resulting collection is depending on the retrieval methods and the pool depth[6].

The first pooling method, now referred to as Depth@ k which consider the top k relevant documents for each topic from the multiple runs created by the participated systems[5]. The second method is, Given the multiple ranking of documents, the extraction of documents is restricted to top-k documents. Taking sample of 10% of the depth-k and will consider those documents as relevant. The third method of pooling is based on IR Evaluation measures. A sampling strategy are used to find a subset of documents and based on the evaluation measures they found the actively present good systems[4]. Next one is the contribution of Mutli-armed Bandits for ordering the documents in the pooling. Using this method, were able to early identify relevant documents in the pools. The document adjudication in pooling method have introduced[2].

3. IMPROVING RELEVANT JUDGEMENT BASED ON HUMAN ACCESSORS

Getting human assessors help for different relevance evaluation have gained a greater impact on the Information retrieval evaluation process. Crowd sourcing can replace the classical human assessors. The literature shows that the agreement between each worker and the TREC assessors are not high if they work individually, but it increases when they are grouped. Also states that the judgements have done faster with good results at low cost [7].

But crowdsourcing with large set of documents always can be a challenge. There can be more chances of errors in judgement process due to the disagreements. It can be overcome by considering the frequency of each document per topic (called pseudo relevance judgement) from all systems and document rankings in order to reduce the human efforts[8].

Another work to reduce the human assessor disagreement and the arbitrariness of grades have solved using pair-wise preference judgements. To combine the documents in order to get high relevance score using a linear methodology Elo rating systems have improved the results in the judgments [9].

4. IMPROVING RELEVANT JUDGEMENT BASED ON TOPICS

In a typical information retrieval evaluation, the relevant documents are retrieved based on the relevance of query or topic from the document corpus collection. Researchers already have stated that better results can get even with less number of topics. Topics difficulties is always a challenge for retrieving relevant documents. Find the most effective topics in evaluating IR systems in terms of topic difficulty is an achievement in terms of cost and time. Used topic difficulty score to determine the difficulty of a topic and identifying suitable topic types for the evaluation [10].

Another set of research have gone with less numbers of topics with deeper depth in order to achieve a better evaluation result at the low cost. The researches have measured the effectiveness of evaluating information retrieval using various depth range from 10,20,100 and so on and measured it with correlation coefficient to judge the retrieval effectiveness of relevant documents. The literature has proved that standard evaluation depth for IR systems with shallow depth could produce good outcome[11].

And topic modelling has used to evaluate the quality of the topics and it have been seen growing for various applications like in text classifiers, image recognition classification and so on! Topic modeling can be constructed with some predefined keywords. With the help of topic modeling, it can extract or doing mining specific relevant topics which can extract more relevant documents. And, with the topic modelling can extract a topic quality metric which predict human judgement about topic [12].

5. IMPROVING RELEVANT JUDGEMENT BASED ON DOCUMENT SIMILARITIES

The search effectiveness can be achieved through both incremental relevance feedback and through document clustering. In relevance-based feedback approach, users relevant judgments are collected rather than pooling and based on those feedbacks the relevancy is determined. The document clustering method displays the retrieved documents in a cluster form rather than just ranked ones. This helps to separate the relevant and non-relevant documents and easy to judge the relevant documents cluster documents efficiently. In this methodology, all the documents are clustered based on user feedback. Choosing the best cluster based on the density strategy. Within each cluster, the documents are sorted by their relevance score for the initial query. And extracted the top N documents from each cluster[13].

Another model is Manifold based and, in this model, regularizes the document fusion scores and so the documents with similar degree of relevance within that manifold are considered to be same and will assign a similar score and will consider into the judged list[1].

In last decades, several approaches have been proposed to increase the performance of cluster-based information retrieval process. Each document was clustered using K-means according to its relevance in which each cluster has similar documents. From that each cluster the frequent terms in the documents were calculated and based on it closed frequent pairs were collected. Then the k most frequent patterns are used to group documents that share similar terms. Patterns or most frequent occurred itemset discovered in each cluster are then used to select the most relevant document clusters[13].

Even without pooling and system ranking, by automatically classify the unjudged documents based on its similarity is another method. This approach considers a topic-specific document classification model for each search topic. The documents are classified into separate classes based on its similarity. Active Learning algorithms can be used for document selections and automatic labelling of unjudged documents. Comparisons and similarity checking with the pooled documents and the unjudged documents based on the classifications improve the relevant scores. But predicating relevance judgement via a classifier introduces bias in the evaluation of Information Retrieval systems when considering the document ranking [3].

Summarize Findings

As the purpose of this study is to examine the various methodologies to improve the quality of documents in the judgement list, a brief research direction on the various methodologies have listed in Table 1.

Table 1. Summarize findings from Literature Review

Methodologies	**Gap/Issues**	**Research Direction**
Pooling	Traditional methodology and dominated by studies	Need to incorporate more in clustering and classification analysis
Human accessors	more error prone and different human agreements	need to reduce the human accessors effort by automate the frequency of documents in each topic
Topics	difficulty in calculate topic hardness and quality	reduce topic pool depth and consider pre-defined keywords
Document similarity	many relevant documents in the unjudged list are not getting considered	consider relevant documents from unjudged list by improving scores

6. CONCLUSION

Increasing the number of relevant documents into the judgement list always help to improve the quality of the judgement list and through that can increase the accuracy of evaluation process. In this work we have summarized various methodologies like pooling, through human accessors, by topic selection and document similarity checking, inorder to improve the quality of relevant documents. Pooling and document similarity checking have more advantages compared to human accessors evaluation like crowdsourcing because it is more error prone. Topic selection is quite challenging process too.

ACKNOWLEDGEMENT

The authors would like to extend their gratitude to RU Grant-University of Malaya for supporting this study [Project Number = GPF098C-2020].

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A SURVEY ON THE INFORMATION CENTRIC NETWORK

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ABSTRACT

The internet is evolving, and data are a critical component in today's Internet. People are more interested in data than data location. The Information Centric Network (ICN) customs this idea and makes data an integral component instead of host addresses. In this study, ICN is comprehensively discussed and highlighted. The comparison of significant attributes demonstrates the diverse research areas in ICN. In contrast to Transmission Control Protocol/Internet Protocol (TCP/IP) architecture, Finally, this study provides useful insights into the emerging areas of ICN to assist future studies with open research issues.

Keywords: Information Centric Network, ICN, ICN Naming, ICN Security, ICN Storage.

1. INTRODUCTION

The Internet is essential nowadays. Doing daily chores without the Internet is almost impossible. As the number of users increases every day, the load on the Internet also increases. In 2010, the Internet Protocol (IP) was supported by approximately two billion hosts and approximately 300,000 routers in its passage [1]. With such a heavy load, continuing with the current IP architecture in the near future is difficult because the data rate of media is also increasing.

According to sources, YouTube usage more than tripled from 2014 to 2016; users uploaded 400 hours of new videos each minute of every day in 2017, and users watched 4,146,600 videos every minute [2]. In such a case, users do not concern about content location, but the content itself. This change reflects the limit of the current Internet architecture and opens a new horizon for the Internetworking world. Evidently, the next generation Internet will be all about speed, data rate, and heavy data. As discussed above, the data rate is continuously increasing, and so is the load on links. ICN architecture is here to rescue, and ICN-based projects promise faster data communication than its rival IP architecture and other network approaches because of its in-network caching capability. However, the current world requires further speed because consumer load is increasing every day. People leave televisions and shift their interest in the Internet. People use their cell phones where they can easily find world news on a single touch, the same is the case with entertainment.

Certain approaches, such as subscriber mobility, publisher mobility, and subscriber and publisher mobility, have also been discussed in many studies. Caching also plays an important role in ICN; therefore, many techniques regarding caching, such as proactive caching [3], content-based caching, content- and node-based caching [4] and routing-based techniques [5] have been discussed. In this study, unlike in [6] we provide a comprehensive survey on past, current, and future research works on ICN and its branches.

2. INFORMATION CENTRIC NETWORK

ICN is a novel redesign of the current Internet architecture composed of various features, such as content access by names, and content is universal throughout the network. With the help of the clean slate design of ICN, it has many built-in features, such as location-independent naming, name-based routing, in-network caching, native multicast, and self-secured content. Figure 1 displays the comparison between

TCP/IP and ICN stacks; the transport and network layers in the TCP/IP stack are replaced by ICN forwarding. Precisely, ICN can change the current network with different properties and services

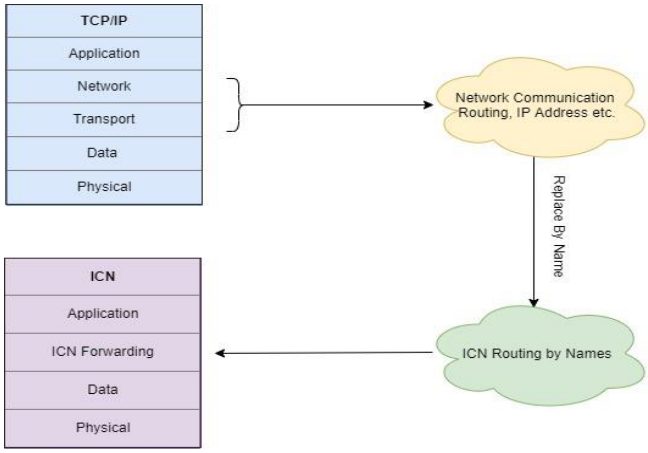

Figure 1. Comparison of TCP/IP Stack with ICN Stack

Many methods and challenges, such as Overlay ICN, Underlay ICN, Clean Slate ICN, and Hybrid ICN, exist in ICN deployment, as shown in Figure 2. The overlay network approach can be used in many ways with ICN (e.g., ICN over User Data Packet (UDP) and ICN "island" in an IP "ocean"). This approach is also called tunneling. Recursive layering process, as described in [7] also achieves overlay methodology by using ICN-in-L2-in-IP. When ICN is implemented as an underlay, unlike overlay deployment, this approach does not use tunnels to connect various islands. Protocol conversion gateways or proxies are used to establish connections. The overlay network in ICN is also implemented in where ICN names deal with IPv6 addresses, and other ICN details reside as payloads in IPv6 packet. ICN is introduced as a clean slate approach that aims to replace or renew the current Internet architecture (i.e., IP architecture). For this purpose, ICN must replace existing routing hardware along with other ancillaries that require ICN-oriented routing and forwarding nodes (FNs), such as NDN Forwarding Daemon [8] and content-centric routers [9]. Moreover, hybrid ICN approach promises the co-existence of IP architecture with ICN implementation by embracing the dual-stack node which can control the semantic of IP and ICN packets. Given that both protocols are diverse in nature, the dual-stack node uses different options to infer names from IP packets [10]. Recent studies have discussed ICN with 5G network slicing [11]. ICN can provide specific services, such as low latency, supported caching, and mobile caching. Certain studies have also investigated the formation of service slices by means of IP and ICN and have debated the requirement for ICN introduction via programmable data plane [12].

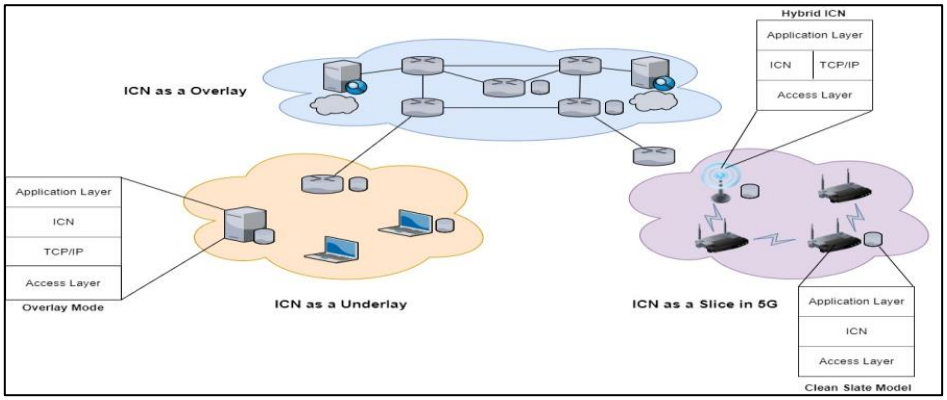

Figure 2. Information Centric Network (ICN) as an Overlay, Underlay, Clean Slate, Hybrid, and Slice in 5G

This powerful design can be a good replacement for the current Internet architecture. In this section, ICN architectural components are discussed. ICN mainly comprises two core components that makes ICN diverse in the current Internetworking world:

i) Content Access by Name
ii) In-Network Caching

a. Content Access by Name

Every host over the Internet has a name, and these names are used to access information from the Internet. Information (also called content) is saved with a certain name in a content provider. ICN accesses content in two ways, namely, content discovery and content delivery; content discovery refers to content naming and publisher information and explains how an ICN node entertains it. Meanwhile, content delivery is about content propagation over the ICN network, interest routing toward the best possible content provider, and how ICN routers send content to consumers. In ICN, only the content object representation is the content name, which can be found either on the publisher or anywhere in the ICN network route. ICN content name is the host address replacement; therefore, the name is a universally unique identification and can temporarily reside in different places, such as an original publisher on an on-path cache. Furthermore, ICN naming can be classified into three distinct classifications:

i.) Universally unique ICN name: names are the only forms of content identification over the ICN network; therefore, names must be unique throughout the ICN communication.

ii.) Location-independent: ICN names are location-independent; no matter where the content resides, its name does not change. Content can be replicated and republished anywhere, but its name remains the same. Secure content is a measure of concern in the ICN network.

iii.) Object name security: ICN names guarantee security by applying self-certification. Information objects (IOs) are also self-certified by their names, indicating that names must be signed by their legitimate publishers, and such names must be affixed with the actual content. Moreover, name and data decryption can only be performed by consumers.

b. In-network Caching

In- network caching is a prominent feature of ICN that makes it different from other network architecture. ICN routers are not only used for forwarding packets but can also cache data during transit, thereby improving hop count, user delay, and other performance parameters. Requested data are en-route to consumers, and ICN routers cache data on all intermediate nodes. ICN routers are quite similar to IP-based routers, the only difference is their content store (CS) level because ICN routers cache data in their CS for future requests, whereas IP-based routers use memory buffer which flushes data once transmitted. Network caching, including its application details, is further discussed below. The main advantage of in-network caching is the reduction of round-trip time because content can be found at any intermediate node near a consumer and can be rapidly accessed

3. CONCLUSION

In conclusion, ICN is an ongoing approach, and many studies call for further investigations to prove that ICN is the best replacement for its rival TCP/IP. This article attempts to fully scrutinize existing technologies related to ICN, and we discuss research challenges that may prove valuable in comprehending ICN. Future works in this area should focus on shortcomings in different ICN schemes,

so that readers can draw ideas to create a de-facto architecture for ICN that can address utmost limitations in current ICN approaches.

ACKNOWLEDGMENT

The authors would like to acknowledge the support of ICN and Network Communication Technology (NCT) Research Groups, FTSM, UKM in providing facilities for this research. This paper is supported under the Fundamental Research Grant Scheme FRGS/1/2019/ICT03/UKM/02/1.

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ACCESSIBILITY AND SUSTAINABILITY OF A TRUSTED DIGITAL REPOSITORY BY POSTGRADUATE STUDENTS OF SELECTED NIGERIAN PUBLIC UNIVERSITIES

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ABSTRACT

This study is an appraisal of the accessibility and sustainability of a trusted digital repository by postgraduate students of selected Nigerian public universities. The objectives were to examine the level of accessibility and to find out digital resources required by postgraduate students in utilizing contents of a trusted digital repository in public universities in the southwest, Nigeria. The paper adopted a qualitative research by means of reviewing and analyzing existing literature. This study used the diffusion of innovation theory, as developed by Rogers, and the Open Archival Information System Model by Consultative Committee for Space Data System (CCSD) to answer the research questions. Findings revealed that the level of accessibility by university students has a significant influence on digital repository while required digital resources had direct access utilizing contents of a trusted digital repository in public universities in the south-west, Nigeria. It was recommended that trust-based access to a digital repository should allow a data source to protect and have total control against malicious information.

Key Words: Accessibility; digital resources; Nigerian public universities; postgraduate students; trusted digital repository content

1. INTRODUCTION

The accessibility and sustainability of digital repository (DR) is one that has been discussed by many authors and scholars with various perspectives, most coming at it from different sides than the others [1]. Accessibility of academic materials to users is expected to benefit students and other users for enhanced sustainability [2]. Access to a digital repository creates global visibility for research works and can collect content in a single location [2]. It is, therefore, important to note that the success or failure of any public university is contingent, partly on its adoption of the digital repositories (DRS) [3]. However, the emphasis on distance learning and instructional technology at many Nigeria public universities especially during the outbreak of coronavirus pandemic (COVID-19) and in the post-COVID-19 effects have led to an increased awareness that the digital content being created by faculty members, staff members, students and the general public of the academic community is an institutional asset. In other words, difficult economic times have heightened the need for universities generally to also identify new ways to generate revenue. As a result, there is a growing interest among university administrators in collecting, preserving, and creating value-added services from the digital content produced in conjunction with teaching and researching [4]. This interest here are in line with academic libraries mission which requires such library to expand its scope to include management of both published and unpublished electronic contents. This can be achieved with the aid of building a sustainable and trusted digital repository.

Although, there are several circumstances that affect the accessibility of digital repositories, and this includes but is not limited to trust. Extant literature shows that the mission of a trusted digital repository is one that provides long-term and reliable access as services to digital resources, as well as to its relative designated community [5, 6]. Once this goal is not achieved, it becomes difficult for DR users to trust such a system. Trustworthiness in the digital repository, therefore, becomes very key because the system can lead to misinformation or deception by some nasty users via altered data [7]. Effective management of trust systems in the digital repository seems very challenging, largely because of issues relating to data inconsistencies. Quite common issues are that of reliable sensors including the compromised one which could produce a distinct phenomenon. Consequently, the truth

about data needs to be contingent upon a combination of data arising from unreliable sources while relating to uncertain issues [8].

Sustainability of digital repository recognizes that the continuity of digital information goes well beyond basic storing and managing of data and is integrated into the lifecycle of the information object. It includes technical, social, and economic considerations. By digital repository, it means building an infrastructure, both social and technical, which is economically viable for maintaining valuable data without significant loss or degradation [9]. This includes, as has been discussed above, the whole socio-technical composition of the repository. Undoubtedly, "it is not possible to preserve such digital information without a sustainable infrastructure, in terms of socio-economic and technical structures.

1.1 Objectives

This study is aimed at investigating the accessibility and sustainability of a trusted digital repository by postgraduate students of selected public universities in the southwest, Nigeria. To achieve this aim, the specific objectives are to: (a) examine the level of accessibility of digital repository by postgraduate students of selected public universities in southwest, Nigeria; (b) find out digital resources required by postgraduate students in utilizing contents of a trusted digital repository in public universities in the southwest, Nigeria.

1.2 Research Questions

a. What is the level of accessibility of digital repository amongst postgraduate students of selected public universities in southwest, Nigeria?
b. What digital resources are required by postgraduate students in utilizing contents of a trusted digital repository in public universities in the southwest, Nigeria?

2. THEORETICAL FRAMEWORK

This section of the review provides the basic theoretical assumptions for this paper, the theoretical framework as well as identification and measurement of variables in the study. This section focuses on relevant theories that can be applied to the variables and concepts in order to come up with a logical linkage between the variables. The theory is reviewed by identifying the proponent(s), assumptions, critics, supporters and relevance of the theories to this study. The proposed theories for this study are the diffusion of innovation theory and the open archival information system model. This is applicable as it explains a backup of the relationship between the study variables (accessibility, digital resources, contents utilization and trusted digital repository).

This study focuses on theories that are relevant to the research study. The theories will be presented by identifying the proponent(s), assumptions, criticism, supporters, and relevance in relation to this study. In view of this, *Diffusion of Innovation Theory*, as developed by Rogers, and *the Open Archival Information System Model* by Consultative Committee for Space Data System (CCSD) will be adopted as theoretical orientations. On the strength of these theories a conceptual framework is proposed.

Diffusion of Innovation Theory

The study titled "accessibility and sustainability of a trusted digital repository by Postgraduate Students of selected Nigerian public Universities" is anchored on Rogers diffusion of innovation theory [10]. Roger's diffusion of innovation theory as appropriate in explaining student's use of open access information repositories. According to the authors, the theory provides a framework for explaining how and why innovations defined as new tools, processes or ideas come to be adopted by certain groups.

Digital repositories perfectly represent Rogers concept of an innovation as an idea, practice or object that is perceived as new by an individual or other unit of adoption. According to Rogers [10], "diffusion is the planned and/or spontaneous spread of innovation through a process of communication". It was also defined by the author as the process by which an innovation is communicate through certain channels over time among members of a social system. The alignment

of the innovation with the existing social structure plays a vital role in the process of diffusion and normative behaviour in a culture or community. The theory explained that the adoption of an innovation depends on certain conditions which include: relative change, compatibility, complexity, trialability and observability. This theory is relevant as it evaluates the effect of perceived innovation qualities of a trusted digital repository for sustainability.

The Open Archival Information System Model

This model depicts that long-term digital preservation concerns came to scholars' attention even before the birth of digital repositories. As a result, an Open Archival Information System (OAIS) was developed in 2002 to guide, generate suitable standards for long-term archiving [11]. The term "Open motivates the possible future archiving standards and frameworks to be formed in open forums to minimize archival restrictions and also build trust in terms of available DR contents [12]. McDonough [13] declared the Open Archival Information System (OAIS) a "theory of digital preservation" constituting digital preservation practices by supplying a conceptual and theoretical idea concerning the functional components of a digital repository; the environment and information objects being stored [13]. The OAIS model is relevant to the study as it ensures that universities are charged with such tasks to preserve information, its contents and make it accessible to postgraduate students in the long term.

3. FINDINGS

Findings from review of literature was used for the analysis. To answer question two (that is, what is the level of accessibility of digital repository amongst postgraduate students?). The diffusion of innovation theory, as explained by Rogers 1995). Roger's explanation on diffusion of innovation theory is appropriate in explaining student's use of open access information repositories. Rogers [10] explained that an innovation is more likely to be adopted if it is perceived to be more advantages than the idea or process it supersedes. It is also more likely to be easy to understand and use, especially when you trust such repository. Libraries which resources and materials could not cope with high demand for information resources needed for research due to dwindling budgets. Concerted efforts by information experts and other stakeholders thus gave birth to the innovation called digital repository because even the contents of the scare research journals were product of the research institutions and the academia. This digital repository solved the dual problem of data inconsistencies, journal scarcity and perceived monopoly of publishers.

On whether digital resources are required by university students in utilizing contents of a trusted digital repository, Allinson [11] appraised the Open Archival Information System (OAIS) model and its relevance to long-term preservation of a trusted contents of digital repositories found that the OAIS is widely applicable to long-term preservation and is useful in providing mutual terminology and communication as far as preservation is concerned. Findings also revealed that organisations such as Sherpa DP and PRESERV who explored the Open Archival Information System (OAIS) model found it to be double standard, based on the fact that the only weakness of the Model is considered to be its strength. The OAIS weakness refers to the defect of concrete implementation on how the digital preservation community can endorse the certification of a trusted digital repository which is often believed to result in ambiguity and continuity.

4. CONCLUSION

This paper discussed the level of accessibility and a means of utilizing contents of a trusted digital repository in public universities in the southwest, Nigeria. This conclusion is in line with a dynamic, calculated application of trust to access level of permission that describes a user's digital repository access.

5. SUGGESTIONS

Based on the findings, it is a known fact that virtually all the private universities in Nigeria allow all categories of students some level of accessibility to a trusted digital repository. It is, therefore, suggested that all public universities should replicate the same by allowing postgraduate students access to a trusted digital repository in terms of content utilization. It is also suggested that trust-based

access to a digital repository should allow a data source to protect and have total control against malicious information.

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AN ADJUSTED BERT ARCHITECTURE FOR THE AUTOMATIC ESSAY SCORING TASK

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ABSTRACT

Automatic Essay Scoring (AES) is the process of identifying an automatic score for an essay answer. The state-of-the-art in AES task relies on word embedding techniques. One of the advanced embedding architectures that seems promising is the Bidirectional Encoder Representations from Transformers (BERT). Yet, such an architecture suffers from a 'catastrophic forgetting' problem. This problem occurs because the gradients of fine-tuning BERT quickly forget significant information. In order to overcome such a limitation and to adapt the BERT architecture to be fit for the AES task, it is imperative to address an adequate adjustment on the learning rate by implementing a Fastai architecture which is a library used to quickly and easily fine-tune a deep learning model. Therefore, this paper aims at proposing an adjusted BERT architecture based on unfreezing fine-tune mechanism in which the BERT architecture can adequately adopt for the AES task.

Keywords: Automatic Essay Scoring; Automatic Essay Grading; Bidirectional Encoder Representations from Transformers.

1. INTRODUCTION

Automatic Essay Scoring (AES) is the process of identifying an automatic score for an essay answer. Subjective or essay answers require much more effort in order to articulate an automatic assessment for it. The state-of-the-art in AES task relies Word2Vec and pretrained Glove architectures (Cozma, Butnaru, & Ionescu, 2018; Li, Chen, & Nie, 2020; Tashu, 2020; Wang, Liu, & Dong, 2018; Zhang & Litman, 2019). The main limitation behind such architectures lies in its inability to handle sentence-level embedding and they suffer from 'out-of-vocabulary' problem. This problem occurs when a term would have no embedding vector within the training (i.e., unseen). A solution for the aforementioned problems depicted by the Bidirectional Encoder Representations from Transformers (BERT) architecture where it has a fixed vocabulary size and a mechanism of rooting the terms. Although BERT showed remarkable performance for tasks like question-answering yet, it showed incompetency when tested for the AES task (Mayfield & Black, 2020; Rodriguez, Jafari, & Ormerod, 2019). The reason behind such miscarriage is due to a well-known limitation behind the BERT architecture which is the 'catastrophic forgetting' (Rodriguez et al., 2019). This problem occurs because the gradients of fine-tuning BERT quickly forget significant information. According to (Lehečka, Švec, Ircing, & Šmídl, 2020), there are plenty of parameters within the BERT architecture in which any task can be suited through tuning such parameters. One of the attempts to suit the BERT architecture for a particular task is through alter the learning rate. To overcome these issues, Fastai a deep learning library that gives practitioners with high-level components that can provide state-of-the-art results in conventional deep learning domains quickly and easily, is implemented. In modern natural language processing (NLP), perhaps the most important approach to building models is through fine-tuning pre-trained language models. However, the way of altering the learning rate is very domain-specific issue where the specified task (i.e., AES) must be considered (Howard & Ruder, 2018). Therefore, an adjustment to the learning mechanism for the AES task is needed. This paper aims to propose an adjusted BERT architecture based on unfreezing fine-tune mechanism for AES task to overcome the 'catastrophic forgetting' problem.

2. RELATED WORK

The literature has shown a great interest in adopting word embedding techniques for the AES task. For example, Wang et al. (2018), Cozma et al. (2018), and Tashu (2020) have utilized the Word2Vec architecture for the AES task. Whereas, Liu et al. (2019), Zhang & Litman (2019), and Li et al. (2020) utilized a pretrained Glove word embedding model for the AES task. Lastly, Hassan et al. (2018) and

Hendre et al. (2020) have utilized an architecture for larger text-level such as sentence and paragraph embedding.

However, all the aforementioned embedding architectures suffer from 'out-of-vocabulary' problem where some terms would have not embedded within the model. As a response, BERT architecture has been proposed to handle such a limitation. This has been depicted where a fixed and indexed pretrained model of embedding with a vocabulary of 30,000 English terms has been adopted by BERT. Recently, Rodriguez et al. (2019), Mayfield and Black (2020), and Beseiso and Alzahrani (2020) have addressed the BERT architecture for AES task. Yet, BERT is still suffering from a 'catastrophic forgetting' problem where its fine-tune part forgets contextual information quickly.

3. Proposed Adjusted BERT

BERT architecture consists of two main models including pretraining and fine-tuning. The pretraining contains a masked language model where some tokens within the text is being masked and the target is to predict these masks. In addition, the pretraining contains a sentence prediction where the sentences of a text document are being processed as input and the output is a binary classification of whether these sentences are consecutive or not. On the other hand, the fine-tuning model in BERT aims at accommodating specific task such as question answering, document classification or document ranking. In this study, the aim of fine-tuning is to predict the score of an answer therefore, it would be document ranking.

3.1. Unfreezing Adjustment

In fact, the fine-tuning part of BERT has a remarkable drawback of forgetting contextual information. An attempt to solve this problem has been depicted in the study of Howard and Ruder (2018) where an unfreezing mechanism is used to adjust latter hidden layers to fit a particular task. To understand the unfreezing mechanism, let assume multiple hidden layers within the fine-tuning architecture as shown in Fig. 1. The earliest layers would depict learning general features such as relationships between embedding vectors. However, the approach toward further hidden layers would require learning very specific characteristics of the particular task. Therefore, rather than using the fine-tuning BERT architecture as it is like the studies of Rodriguez et al. (2019) and Mayfield and Black (2020), it is necessary to examine a suitable adjustment. To this end, the learning rate values of the latter hidden layers' gradients will witness a gradual unfreezing. This can be seen as a gradual increment of learning rates within the latter hidden layers' gradients.

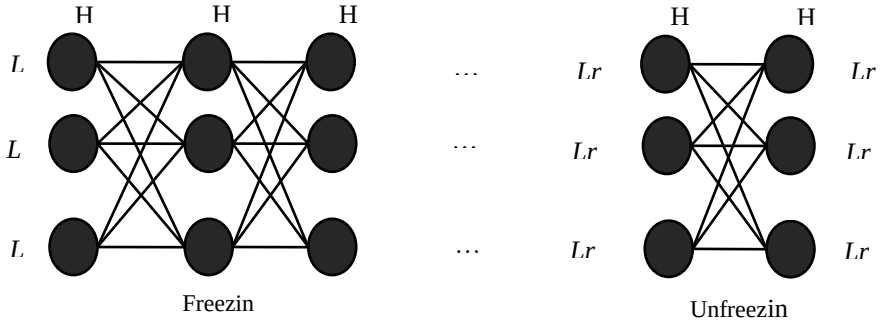

Figure 1. Arbitrary hidden layers within BERT fine-tuning

4. RESULTS

The pretrained BERT model is fine-tuned by implementing a Fastai architecture. This architecture is build using the transformers library Wolf et al. (2019). The learning rate was adjusted to 0.0001 with a batch size of 24 for 20 epochs. The model was trained under the Google Colab environment. The results are shown in Table 1.

Table 1. The performance of the trained model with the adjusted parameters

Epoch	Training Loss	Validation Loss	Training Accuracy	Validation Accuracy
1	0.61918	0.53948	0.380825	0.460516
2	0.4983	0.33486	0.501699	0.665145
3	0.37534	0.23244	0.624664	0.767557
4	0.29657	0.21159	0.703433	0.788406
5	0.2526	0.20867	0.747396	0.791328
6	0.22683	0.19557	0.773172	0.804427
7	0.2046	0.20652	0.795401	0.79348
8	0.18391	0.19948	0.816095	0.800519
9	0.1628	0.21067	0.837205	0.789327
10	0.14798	0.24282	0.852023	0.757179
11	0.1301	0.23783	0.869903	0.762167
12	0.10918	0.27078	0.890821	0.729225
13	0.09008	0.27861	0.909922	0.721394
14	0.07298	0.28819	0.927022	0.711812
15	0.06133	0.30284	0.938674	0.697164
16	0.0517	0.29493	0.948297	0.705074
17	0.04418	0.29991	0.955819	0.700092
18	0.0388	0.30857	0.961198	0.691426
19	0.0361	0.30991	0.963899	0.690089
20	0.03438	0.31015	0.965621	0.689847

As seen from Table 1, the final training accuracy obtained is 96.56% with 3% training loss, while the validation accuracy increases as the number of epochs minimizing the loss function to minimum. The validation accuracy achieved a maximum 80% accuracy in the eighth epoch, while the training loss continued to decrease as the model learns more features depending on the validation of the data in each epoch even if the validation loss increases as the number of epochs increases. The dataset chosen includes 1000 essay scored obtained from the open-source ASAP dataset available at Kaggle repository. The results shows that the trained model of incorporating bert with fastai performs well scoring different types of essays with different lengths, solving the catastrophic forgetting problem identified in the bert model. This incorporation of both models has strengthened the final trained model even with limited set of data which has proven to be efficient in the essay scoring problem.

5. CONCLUSION

This paper has presented an adjusted BERT architecture with fastai model for the AES task. Such an adjustment has been depicted by the unfreezing mechanism in which the learning rates of the latter hidden layers of the BERT's fine-tuning part are being gradually incremented. Such increment would contribute toward fit the learning model to the AES task. The final results shows that the fine tuned model incorporating bert with fastai models was able to perform well in scoring the ASAP dataset. For future direction, the experimental results acquired by the proposed adjustment would have a valuable outcome in terms of examining the capabilities of BERT for the AES task.

ACKNOWLEDGEMENTS

This study is supported by the University Kebangsaan Malaysia (UKM).

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AN ANALYSIS FOR CYBER SECURITY APPLICATIONS FOR SCHOOL CHILDREN AND ADULT LEARNER

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ABSTRACT

Smartphones are turning into a necessity tool for accessing, finding, and sharing information in an efficient and convenient manner; yet the availability of this information has resulted in a surge of cyber threats. Malicious cyber attackers are taking advantage of these security flaws. The Malaysia National Cyber Security Awareness Survey found that more than 80% of children in Malaysia access the Internet more often at home than at school and elsewhere. Children who communicate online face a variety of threats and concerns that can endanger themselves, friends, and family. Accordingly, preliminary knowledge and awareness related to cybersecurity play an important role in shaping children's online behavior and etiquette. As such, this study is to explore the influence of cybersecurity applications for school children and adult learners about online security threats and risks. The study employs a quantitative and qualitative approach based on a survey questionnaire to obtain data. The study's desired outcome is the capacity to identify the impact of cybersecurity applications factors on school children and adult learners. Finally, the research highlights a new perspective to the current literature on cybersecurity, focusing on the viewpoints of low levels of cyber security awareness.

Keywords: cybersecurity; smartphone; online security threat; cyber security awareness

1. INTRODUCTION

In recent years, the evolution of knowledge and technological advancement has grown exponentially. Social media and technology play an important role in realizing society's dream for more modern life. These technological advances have an impact that can change the way of life and human civilization, including routine activities in our daily lives, especially among children. With this new method, communication and information sharing have become so easy that today's children are more willing to spend time using smartphones and playing video games than interacting with people around them. In fact, statistics show that from 2019 to 2020, household access to the Internet throughout Malaysia has recorded 91.7 percent. Meanwhile, household access to mobile phones and computers increased to 98.6 percent and 77.6 percent in 2020 [1].

Children facing online risks, including pornography, child grooming, and sexual harassment, would be the focus of several parties in 2020, according to Dr. Wan Azizah, who is also the Minister of Women, Family, and Community Development. Various initiatives have been undertaken to address the internet hazards that children face, including a deal between national telecommunications firms and governments to help governments combat the spread of child pornography. Dr. Wan Azizah also introduced CyberSecurity Malaysia's book "Mendidik Anak-anak Digital," which offers information on standards for educating children in the realm of cyber security [2].

How safe do you feel when you are online? Every 39 seconds, a hacker attack occurs, affecting one in three citizens [3]. Cyber-attacks are not only increasing frequently, even more, sophisticated every day. There are many cyber security mobile applications available for free download online for example from Google Playstore. In an effort to curb cyber threats and crimes, many types of platforms have been designed to facilitate community learning. These apps feature more than 100 training topics covering the basics of information technology security, network administrators, system administrators, and forensic training. This cybersecurity mobile app also comes with hundreds of hours of free video training as a beginner on information technology and cybersecurity. With this, every user is guaranteed to improve their cyber security skills as well as increase their knowledge of cyber security. Therefore, the study's main goal is to investigate the influence of cybersecurity application elements on school children and adult learners.

2. MATERIAL AND METHOD

The study uses a mixed-methods technique (quantitative and qualitative), including standardized questions to elicit specific information from a group of individuals. This questionnaire is implemented for the purpose of researching the level of public awareness on cyber security issues approached by users of cyber security applications. As a result, the survey is categorized into two sets of feedback collection from school children and adult learners.

2.1 Sample and data collection

The questions are disseminated using internet surveys via Google Form. The survey is categorized into two sets of feedback collection from 60 primary school students and 55 Universiti Kebangsaan Malaysia students. Because the present generation of primary school students and university students is regarded to be more technologically adept and spends more hours on the internet for academic and pleasure purposes, especially during the covid-19 pandemic, this study employs primary school students and university students as the sample. Furthermore, university students' surroundings are regarded as favorable to learning, and the level of public awareness that impacts their internet activities is identified.

Google Forms offers a variety of options for sharing the actual form. We have adopted with the simplest method where offer folks with a link. Copy the provided link and put it somewhere our audience can see it (Email, WhatsApp, Telegram, etc.). We also check the box for a shortened URL, which allows users to type the URL directly into their browser.

Moreover, the confidentiality of responders' profiles and data will be guaranteed, and the information will be used solely for educational reasons. The scale indications will range from strongly disagree (1) to strongly agree (5) on the Likert-scale continuum, and the study methodology will be based on the impact of cybercrime components for the university student set. While features questions that are detailed and have in-depth responses based on the impact and influence of cybersecurity applications components will be the study methodology for primary school student set. Figure 1 summarizes the lists of analyses on the computer and network security for school children. While the lists of analyses on the computer and network security for adult learners are summarized in Figure 2.

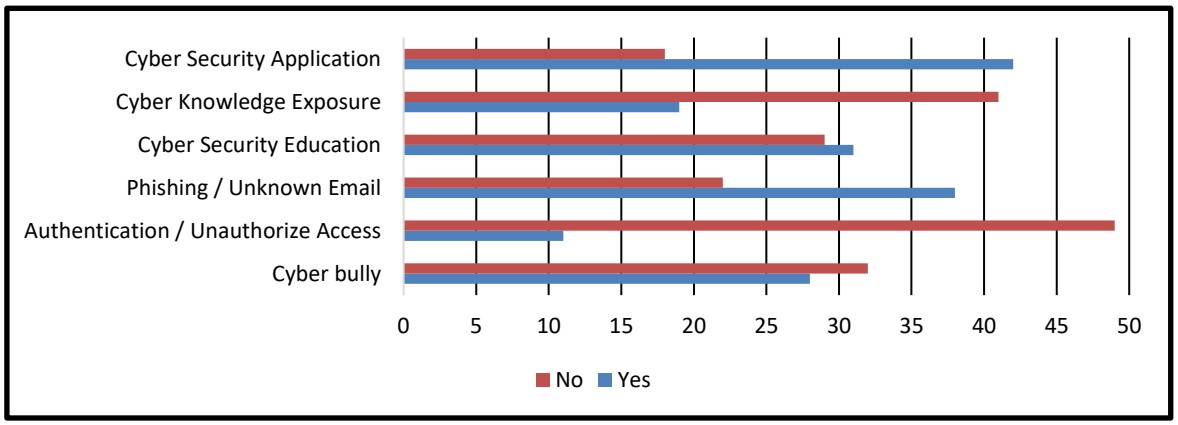

Figure 1. Analysis for School Children

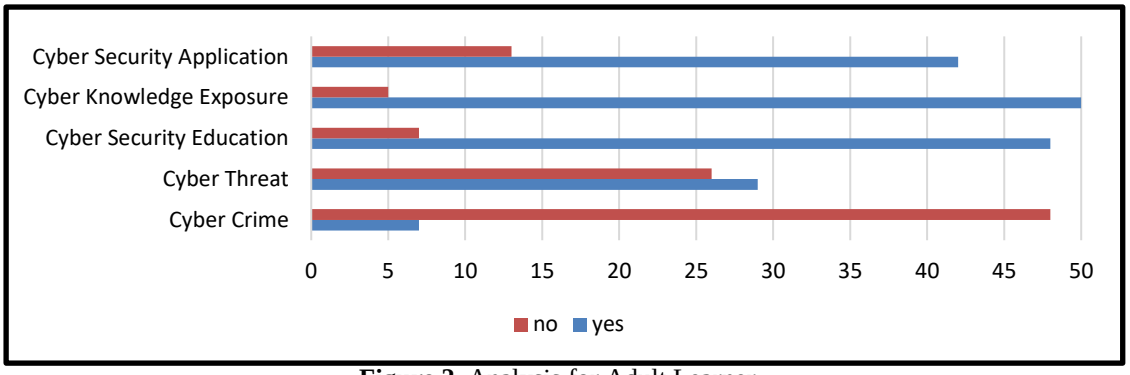

Figure 2. Analysis for Adult Learner

3. DISCUSSION

A bar chart or bar graph is a chart or graph that uses rectangular bars with heights or lengths proportional to the values they represent to convey categorical data. The bars in Figure 1 and Figure 2 are plotted horizontally. Bar graphs and charts are used to visualize category data. Categorical data is the division of information into defined categories, such as cyber security application, cyber knowledge exposure, cyber security education, cyber threat and cybercrime. These are qualitative categories. Categories appear along the horizontal axis in a column bar chart, and the height of the bar corresponds to the value of each category, where yes or no answer. Moreover, bar charts have a discrete scope of categories and are typically scaled to fit all of the data on the graph. When the categories being compared do not have a natural ordering, the bars on the chart can be arranged in any sequence.

The use of the Internet to exploit children is on the rise as today's children and teenagers grow up with devices that allow them to access numerous sorts of unsuitable information online. Daily "Sajian Internet" for children, particularly during the execution of the Movement Control Order (PKP) in response to the Covid-19 outbreak, may have a harmful influence on their brains and emotions [4]. In reality, this circumstance strengthens parents' obligation to protect their children from hackers' exploitation.

According to the Ministry of Women, Family and Community Development (KPWKM) has created a national child protection strategy to fulfil the aim of child protection, especially online [5]. According to the Malaysian Communications and Multimedia Commission (MCMC), combating cybercrime is not just the duty of the government, but involves all stakeholders, including parents. Because so many activities are now done online, cyber security is crucial. However, many people may overlook data security and privacy as a result of this convenience, which can have a severe influence on finances, mental health, and even physical health.

Attackers have taken advantage of this burgeoning industry, according to a survey published in early 2011 [6], by mixing old and new tactics. Malaysia is assaulted with numerous unknown hackers targeting websites every month, according to research done by the Open Web Application Security Project (OWASP). The most serious assault was in March 2015, when 39 gov. my websites and 107 edu. my homepages were hacked [7]. This is due to the fact that many people do not install security software on their phones and feel that accessing the internet on their phones is just as safe or secure as visiting the internet on their PCs [8]. Now, big companies are not the only main targets of cybercriminals anymore. More than half of cyber-attacks now target governments and individuals, especially children and teenagers. According to the CyberSAFE National School Survey Report (2014), about 40% of children do not know how to protect themselves on the Internet. 83% of children do not use various means to protect themselves on the Internet, and 30% of them do not take any action at all or only take one action to protect their online safety [9].

In order to successfully combat malevolent intent, cybersecurity applications must be freely available to educate the public especially the school children. Therefore, the findings of the survey revealed that cybersecurity applications will influence the level of public awareness of cyber security issues. To

summarize, knowing the awareness that drives cybersecurity behaviors will be able to lead the development of a more secure and resilient cyber ecosystem to enhance national security, economic prosperity, and social harmony

4. CONCLUSION

The findings will pave the way for further research into cybersecurity application analysis on school children and adult learners. As a result, while examining the positive and negative causal links of cybersecurity application habits, it will be a necessary intervention. The existing cyber security applications in the Malaysian market are immature in the field of providing education among children and can be perfected. The question is, how can these apps guarantee that future generations do not commit cybercrime or become victims of cybercrime? The fact is the lack of education among children is also an issue that needs to be addressed because recognizing education to children is one of the easy and effective ways to ensure the younger generation is free from the threat of cybercrime.

ACKNOWLEDGEMENT

The authors would like to acknowledge the support of FTSM, UKM in providing facilities for this research. This article is supported under the Fundamental Research Grant Scheme FRGS/1/2019/ICT03/UKM/02/1.

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AN ENERGY-EFFICIENT HOMOMORPHIC RESIDUE NUMBER SYSTEM BASED CNN MODEL FOR CLASSIFICATION OF DYSLEXIA NEURAL-BIOMARKERS

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ABSTRACT

The increasing generation of neuroimaging datasets and the recent cloud deployment of deep learning (DL) algorithms as a service have enabled timely remote classifications of discrepancies in neural-biomarkers of critical health conditions such as dyslexia. Using any of these untrusted platforms to implement a secure DL algorithm will identify and resolve potential security attacks or patient data theft, hence, the need for a privacy-preserving classification method based on fully homomorphic encryption (FHE). However, existing FHE privacy-preserving methods are still inefficient in terms of accuracy, latency, and feature extraction time with significantly large cipher-image expansion problem. This study presents homomorphic residue number system-CNN (HoRNS-CNN) model for the classification of dyslexia neural-biomarkers. The HoRNS-CNN architecture is made up of RNS-FHE scheme and pre-trained CNN models with the use of an energy-efficient special moduli set to design an encryption module for 8-bit grayscale code of each pixel in the neuroimage dataset while pre-trained CNNs were applied directly to the encrypted data in the cloud. The activation functions of the CNN models were approximated by a Taylor polynomial function of degree 3 to adapt them to homomorphic operations with respect to the used moduli set. Results from proposed HoRNS-CNN model demonstrated an improved performance.

Keywords: Privacy-preserving methods; homomorphic encryption (FHE); residue number system (RNS); neuroimaging datasets; dyslexia detection.

1. INTRODUCTION

Privacy-preserving classification is becoming an increasingly important field of study in recent years due to the sensitivity and privacy concerns of some datasets such as medical images and the cloud deployment of platforms (e.g., Cloud Machine Learning Engine) that allow commercial use advanced machine learning (ML) algorithms [1]-[3]. Also, the availability of increasing neuroimaging dataset (e.g., MRI scans) makes such advancement current and relevant. The user can use these platforms to design an algorithm or implement some pre-trained DL algorithms, but the server that manages these platforms in the cloud cannot be completely trusted. Implementing a secure DL algorithm on any of these platforms will detect and resolve potential security attacks and vulnerabilities, as well as patient data theft, in the field of medicine involving learning disability detection. A security vulnerability is a weakness, flaw, or error discovered in a security system that could be exploited by a threat agent to compromise a secure network. Thus, the privacy of patients' medical information becomes critical [4], especially when such datasets are highly sensitive, as in the case of learning disabilities. While remote classification can significantly improve the quality and timeliness of medical decisions by lowering costs, such data may be vulnerable to a variety of security threats and attacks.

The development of FHE scheme is a game changer, greatly expanding the scope of computations that can be used to process encrypted data homomorphically. Despite significantly higher prediction accuracy on public datasets (e.g., MNIST and CIFAR-10) [1], [2], [4], existing studies face major problems associated

with the design and practical implementation of privacy-preserving FHE schemes with DL algorithms. These problems include inefficient energy use, low accuracy, long latency (delay), large cipher-image expansion, and significantly longer feature extraction time. Therefore, practical privacy-preserving CNN method requires a mechanism for improving the biological interpretability of the training dataset, energy-efficient FHE scheme, hyper-parameter optimization and data augmentation in the encrypted domain, hence the need for this study. This study presents HoRNS-CNN model for the privacy-preserving classification of dyslexia neural-biomarkers. The main ingredients of HoRNS-CNN are homomorphic residue number system (HoRNS) and depth-based pre-trained CNN models [3]. This study's contribution is thus, the implementation of an energy-efficient RNS-FHE scheme on deep neural networks.

2. MATERIALS AND METHODS

The general system architecture of a cloud-based scheme for the secure, efficient, and accurate classification of dyslexia neural-biomarkers is depicted in Figure 1.

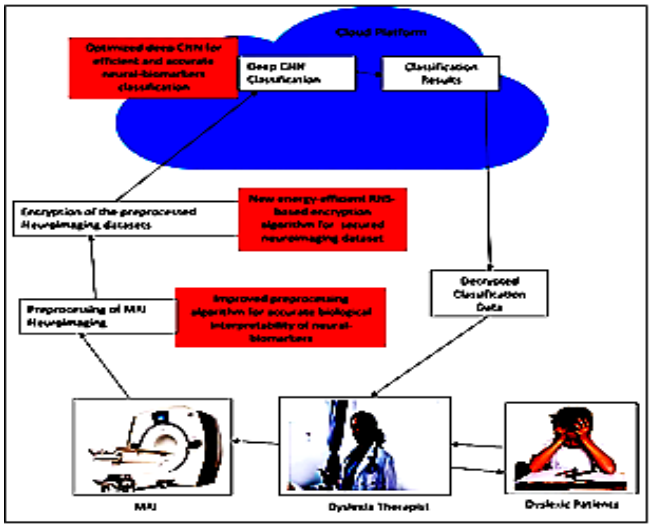


Figure 1. An Overview of system architecture

3. RESULTS AND DISCUSSION

3.1. Results of Data Preprocessing

The MRI datasets used in this study were obtained from publicly available databases such as Kaggle, OpenNeuro, and the Connectivity-based Brain Imaging Research Database at Beijing Normal University (C-BIRD). Gaussian smoothing with an isotropic kernel of size 4mm and modified histogram normalization (MHN) methods were employed to improve the comparability and homogeneity of neural-biomarker tissues inherent in the MRI dataset used [6] as shown in Figure 2 and Figure 3.

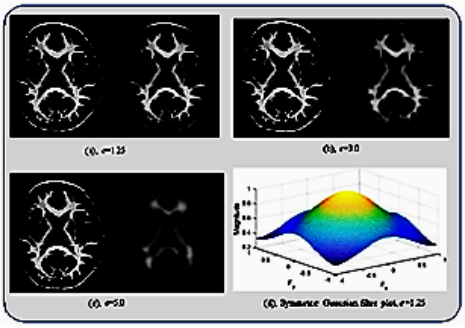


Figure 2. Visual comparison of a Gaussian smooth neuroimage sample at a different value of σ.

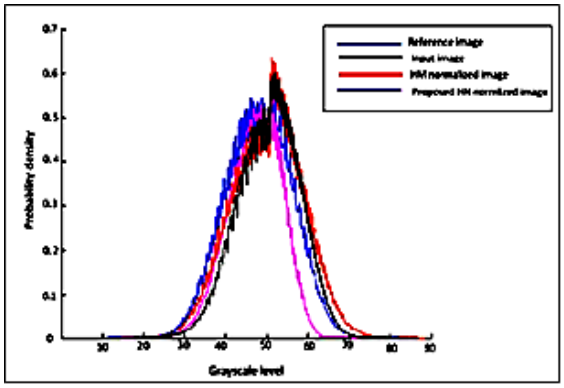
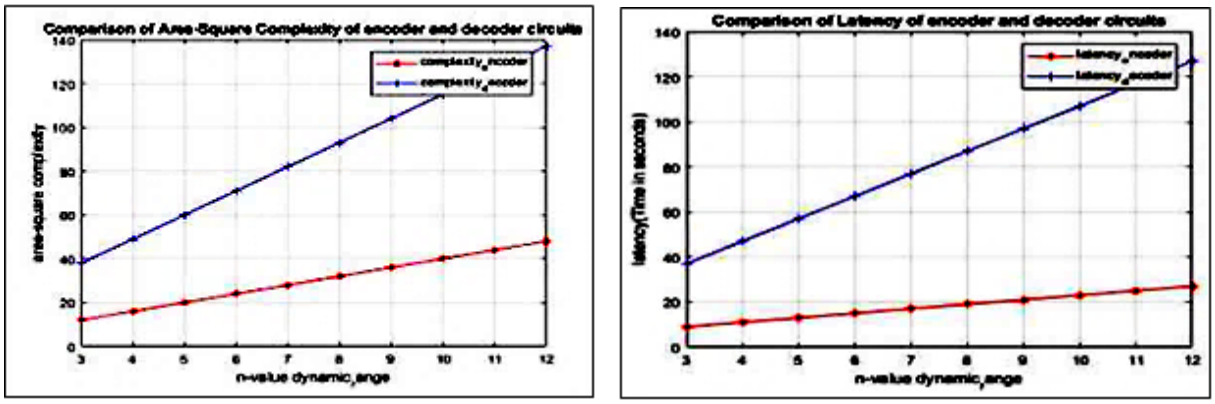


Figure 3. Visualizing the pdf curves of the reference image, input image, and normalized images.

3.2 Results of FPGA implementation of RNS-FHE

The demonstration of the homomorphism properties of the proposed RNS-FHE scheme shows that the scheme is homomorphic with respect to addition, subtraction, and multiplication with manageable cipher-image expansion and a polynomial asymptotic time-complexity of O(n3) with respect to the given moduli set $\{2^n - 1, 2^n, 2^{n+1} - 1\}$. The proposed scheme's FPGA implementation improves critical path latency by 23.5% and 15.3%, respectively. The Area-Square complexity and Latency is shown in Figure 4.



(a) (b)

Figure 4. Comparison of RNS bitstream encoder and decoder, (a) Area-Square complexity, (b) Latency.

3.3 Classification performance of HoRNS-CNN model on cipher neuroimages

Three cutting-edge depth-based pre-train CNN models were used in the simulation of HoRNS-CNN model. They include Inception-V3, Two-pathway cascaded CNN, and ResNet-50. Their training procedure was based on a transfer learning paradigm, with parameter fine-tuning from the top n-block layers. The proposed models were modified in this study by carefully updating their weights with our task-specific training patched neuroimages. For each of the three selected models, the value of n = 4,3,5. The three CNN models were adapted to homomorphic addition and multiplication operations by approximating the ReLU activation function with a Taylor polynomial series of degree 3 [5].

Table 1. Classification performance of HoRNS-CNN models on cipher neuroimages (mean±SD after 10 repeated 10-fold CV)

DL Model	Iteration (Epoch)	Accuracy (%)	Sensitivity (%)	Specificity (%)	F-Score (%)	Feature extraction time (mins)
Inception-V3	400	92.02±0.0176	92.12±0.0219	91.31±0.0187	91.71±0.0352	60.77
Two Pathway Cascaded CNN	200	83.77±0.0087	83.22±0.0221	80.17±0.0212	81.67±0.0133	79.21
ResNet-50	400	93.04±0.0300	93.94±0.0350	91.68±0.0255	92.80±0.0235	78.81

4. CONCLUSION

We presented HoRNS-CNN model for privacy-preserving classification of dyslexia neural-biomarkers from publicly available neuroimaging datasets in this study. HoRNS-CNN is composed primarily of fully homomorphic RNS scheme (RNS-FHE) and pre-trained depth-based CNN models including Inception-V3 network, two-pathway cascaded CNN model, and ResNet-50 model. Specifically, we present a follow-up to Usman and Muniyandi [3] by providing mathematical formalization underlying the algorithms to design a RNS bitstream encoder/decoder circuits for brain neuroimages encrypting/decrypting. The encrypted neural-biomarkers in the images are then subjected to deep model classification, under a concept general acknowledged as privacy-preserving prediction. We were able to achieve the above by using a powers-of-two special moduli set $\{2^n - 1, 2^n, 2^{n+1} - 1\}$ and by modifying configuration of the used CNN models. The proposed pre-trained depth-based CNNs implemented in HoRNS-CNN model are efficient in terms of asymptotic complexity, energy-saving, feature extraction timing-performance with significantly high performance on classification metrics used without revealing the dataset's secret.

ACKNOWLEDGEMENT

This research is funded by UKM and FRGS. Grant Code: FRGS/1/2021/ICT07/UKM/02/1.

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AN OVERVIEW OF FACTOR INFLUENCING THE ADOPTION OF BUILDING INFORMATION MODELING AND INTERNET OF THINGS INTEGRATION IN CONSTRUCTION INDUSTRIES

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ABSTRACT

Low productivity in construction projects can be attributed to a failure to implement new methods for managing building information. Building information modeling (BIM) and the Internet of Things (IoT) have the ability to reduce costs, improve quality, increase productivity, and ensure on-time delivery, among other advantages. However, BIM-IoT's adoption and execution are subject to the same kinds of conflicts seen all around the world. Therefore, the goal of this study is to perform a literature analysis of the factors that drive BIM-IoT adoption in the construction industry. The factors are discovered through a survey of the literature, and the factors are then organized into different categories namely environmental, organizational, and technological.

Keywords: Building Information Modeling; Internet of Things; Environmental factor; Organizational factor; Technological factor

1. INTRODUCTION

Improved project delivery in the construction industry can be achieved using Building Information Modeling (BIM) and the internet of things (IoT) [1]. With BIM-IoT centric project delivery, building component data sets with high resolution, geometric and positional precision, and unique identities may be obtained [2]. The Internet of Things (IoT) is defined as the "interconnection of sensor and actuator devices that enables cross-platform information sharing and innovative applications" [3]. A wide range of IoT-related technologies is available, from sensors and identification and recognition to cloud-based platforms and communication networks to software and algorithms to power and energy storage [4]. There are many common protocols and technologies used in IoT devices [5]. Typical IoT devices include intelligent devices, smart mobile devices, single board computers, sensors, and actuators [6]. The integration of BIM and IoT data is a more recent innovation. When used in conjunction, BIM and IoT data can provide a more complete picture of a project than either could provide on its own. BIM models depict the project at the component level. A BIM model is a high-fidelity operational dataset that captures the as-designed architectural items, attributes, and spatial organization as a set of virtual assets. Building Information Modelling and Internet of Things (BIM and IoT) devices have been used in a wide range of applications in the past. While there has been some progress in the integration of BIM with IoT, most studies are still theoretical and conceptual. This study, therefore, examines the various factors that influence the adoption of building information modeling and internet of things integration in the construction industry.

2. MATERIALS AND METHODS

An overview of BIM-IoT integration in the construction industries is the goal of this work, which uses the literature review method [7]. Although there are reviews on BIM-IoT integration in the literature, the authors seek to focus on the factors influencing the adoption of BIM-IoT integration in the construction industries.

3. RESULTS AND DISCUSSION

Based on the extensive literature review there is a growing research interest in the adoption of building information modeling and the internet of things in the construction industries among different countries such as the United States, United Kingdom, China, Australia, Malaysia, South Korea, Hong Kong, Germany, Canada and Spain (Figure 1 (a)). The number of published articles has grown astronomically between 1990 and 2022 as shown in Figure 1 (b). Factors such as technical defects of BIM, motivation, and BIM ability affect the adoption of BIM-IoT technologies in the construction industry [8]. Other factors identified include adaptability in business, cultural norms, a lack of expertise, a lack of information technology assistance, a lack of supervision, an absence of observational skills, and a perception of danger [9]. Shehzad et al. [9]. Identified 74 factors, which were categorized into technological, organizational, and environmental. In the technological category, compatibility and complexity are the two most important considerations. Compatibility factors include scalability, interoperability, and collaboration. To be interoperable, systems must be able to share data that has the same context and meaning. However, complexity is a measure of how difficult it is to master and understand a certain technology. The absence of technical support is also a point to consider. In order to have an impact on BIM-IoT adoption, organizational factors must be considered in conjunction with inter-organizational processes, practices, and policies.

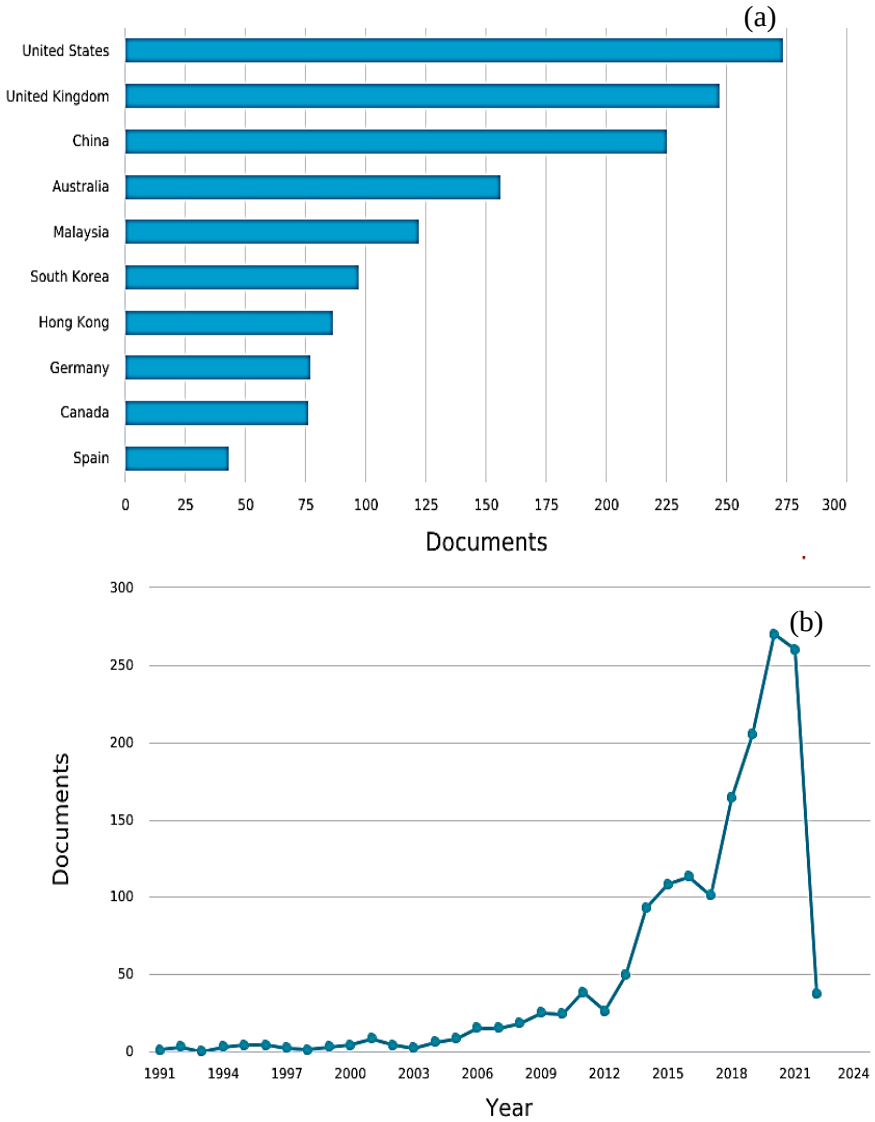

Figure 1. Analysis of the publications in the adoption of building information modeling and internet of things in the construction industries based on (a) the countries of research (b) year of publications

4. CONCLUSION

Although this research study has some limitations in scope, it provides a holistic view of the factors influencing BIM-IoTs adoption in the construction industry. However, only existing studies using technology adoption theories and models are considered, while the general adoption studies are omitted.

ACKNOWLEDGEMENT

This research was fully funded by Universiti Kebangsaan Malaysia and the Ministry of Higher Education Malaysia for financially supporting this research (FRGS/1/2020/TK0/UKM/02/9).

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ANALYZING EMAIL AND HUMAN BEHAVIOR FEATURES ON PHISHING EMAIL CLASSIFICATION

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ABSTRACT

Phishing emails are also known as cyber-attack cannot be separated from the existence of the sender, the attacker of deceptive phishing will create an email based on observations and different ways of writing. The attacker behavior aspects on writing part make as sure as possible to trap the victims to follow the flow of the email made by the attacker. Due to the large number of attackers who make email in the same scope on behalf of a trusted company, we can observe and analyze the differences in email content in terms of writing, word choice, and language style or linguistic features. The common goals in this area are to understand and know the topic provided by the email content. Numerous other features of phishing emails can be observed, such as stylometric, personality, gender, and tone profiles on the human side and headers, bodies, and URLs on the email side. Machine learning and deep learning approaches should be able to predict phishing statuses more accurately by using a combination of email and human behavior features.

Keywords: Features; Features Selection; Behavior Features; Email Features; Linguistic; Stylometric; Phishing Email Classification

1. INTRODUCTION

Phishing email are also known as cyber-attack cannot be separated from the existence of the sender. They utilize a strategy to create urgent atmosphere that convince the victim to react, for example, account alert or promising reward. The attacker behavior aspects on writing part make as sure as possible to trap the victims to follow the flow of the email made by the attacker. Due to the large number of attackers who make email in the same scope on behalf of a trusted company, we can observe and analyze the differences in email content in terms of writing, word choice, and language style or linguistic features. Stylistics, a branch of applied linguistics is a study about the writing style on the language and word used by different individuals in different situations or settings. The common goals in this area are to understand and know the topic provided by the text. Several categories of stylistic features of texts can be classified as human behavior features in order to understand the given text [1].

Every part of the email has its criteria and characteristic, and every single email will have different characteristics because the sender will give different information and data. By using those parts as features in the classification process may have a bigger chance of getting a satisfying result. Based on the literature survey on the phishing email classification features selection, the feature will be included are header feature and URL feature. In other words, there will be some additional features that will be combined with the stylistic features to get a result for the phishing email classification [2].

2. LITERATURE REVIEW ON BEHAVIOR FEATURES

2.1 Background of Features Selection

Feature selection becomes a crucial part of conducting email classification research; selecting the best and suitable features in the experiment will give better result. Though, there is no such optimized features that can be equally applicable in all domains [13]. In the past years, the researchers tried with different features selection and extraction. There are some of popular features used on the phishing email classification such as: content based, word embedding, word analysis, and header. By conducting several reviews of research in the area of phishing email classification in recent years, the most frequently used feature is content based and URL. The main reason is because the phishing email mostly contain links that will redirect victim into another scheme [2]. In some previous research, the features of each category both in terms of email and human are features that play a very important role in the process of email classification, whether ham, spam, or phishing. Based on the literature survey, there

are two main features on the phishing email classification area namely human behavior and email behavior. For the human behavior will defined from the context of the phishing email which based on stylistic features [1], as for the email behavior is based on the structure of the phishing email. The structure of the feature can be seen on the Figure 1.

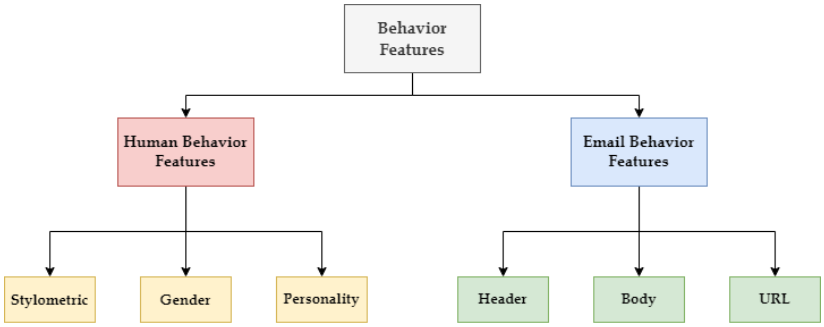

Figure 1. Behavior Features Classification

2.2 Human Behavior Features

Human behavior features are used mainly on determining authorship, gender, personality, and other related to interpretation of text or spoken language. In other terms, those features categorized as stylistic features which analyzes the content of the input data to certain step and categories. Some human behavioral features that are commonly used in research related to stylistic features are:

Stylometric Features: writing style; **Gender Features**: men and women prefer different words; **Personality Features**: different personalities often use different words and vocabularies [1]; **Tones Features**: emotion found in text by word choices [2]. Table 1 shows human behavior features on previous research:

Table 1. Human Behavior Feature Example

No.	Features Name		Reference
1	Stylometric	Lexical (Based on Words)	[1][3][4]
		Syntactic (Word order)	
		Structural (Structure of text)	
		Subject Specific	
		Semantic	
		Idiosyncratic & Grammatical	
2	Gender	Word choices (Man & Woman)	[1]
3	Personality	Vocabulary used	[1]
4	Tones	Emotion Tones	[2]
		Language Tones	
		Social Tones	

2.3 Email Behavior Features

Each of the email part can be extracted and selected into a feature that can help to improve the result of email classification. Email features that extracted from each of the parts is called behavior-based features. Generally, the structure and content of the overall email is considered as the behavior of the email [1]. Nowadays, email behavior feature is the features used on many researches on email classification that extract parts of email, commonly header features, body features, and URL features. Table 2 shows several of email features that used on previous research.

Table 2. Email Behavior Feature Examples

No.	Features Name		Reference
1	Header	Sender	[5][6][7][8] [9]
		CC	
		Subject	
		Time	
		Content Format	
2	Body	Javascript	

		Email Format (HTML/Text)	[5][6][7][8] [9][10]
		Attachment	
		Presence of URLs	
3	URL	URL Length	[2][5][7][8] [9]
		URL IP address	
		URL @ symbol	
		Number of URLs	

2.4 Combining Email and Human Behavior Feature

Integration between email and human features in phishing email classification has not been fully integrated. The part of the email consisting of the header, body, and URL is combined with features that come from the body text of the email, for example word count, punctuation word, unique word and others [3].

Only few studies use the combined feature, especially in the area of phishing email. Some researches that used the two features of these categories, namely email and human features. Based on previous research that uses either email or human features in phishing classification, the features used such as URL length or number of URLs for feature emails and stylometric category for human features show promising results [2][11][12]. Therefore, this is a challenge in terms of integration between features selected to improve the performance of the phishing email classification.

3. RESULT AND DISCUSSION

3.1 Strength & Limitation

The features and technique also have some strength and limitations, mainly for features depending on how the research approaches the problem. The selection of techniques and features all depend on the problems that arise and want to be resolved, departing from it then only can be determined what features and techniques are appropriate and will be used to solve related problems. Behavior features handle the linguistic aspect from the both of human side and email side. There is still uncertainty of linguistic features combined with email features on deceptive phishing email classification and detection [13]. In other words, there are still human behavior features that can be observed more on deceptive phishing email classification that can be combined with email behavior features for example is stylometric feature. Stylometry is a branch of linguistic features in natural language texts which can be extracted as features. However, the issue in stylometric feature is the selection of the optimum feature set.

3.2 Open Issue (The Gap)

Phishing email classification has some potential that can be developed to a more advanced level, either on the side of feature, technique used, dataset combination, etc. On previous researches on phishing emails classification, the feature set used on every experiment is different either using email or human features [2][11][12]. There is a lack of research on combining email and human features, although it shows promising results in the performance result. Thus, there is a need to identify which feature or feature set will have the highest impact on classification of phishing emails.

Deep learning approach is an approach that is practically new in terms of classification area, especially in phishing email classification. There only several researches that using deep learning as the main technique [6][11][14][15] due to the feature engineering aspect or the deep learning model complexity. This becomes a challenge and new knowledge in text classification, especially phishing email classification. Up until now, there are only few of researches using deep learning as their main technique on phishing emails classification area.

In the area of phishing emails classification, features selection has become essential part of determining the email is phishing or not phishing. A combination of several features can be implemented to produce a good result and accuracy. There is still uncertainty of the impact on phishing email classification using behavior features either on the human side (stylistic) or email side. The usage of those features may help to improve the result or accuracy of classifying email especially phishing email. By understanding

that feature selection is very influential in the continuity of experiments in email classification is a reasonable advanced challenge.

4. CONCLUSION

This paper presents analysis of the phishing emails classification domain by focusing on the behavior features. There are many email and human features that can be observed more to help improving the current classification model on the phishing email area, namely stylometric, personality, gender, and tones feature on the human side, and header, body, URL on the email side. One way to do it is by combining the human side and email side features and do the comparison for the combination. As for today, the challenge for phishing email classification is on the improvement by using different features, different approaches and the workflow of the selected features with the selected approaches either using machine learning or deep learning technique.This study has several limitations. This study focuses only on phishing email classification research and the explanation on behavior features. The scope can be extended in future reviews.

ACKNOWLEDGEMENT

This work was partially supported by Universiti Kebangsaan Malaysia under Research Grant FRGS/1/2019/ICT02/UKM/02/2.

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ANNOTATION OF NAMED ENTITY RECOGNITION FOR QURANIC TEXT USING RULE-BASED METHOD

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ABSTRACT

The variety and difference between domains for textual data require customization in the Natural Language Processing component especially in Named Entity Recognition where different domains contain different types of entities. This paper describes the performance of a rule-based Named Entity Recognition method to extract the entities that exist in the English translation to the meaning of the Quranic text. Named entity tagging, a common task in-text annotation, in which entities (nouns) in the unstructured text are identified and assigned a class. A few rules are built to extract several types of entities such as the name of prophets and people, creation, location, time, and the various names of God. The rules are built mainly using RegEx and gazetteers. The rules that have been built result in high precision and recall as well as an F-score of over 90%. The results from this experiment can be used as annotation in building a machine learning model to extract entities from the same type of domain which is the Quranic text.

Keywords: Named Entity Recognition (NER); rule-based method; Quranic text

1. INTRODUCTION

In the religion of Islam, the Muslims believe in a book named Quran that contains various information and stories that serve as guidance and reminder for Muslims. This guidance and reminders are often told in the form of a story from the old days thus there are multiple entities that exist in the Quran. Due to the uniqueness of this Holy book and since the original language of this book is in Arabic, the usual Named Entity Recognition (NER) method cannot be used to accurately extract the entities. The common NER library which is the SpaCy library has been used to extract the entities from the dataset used in this project but the precision of the common NER model only results in a precision of 0.41 and this model does not accurately recognize the entity such as Allah. Hence, some customization should be made to cater to the different entities that exist in this Quranic text.

Named Entity Recognition (NER) is an essential component of Natural Language Processing (NLP). NER functions by carrying out two major tasks which are by identifying entities that exist in text and later classifying them into the respective type of entities [1]. The common type of entities extracted includes the name of a person, the name of the organization, and the name of places in English. These types of entities are too general and work well only for general articles in English. Therefore, many projects and research have been carried out to extend and modify the usual NER method to extract even more types of entities and in texts of different languages. For example, modifications are made to the basic NER method for texts in different languages such as Arabic [2][3] and Chinese [4][5]. Modifications are also made for texts in various domains such as in the medical domain to extract names of diseases [6].

This paper proposes a process of extracting entities from the English translation of the Quranic text using a NER method called the rule-based method. This NER model requires manually crafted rules that can carry out the NER task. These rules are usually built from grammatical patterns, syntactic features, orthographic features along with hand-made gazetteers [7]. The rules for this project are made mainly by patterns using regular expression or RegEx, and gazetteers. The NER model is built to extract eight types of entities that will be elaborated in section 2. The dataset that is used for the documentation of

this paper is the 112 verses of Surah Al-Anbiya. The results of the extraction are then sent to domain experts in the Quranic field to be verified. The verified results are then analyzed for future use of annotation in the building of a machine learning NER model and as a gold standard to compare with, for evaluating the performance of the approaches being done.

2. MATERIALS AND METHODS

This experiment is done using the NLP library named SpaCy and is fully written in the Python language. There are a few steps involved in the completion of this project. Figure 1 below shows the pseudocode of the project.

```
Program start

Set raw Quranic translation as text

#Pre-processing
For each verse in text:
        remove digits
        remove special characters
        set co-reference for the entity Allah
        remove phrases in parentheses and brackets
        return cleaned_text

#NER
For each verse in cleaned_text:
        identify name of Allah, name of prophets,
        name of person, name of group of people,
        name of location, afterlife location,
        name of creations and special time terms
        based on specific rules for each entities

End of program
```

Figure 1. The pseudocode of the project

The project starts with the pre-processing dataset which involves the removal of unnecessary digits, special characters, references, and the co-referencing of the term Allah. The removal of these elements is assured to not alter the actual text since only the irrelevant elements are discarded. This step also helps ease the next process which is the NER process since the dataset is cleaner and has less noise. This pre-processing step is done mainly using the regular expression module in Python. The first step also involves the building of the rules. This paper proposes the extraction of eight different entities as well as their entity tags as shown in Table 1 below.

Table 1. Types of entities extracted

Entity Tag	Type of Entity	Example
PER	Individual, person	Maryam, Qarun
PER-PROPHET	Prophets	Adam, Musa
PER-GROUP	Name of a group of people	Muhajirun, Children of Adam
LOC-AFTERLIFE	Places in afterlife	Firdaus, Hell
LOC	Name of the city, historical places, and mountains	Babylon, Makkah, Egypt, Mount Sinai
GOD	Name of God	Allah, All-Knowing
CREATION	Creations such as angels, jinns	Jibril, Iblis
STIME	The time that refers to Qiamat	Last Day, Day of Recompense

Gazetteers are made to extract some types of entities which are the names of people and prophets, names of locations, and names of creations. This is because there are no specific patterns for these entities, and the name of these entities are fixed. The gazetteers contain a complete list of entities that are compiled from a Quran corpus built by the Language Research Group of the University of Leeds. The other types of entities which are the name of groups, name of God, and name of special time are extracted using RegEx. These entities have specific patterns that can be identified using regular expressions. For example, the various names of Allah found in the text are written with the prefix 'All' (e.g. All-Knowing), 'Most' (e.g. Most Gracious), and 'Oft' (e.g. Oft-Forgiving). These patterns can be used to extract the entities for the name of God. The same method is applied to extract the entity type for the name of groups and the name of a special time. Figure 2 shows the examples of the output of this NER model.

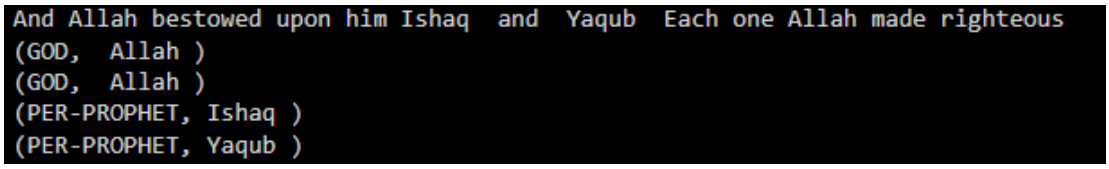

Figure 2. Example of NER output

The extraction is done using the rules created in the first step with the help of the SpaCy library. The entities extracted are then compiled and organized to be verified by the domain expert who is knowledgeable in the Quranic field. This is because the Quran is a Holy Book for Muslims and the purity of the content should be preserved and monitored by experts. The verified results are then analysed using the precision, recall, and F-score method that derives from the confusion table [8]. Precision is defined by the performance of the method in extracting and labelling the entities correctly among all the extracted entities. The recall score calculates the correctly extracted entities among all the entities that should be extracted. The true positive from this experiment refers to the correctly labelled entities, the false positive refers to the incorrectly labelled entities meanwhile the false negative refers to the entities that are not extracted by the NER method.

3. RESULTS AND DISCUSSION

The result for this project is verified by the domain expert and has been classified into True Positive, False Positive, and False Negative in order to calculate the precision, recall, and F-score values. Table 2 shows the scores of the precision, recall, and F-score of this experiment.

Table 2. Rule-based NER method evaluation scores

Type of evaluation	Value
Precision	0.98
Recall	0.91
F-Score	0.94

The scores of the evaluation are over ninety percent which is considered very good. The range of this result is expected because the rules are manually crafted to fit the type of entities with high accuracy. The extraction for the entity type that uses gazetteers shows a very high accuracy except for the entity location because it fails to classify the entity 'heaven' and 'earth' that appear multiple times in the dataset. The entities extracted using RegEx show a lower accuracy compared to the entities extracted using gazetteers since some of the patterns are not very specific and results in wrongly labelled entities. For example, the pattern that is used to extract the entity name of groups incorrectly classified the word 'borders' as a name of a group. This issue can cause a bigger problem if tested in a dataset that contains a lot of names of group entities and should be improved for future work. Despite the good performance

of this NER method, based on the verification and comments from the domain expert, there are some issues that occur during the pre-processing part related to the dataset. The co-referencing for the term Allah has changed the meaning and context of the Quranic text which may cause some of the extractions to be invalid.

4. CONCLUSION

The rule-based NER method described in this paper successfully extracted entities from Surah Al-Anbiya with a very high F-score of 0.94 thus showing that the rules built are accurate and valid except for some of the issues mentioned in the result section. The analysis from this experiment can serve as a guide for the annotation and building of the future machine learning NER method for Quranic text.

ACKNOWLEDGEMENT

This work was supported by Universiti Kebangsaan Malaysia under Research Grant FRGS/1/2019/ICT02/UKM/02/2.

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CLUSTERING ANALYSIS OF PERSUASIVE LANGUAGE IN SCAMMER EMAIL TO DETECT ROMANCE SCAM

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ABSTRACT

A successful scam is a romantic scam that causes financial and emotional harm to its victims. It is based on developing a relationship that fosters deep trust and causes victims to willingly transfer funds to fraudsters. Factors that motivate people to engage in online chatting or dating are because they are lonely and believe that those online relationships will alleviate their loneliness. Persuasive methods and persuasive strategies are employed by a scammer to obtain a victim. Scammers will use various types of persuasive language to achieve success in their persuasive strategy. The goal of this study is to detect romance scam persuasive language in scammer email using clustering analysis. In addition, clustering analysis uses persuasive methods and persuasive strategies to identify clusters of persuasive language. We performed cluster analysis on the scammer's messages using K-means. It is because of its simplicity and efficiency in performing cluster analysis at a satisfying level. In this study, it is possible to find seven correlated persuasive language scammer messages, which are the profile, developing trust, hyper-personal relationships, grooming, the sting, scam maintenance, and scam trajectory. It can identify the cluster of persuasive language in scammer emails based on this clustering.

Keywords: Romance scam; Clustering; Persuasive; K-means

1. INTRODUCTION

Cybercrime has risen because of technical advancements, particularly the Internet, and the dangers of this digital contact have opened the floodgates to online dating romance frauds. An online dating romance scam is a sort of mass marketing or advance fee fraud in which scammers use fictional identities to pretend to establish a relationship through online networking sites to defraud victims of money. The victims of an online dating romance fraud face a wide range of consequences, including not only cash losses but also negative emotions and poor performance in daily life. What is unclear is why and how these victims are unconcerned about the scammers' delusory promises [1].

Dating sites and unsolicited e-mails frequently prey on vulnerable, unsuspecting persons to extract money. Anonymity, disguise, and deception are all too common on the internet. Linguopsychological gadgets are used by scammers to entice potential victims into the fraud scenario. Devices were inspected and classified using seven letter sets (each having 18–23 letters), which included scammer correspondence. Similar lexical and macrostructural trends were found in both sets, which are frequent in e-romance scams. Frequently used devices appeared to indicate scammers' hostile intentions, which might be harmful to a victim. Persuasion, flattery, trust appeals, and essential human motivations including connection, greed, and charity are some of the most common fraudsters' tools [2].

Persuasion is a process in which one party attempts to persuade another to do (or not do) something or believes (or not believe) something. It is a vital and varied human resource. It is obvious that it is critical in commercial activities, but it is also critical in professional and everyday lives. We frequently find ourselves trying to persuade others about something important to us and/or them in everything we do [3].

Scammers have used seven persuasion techniques to categorize their victims. These include the profile, developing trust, hyper-personal relationships, grooming, the Sting, Scam maintenance, and Scam trajectory. Scammers will use three types of crises for the scam's trajectory: Trajectory 1, small amounts to a crisis, Trajectory 2, the crisis, and Trajectory 3, the crisis to a decrease in requested funds [4].

Clustering is a data mining technique commonly used to identify homogeneous groups or clusters of a set of objects. This technique divides the data set into several subsets or groups so that the elements of each group share a set of properties, with a high degree of similarity in one group and a low degree of similarity between the groups. The clustering process divides activity data in a set into groups where data commonality within a group is greater than data similarities with data in other groups [6].

Using data mining techniques, this study focuses on classifying textual scammer persuasive language E-mails. The goal is to categorize and analyse scammer persuasive language messages that are thematically similar. This also proposes data clustering using k-means. The user's input is the number of clusters (K), and the user must specify whether the number of clusters is fixed or not.

2. MATERIAL AND METHOD

This study makes use of the "What's the Bloody Point?" dataset, which contains emails baiting Nigerian 419 money scammers [5]. There have been ten scammer email conversations with victims, for a total of 1000 emails. Data was prepared by storing conversation email message scammer with the victim in the WEKA application and collecting conversation email message scammer with the victim in a dataset.

2.1 Features Exaction

The filter StringToWordVector is applied to the attributes that are the topic of the e-mail message from the scammer after the info is loaded into WEKA. Those attributes contain instances that represent the body of the scammer's messages. The StringtoWordVector filter pre-processes the info, then K-means clustering is applied. This filter transforms string attributes into a set of attributes, each of which represents one word.

StringToWordVector generates an inventory of words that attribute. These words can be found within the messages. This feature's settings are used; [7]

- **The TF-IDF Transform**: could be a numerical statistic used as a weighting factor that reflects how important a word is to the collection's message. The tf-idf value rises in proportion to the number of times a word appears during a message, but this is often offset by the frequency of the word within the corpus.
- **minTermFreq**: which specifies the minimum frequency of occurrence of a word for instance, if set to three, the words that appear after the filter's application are people who appear a minimum of 3 times within the collection.
- **Stemmer**: which removes the word endings. The method of reducing inflected or derived words to their stem, base, or root form is understood as stemming.
- **Stopwords**: if set to "True," this parameter activates Weka's default stop word list. A stop word list may be a list of words that don't provide important information about the message's content.
- **WordsToKeep**: this parameter specifies the number of words that will appear after applying the StringToWordVector filter.

2.1.1. K- means

K-means separates the emails into K clusters, each of which contains seven connected influential dialect scammer messages. There's the profile, creating belief, hyper individual connections, preparing, the sting, trick support, and trick direction. The K variable is a number that speaks to the number of bunches into which the messages are subdivided. The objective is to weaken the cruel squared Euclidean distance of the messages from the centers of their clusters. Separated from gathering the messages into K clusters, K-means relegates a weighting figure to the words created by the StringToWordVector channel. It can distinguish the cluster of enticing dialects in scammer emails backed by this clustering. This K-means work helps in way better understanding the substance of message clusters.

The following parameters are used in this application: [7]

- **numClusters;** this specifies the number of clusters into which the messages will be divided.
- **maxIterations;** expresses the maximum number of iterations and predetermines the K-means implementation time.
- **Seed;** This option allows for multiple iterations with different random initial centres.

$$Dist_{xy}\sqrt{\sum_{k=1}^{m}\left(x_{ik-y_{ik}}\right)^2}$$

Euclidean Distance: It involves the distance between 2 data points or the distance between a data point and a cluster center. Euclidean distance between 2 points a and b with k dimensions are calculated as Euclidean distance or Euclidean metric is 1 Ordinary distance between 2 points measured with a ruler. It is the straight-line distance between 2 points [8].

3. RESULT AND DISCUSSION

Using the K-mean into the Bloody Point dataset to analyse 200 emails were exchanged between the scammer and the victim. The cluster analysis was carried out, which resulted in the formation of five message clusters.

Table 1. Distribution of Scammer Words into 5 Clusters

Cluster Instances		
No of clusters	No of words	Percentage of Instances
Cluster0	41	0%
Cluster1	60	0%
Cluster2	535	4%
Cluster3	11540	93%
Cluster4	176	1%

Table 1 appears that the bulk of the 11540 words utilized by the scammer has a place to cluster 3. The moment cluster, cluster 2, contains 535 words, the third cluster, and cluster 4, contains 176 words, the fourth cluster, cluster 1, contains 60 words, and in the long run, cluster 0, contains 41 words. The words for each cluster are composed in slipping arrange, upheld the weighting calculate that direct K-means doled out to each word in each cluster. This weighting figure shows the relationship of the word to the substance of the messages that have a place in a cluster, and it's upheld the word's recurrence in messages by and large. It is attending to vary from cluster to cluster for a synonym since one word seems moreover to be more representative of the substance of the messages in cluster0 than in cluster1. Typically, frequently a much greater calculate and so the foremost crucial the word for the cluster gets to be.

Table 2. Important and frequent words

No	Cluster0	Cluster1	Cluster2	Cluster3	Cluster4
1	about	and	am	back	can
2	am	bank	and	bank	like
3	and	be	are	be	me
4	be	been	been	because	my
5	do	have	big	been	
6	i	i	boy	before	
7	me	like	but	best	
8	money	me	by	big	
9	now	money	call	boy	

10	send	more	do	business	
11	that	send	first	but	
12	the	the	get	by	
13	this	there	fly	call	
14	to	they	for	can	
15	want	to	from	chief	

Table 2 shows 15 frequent words found in 5 clusters of scammer email messages. To comprehend the content of messages that belong to each cluster and then make some assumptions about scammer action wording concerns. As a result, it is shown in Table 2 with the 15 most important words for each message cluster, and it is related to persuasive language. Clustering which is in clusters 0 until 4, shows the word more related to persuasive strategies involved with asking victims to comply in several steps which is scammer asking the victim to make small steps of compliance. Each cluster in the above has a different word pattern and contains persuasive wording and there are only 4 related to the persuasive word in cluster 4.

4. CONCLUSION

Persuasive strategies can identify from the seven persuasive methods which are the profile, developing trust, hyper-personal relationships, grooming, the sting, maintenance of the scam, and trajectory of the scam. Persuasive strategies in the scam email can identify the language features for a persuasive email message that have related to the persuasive method used by a romance scammer. By using the clustering method which is K-means and clustering using five clusters, it can identify the more word related to persuasive language involve with asking victims to comply in several steps, the scammer is asking the victim to make small steps of compliance. For future research, more clustering groups will be applied to see more related words in the persuasive language.

ACKNOWLEDGEMENT

This paper was supported by Fundamental Research Grant Scheme (FRGS/1/2021/ICT02/UKM/02/1) National Security Cluster from Ministry of Higher Education, Malaysia.

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COMPUTERIZED CLINICAL DECISION SUPPORT SYSTEM: ADAPTIVE INTERVENTION IN CONTROLLING ALCOHOL ADDICTION AMONG INDIGENOUS IN MALAYSIA

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ABSTRACT

According to World Health Organization (WHO), every year, 3 million death is observed as a result of problematic alcohol consumption across the world, accounting for 5.3 percent of all fatalities. Early in life, alcohol intake causes mortality and disability. Similarly in Malaysia, especially for indigenous community such as Orang Asli Community is heavily affected by binge drinking and requires attention for effective brief alcohol interventions. Hence, the objective of this research is to ease the transition to technology-based intervention in alcohol use disorder recovery and improve access to the treatment for indigenous community. The study involves examining of the factors influencing the effectiveness of computerized clinical decision support system for patients suffering from alcohol abuse. This research embraces the advantage of qualitative approach in 4 levels of study to observe existing limitations or challenges from current patient-clinical relationship and propose technology-based intervention to leverage existing clinical procedure, which is beneficial to both healthcare and patients. Outcome of this research presents the design and realization of intelligence alcohol recovery treatment (ART) system with prediction model to assist self-help alcohol use disorder recovery journey. This study serves as a model for a new style of work that incorporates clinical viewpoints from beginning to end—both as collaborators and active participants—to improve clinical work experiences and opens a new research avenue in clinical decision support system for prompting brief alcohol interventions.

Keywords: Alcohol use disorder; Alcohol brief interventions; Computerized clinical decision support system; Orang Asli Community; Self-help recovery

1. INTRODUCTION

In global view, excessive alcohol consumption is the source of a public health concern, accounting for 5% of worldwide disease burden [1]. Only a tiny percentage of patients receive effective, evidence-based therapies for alcoholism, which is undoubtedly the most serious area of unmet medical needs in psychiatry [2]. Similarly, alcoholism has become all too frequent among Orang Asli Community in Malaysia [3]. A study on the prevalence, knowledge, attitude, and practices of non-communicable diseases (NCDs) among adult Orang Asli and Malay ethnicity in Negeri Sembilan, Malaysia, indicated that NCDs incidence (including alcohol use) is a growing tendency among Orang Asli, due to low rates of healthy lifestyle practices and requiring immediate attention. Adequate NCD education and promotion are required for disease screening and prevention [4]. Although alcohol addiction has a detrimental influence on people's life, early identification of binge drinking, and effective intervention support can lead to therapies that are more successful. Likewise, estimation on relapse rate will aid in the recovery monitoring and prevention of addiction. Thus, it is critical to recognize the constraints faced by the Orang Asli community while developing computerized clinical decision support system as adaptive intervention in controlling alcoholism.

Despite the fact that there are numerous web-based therapies for alcohol consumption management available online globally, many of them were tailored to their specific needs. These websites mostly utilize English as their primary language, which may not be appropriate for the majority of Orang Asli who are illiterate [5]. Likewise, authors of [6] clearly stated that lack of culturally specific health promotional materials, lack of community-based programs and inefficiency of indigenous health data collection are factors contributing to the indigenous community's failure to receive successful health promotion. On the other hand, research conducted on the digital inclusion of the Orang Asli of Peninsular Malaysia stated that half of the respondents surveyed believe that ICT will help to improve their health (53%) and about 61.9% of the respondents expect that ICT will bring changes to their

community [7]. Similarly, according to the Department of Orang Asli Development (JAKO), there was no existing effort that had been taken in terms of ICT-based intervention for Orang Asli and the signal coverage in Gombak is in acceptable range, additionally most of the Orang Asli in Gombak area are using smartphones. All in all, there was no community-based approach to adaptive interventions in controlling alcohol addiction among Orang Asli in Malaysia and there is an opportunity to develop computerized clinical decision support system for prompting brief alcohol interventions by taking the advantage of ICT readiness and available advance technology of today.

Therefore, the goal of this research is to determine the feasibility and acceptability of adaptive decision support intervention for patients with alcohol addiction from Orang Asli community, which integrates intelligent tools with objective data to create a successful collaboration between patients, community, and healthcare providers. The proposed solution will develop prediction models to estimate the relapse rate, promote self-care and improve effectiveness of addiction recovery. In order to achieve this aim, this research concentrated on eliciting concerns and gathering design ideas from patients with alcohol addiction and existing healthcare providers to propose adaptive intervention in controlling alcohol addiction among Orang Asli in Malaysia.

2. MATERIALS AND METHODS

The methods and research protocols for this overall study were developed in collaboration with clinical professionals from UMCAS and Orang Asli Gombak Hospital. For this research, four level of study is conducted to understand the current limitations and opportunities in order to develop a supportive and effective decision support intervention system.

Figure 1. Proposed framework for identifying the factors influencing effectiveness of computerized clinical decision support system for alcohol intervention

Firstly, study 1 consists of distributing survey to the health care providers as expert knowledge acquisition process on the as-is workflow in the healthcare domain to understand the current challenges with substance recovery support. Sample universe is selected as healthcare providers from local and international. Sample size of 50 respondents is recruited and data is collected thru online google form survey. Scope of question includes identification of current practices for alcoholism interventions using ICT such as data management, relapse rate control, and addiction rate monitoring process. Secondly, study 2 as focus group interview session is conducted with NCD unit from Orang Asli Hospital (Gombak) to understand current healthcare practices and challenges in intervention for alcoholism among Orang Asli community. This session emphasizes on the current ICT landscape in Gombak Hospital and identification of potential automation process in current workflow for alcoholism intervention to reduce the labor intensiveness. Thirdly, study 3 as one-to-one interview session is conducted with 2 participants as information gathering from addict (Teenage) and information gathering from addict family member. In these interview sessions, the major focus is to identify the pattern on relapse rate and figure out the factors influencing effectiveness of computerized clinical decision support system for prompting brief alcohol interventions with treatment seeking individuals from Orang Asli Community. Fourthly, study 4 as systematic literature review is performed on related work of web-based intervention systems for substance recovery support, prediction models for estimation of survival and relapse rate of alcoholism and review of similar applications (for example, WHO quit challenge, Zeropercent). The collected data from study 1 to study 4 is reviewed and processed to determine the initial findings on the current limitations in adaptive intervention of alcoholism among Orang Asli. Moreover, based on the data collected, prediction model will be proposed using Naive Bayes Classifier and Support Vector Machine to estimate relapse rate for alcohol

addiction patients from Orang Asli Community.

3. RESULTS AND DISCUSSION

In summary, for study 1, a total of 50 respondents have involved in the survey with 30 from local healthcare providers (n=30) and 20 from international healthcare services such as Pakistan, Myanmar, Indonesia, and Turkey (n = 20). The participants are mostly experienced individuals with working experience ranges from 2-5 years in alcohol intervention centers. Based on the result from local healthcare providers, 85.7% responded of no existing web-based system to manage the data of substance addicted patients (E.g., hospital visit records, patient history, etc.). 71.4% responded of no existing web-based system to monitor the progress of alcohol addicted patients. (E.g., Overdue appointments, Addicts return rate to hospital, etc.). 85.7% responded of no existing web-based system to provide online self-assessments (ASSIST-BI, DASS 21, etc.) for alcohol addicted patients. 71.4% responded of not having community-based rehab program in Malaysia for addicts. On the other hand, the result from the international healthcare service experts indicated that there is existing ICT-based intervention for alcoholism, however, the solution is not widely implemented and utilized. For example, 57.1% responded of not having any statistic or tracking workflow for the relapse rates among recovering alcoholics after discharge from healthcare center. Most of the substance addicts such as drug addict are also alcohol addict with around 70-80% of ratio. In brief, the result from study 1 concluded as there is a need for improvement in clinical decision support system for alcohol intervention with integrated intelligence solution such as prediction analysis for relapse rate, online self-assessment, and online community-based rehab programs.

For study 2, the outcome of the interview indicated that there is no existing web-based system used to manage the data of addicted patients and currently, data is managed in flat files. There is no ICT based solution to monitor the progress of alcohol addicted patients. Currently, face to face and paper-based assessment is conducted which is labor intensive and challenged with data loss. It is recommended to have self-assessment online to educate self on the addiction level (for example, ASSIT, DAST 10 and WHO QOL). There is no streamline workflow on health care centers to track the relapse rate. Additionally, in order to provide user-friendly solution, multi-language (English and Bahasa Malaya) speech automation is suggested for clinical decision support system for alcohol intervention. Overall, there is a strong demand in recommendation features (such as online alcohol intervention support, early detection of binge drinking, prediction of relapse rate and recommendation of relevant intervention) to promote self-care and health-care services.

For Study 3, the response from lived experience of addict patient and family revealed that there is opportunity for early identification of binge drinking and the ICT-based solution such as online assessment and self-care modules can be supportive in addiction recovery. Self-assessment before admission and after admission can be conducted to compare the survey result/score and predict the relapse rate. Additionally, with the popularity of social media usage and ICT readiness, symptoms of binge drinking can be observed in online as well. Similarly, the intervention solution can also be included as community based such as social media sharing of addiction recovery journey, no-drinking challenge leadership board – in order to motivate peers to peers on this recovery journey using technology advantage.

For study 4, review on existing studies concluded that there is existing internet access in the urban area of the Orang Asli and the access to internet is known process to the community and the usage of ICT is already practiced in the community [8]. Secondly, the provision of ICT related service will increase the communication and information distribution among the Orang Asli faster than current state [7]. Thirdly, there is also a strong believe by the community the ICT intervention will support them with their healthcare status and many other benefits [9]. From the perspective of limitations, the first visible limitation with the Orang Asli community is lack of web-based intervention support for substance misuse recovery (i.e., incapable of providing the equitable health-care service thru knowledge/resource sharing via accessible platforms to maintain good health). Secondly, due to the lack of culturally specific health promotional materials (i.e., no user-friendly interface for the Orang Asli e.g., multilingual support). Thirdly, due to the lack of community-based programs (i.e., no comprehensive

health services for the community such as relevant features dedicated for the community's need). Fourthly and finally, due to lack of indigenous health data collection for monitoring and maintain the Orang Asli health data.

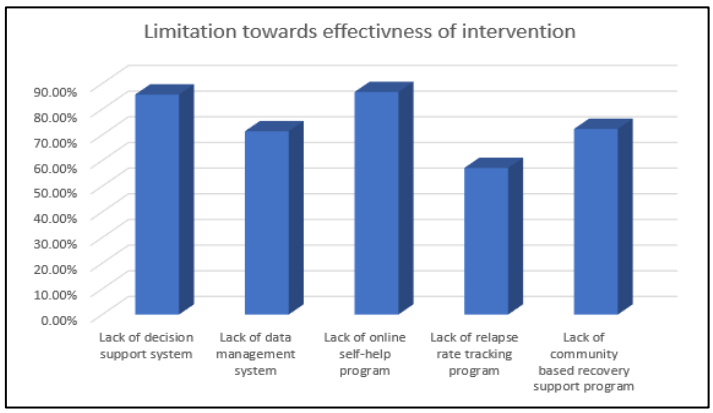

Figure 2. High level overview on limitation towards effectiveness of alcohol intervention

4. CONCLUSION

In brief, the goal of research is to take advantage of objective data that may be utilized to effectively monitor alcohol addiction in Orang Asli Community over time. This research makes a significant contribution by giving clinical values to patients and healthcare practitioners with outlook on relapse rate, recovery progress and promote self-help. Future work of this research is to use participatory design methodologies to address the clinician's perspective on this online data-based intervention system. The outcome of findings will be validated to propose the factors influencing effectiveness of computerized clinical decision support system for alcohol intervention among Orang Asli.

ACKNOWLEDGEMENT

This research was supported by the Impact-Oriented Interdisciplinary Research Grant Programme (IIRG) Universiti Malaya (IIRG005B-2020SAH).

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DESIGN OF MOBILE HEART DISEASE APPLICATION USING AFFORDANCES THEORY

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ABSTRACT

With the proliferation of mobile and wireless Internet connectivity as well as the high adoption rate of smart phones, the monitoring of personal health is made easier with such mobile technologies. Numerous health monitoring applications are currently available on the major mobile platforms either on Apple App Store for iOS devices or Google Play Store for Android devices. However, the usability and the user satisfaction aspects of these health monitoring applications, in particular for mobile heart diseases applications require investigation on their design approach, as well as the overall affordances of the application. Previous studies argue that designers often lack consideration and involvement of their potential users, the applications lack features expected and needed by the patients, lack of support for interactive communication between heart patients with their cardiologists, and in general, have poor usability. The objective of this paper is to present our work in designing a series of mobile heart disease monitoring application called HeartM through HeartM v1.0 to HeartM v3.0. The design of HeartM follows the affordances theory especially on the technological affordance, medical affordance, and the social affordance of the application. The research adopts the Design Science Research methodology. This paper contributes to the design knowledge and offers recommendations particularly for the design of mobile heart disease application.

Keywords: user satisfaction, usability, HeartM, affordances, mobile application, heart disease.

1. INTRODUCTION

The current pandemics of COVID-19 affecting most vulnerable people with chronic diseases such as heart illness, limiting their contact with their cardiologists and they need to be extra vigilant in order not to get infected. Mobile health monitoring applications including mobile heart disease applications is therefore have high potential to change the way cardiologists and heart disease patients remotely interact, hence reducing the risk of exposing themselves to the infections [1]. Heart disease patients are able to monitor their hearts' conditions using mobile heart disease applications which are available on Apple App Store and Google Play Store [2]. However, when heart disease patients feels dissatisfied with the usability and affordances of the mobile heart disease application, this will directly impact the user satisfaction level such as the learnability, efficiency, memorability, errors tolerant, and the overall usability.

Previous studies on user satisfaction with regards to the effectiveness of the design and usability of mobile heart disease application consider the design issue is a big challenge to UI/UX designers and developers. Some research [3] argue that software designers of any mobile applications often do not think deeply about the needs of their users. [4] conjecture that many mobile heart disease applications do not support interactive communication between cardiologists with their heart disease patients and have poor usability. [5] claim that many mobile heart disease applications which are available often do not have the features needed by the heart disease patients.

Therefore, the objective this paper is to present of design HeartM based on affordances theory and to improve the design of mobile heart disease application by adopting the user centered design in gathering design inputs from the cardiologist and the heart disease patients. This paper begins with a review of affordances theory and brief method design science research. It continues with present affordances of HeartM, from HeartM v1.0 through to HeartM v3.0. The last section of the paper wraps with a brief conclusion and salient points for further research.

2. MATERIALS AND METHODS

2.1 Affordances

The theory of affordance was first proposed by [6] who studies what and how users interact with objects that influence user satisfaction. The concept of affordances is then adopted by many researchers in the field of Human Computer Interaction (HCI). Namely, [7] associates the ability of a system (i.e., its affordances) with the usability of an object, especially the basic properties that determine how it can be used. Recently, according to [8] affordances has become a policy theory for HCI. [9] use affordances in their study of computer supported collaborative learning (CSCL) use among educators, students and researchers. A study using affordances theory in health field (medical) was conducted by [10] whereby they developed a model that adapts the affordances theory to realize the use of electronic health record (EHR) in clinics.

The affordances of HeartM are determined based on: (i) the technologies afforded by the mobile device such as the good resolution cameras and flashlights called photoplethysmography (PPG) which uses the user's finger tissue for heart rate measurement [11], and to remind heart patients to take medication on time. (i.e., the technological affordance), (ii) the medical features such the personal monitoring of heart condition by personally recording the heart beat using the mobile phone, the management of medication taken, and the exercises prescribed to maintain health of the patient (i.e., the medical affordance), and (iii) the social features such as the communication between patient with their cardiologist and their sharing of vital health information with their cardiologist or family members (i.e., the social affordance). These affordances were also proposed during the engagements made with the patients during the earlier phase of the research (hence, the user centered design approach facilitated by the more formal Design Science Research methodology).

2.2 Method

[12] defines Design Science Research (DSR) as a design science that is more focused on the creation of new and innovative 'artifacts' to solve problems. Further, [12] define 'artifacts' as forms, models, methods or instantiations (prototypes or systems developed). The central artifact of this paper is HeartM. Figure 1 shows the adoption and adaptation of DSR process proposed by [12] in this study to the design of HeartM v1.0 up to the HeartM v3.0.

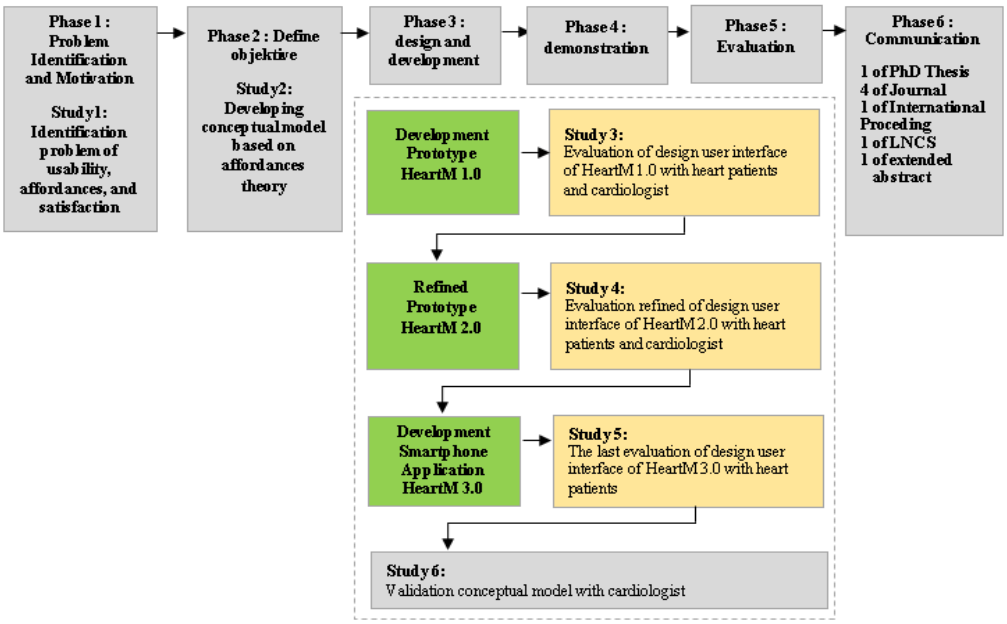

Figure 1. Shows the adoption of DSR process in this study.

In order to assist researchers to conduct the design science research methodology (DSR), [13] introduced a DSRM process that consists of six phases. This research adopted all phases as summarised below:

- Phase 1: problem identification and motivation for the Study 1 of this research through identification of problems on mobile heart disease application on the aspects of usability, affordances, and user satisfaction,
- Phase 2: defining the objectives of a solution for the Study 2 of this is research by developing a conceptual model of the mobile heart disease application based on the affordances theory,
- Phase 3: design and development of HeartM v1.0 (basic features) up to HeartM v.30 (with better features and affordances) with involvement of patients and cardiologists (the user centered design),
- Phase 4: demonstrations of HeartM to patients and cardiologists,
- Phase 5: empirical usability evaluations of HeartM v1.0 to HeartM v3.0 with patients and cardiologists in order to fullfil the objectives of Study 3 (for prototype of HeartM v1.0), Study 4 (for prototype of HeartM v2.0 and its refinement); and Study 5 (for final evaluation of prototype HeartM v3.0), and Study 6 (validation of the conceptual model with the cardiologists), and
- Phase 6: communication produce to disseminate findings of the research via journal publications, conference proceedings and the thesis towards the end of the research.

3. RESULTS AND DISCUSSION

This section briefly presents the results of the design and evaluation process of HeartM described in the previous section. The first study of design is to identify requirements. In this study, the main researcher met the participants (heart patients and cardiologists) who have agreed to participate in the study to seek their insights on the proposed features of HeartM v1.0. For the evaluation of HeartM v1.0, this first iteration used the high-fidelity of HeartM v1.0. According to Chávez et al (2019) defined high-fidelity as a realistic representation of the application (i.e. HeartM 1.0). In Study 3, the main researcher met the participants (heart patients and cardiologists) who have agreed to participate in the study to seek their insights on the features of HeartM v2.0. After that, the participants give opinion based on their evaluations of the high-fidelity HeartM 2.0. Last, result of evaluation HeartM v2.0 used to improve HeartM v3.0. Figure 2 shows a series of UI evolutions for HeartM v1.0 to HeartM3.0. Due to page limit constraints, features and interfaces for HeartM v.30 is available upon request.

Figure 2. Series of UI Evolution for HeartM v1.0 to HeartM v3.0

4. CONCLUSION

The design process of the mobile heart disease application called HeartM found that users' perspectives are very crucial to ensure users' satisfaction as well as in ensuring overall usability and affordances of the application. Further research will focus on usability evaluation to ensure end users' satisfaction in using the HeartM v3.0. The use of Design Science Research methodology aids this research in many ways, especially in ensuring the research is empirically driven and in ensuring that the utility, quality, and efficacy of the design artifact must be rigorously demonstrated via well-executed evaluation methods.

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DISAMBIGUATE VERB WORD SENTENCES WITH DOC2VEC IN WSD

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ABSTRACT

Word Sense Disambiguation (WSD) is known to have a detrimental effect on the precision of information retrieval systems, where WSD is the ability to identify the meanings of words in context. There is a challenge in inference-correct-sensing on ambiguous words. This paper proposes a method to find a procedure and technique to trace an ambiguous word focus on verb in document using a tool from Gensim and WordNet. Our concept is to find the verb that has low similarity with subject in the document. We used doc2vec to find the similarity value between subject that bind with word context and compare for each neighborhood context in the document. We evaluate the similarity on original query with a new query. It shows an improvement on similarity value between subject and the new verb.

Keywords: Paragraph2vec, Doc2vec, Wordnet, Sentences Embedding, Word Sense Disambiguation.

1. INTRODUCTION

In natural language text, humans are able to interpret more than one meaning for each word in a sentence. For example, a question from Islamic study query "Why do we Muslim need to face the Macar kaabah when praying?". Figure 1 shows the words 'muslim', 'need', 'face', 'macar/mecca', 'praying' and 'kaabah' are possible words that have two or more meaning. To identify more related meaning we need some mechanism to handle it. This will make an information retrieval more accurate. Semantic web technology is introduced to overcome the shortcomings of search engine [1].

```
# (0) "muslim"
# (1) muslim : "a believer in or follower of Islam"
# (2) need : "require as useful, just, or proper" (main)
#      : have need of
# (3) face : "deal with (something unpleasant) head on" (main)
#      : oppose, as in hostility or a competition
#      : be oriented in a certain direction, often with respect to another reference point; be opposite to
# (4) mecca : "joint capital (with Riyadh) of Saudi Arabia; located in western Saudi Arabia; as the birthplace of
#         Muhammad it is the holiest city of Islam"
# (5) kabah : "(Islam) a black stone building in Mecca that is shaped like a cube and that is the most sacred Muslim
#         pilgrim shrine; believed to have been given by Gabriel to Abraham; Muslims turn in its direction when praying
# (6) praying : "address a deity, a prophet, a saint or an object of worship; say a prayer"
```

Figure 1. Example for the WSD task

WSD is the best solution to solve this issue [2]. Warren introduced this solution in 1949. Firstly, he stated that the ambiguity of the words needs to be resolved to ensure automated translation between languages can be done. WSD method is used in various linguistic fields such as Information Retrieval [3,4], Machine Translation [5,6], and Information Extraction [7]. In the 1970s, WSD was a subtask of semantic interpretation systems developed within the field of artificial intelligence [8].

The disambiguation process requires users providing manual suggestions that relate the concept suggestion predicate to the disambiguate concept. The data on Semantic Web are display in RDF format. RDF is a W3C recommended language for representing data on Semantic Web and uses an ontology to represent data into the following triple-form representation.

{Subject, Predicate, Object}

Predicates indicate the explicit relationships that exist between Subject and Object and may be represented by a word, phrase or sentences [9]. Predicates are usually use in documents which is verb and the possibility of an ambiguous word is higher. In this study, we tracked and disambiguated an identified verb with a low similarity to Subject and aggregated it with all of its contexts before comparing it to other contexts in the document. To compare the similarity value, we use doc2vec from Gensim library and Wordnet is utilized to extract the relevant meaning.

Section 2 explains the materials and method of the research. Section 3 discusses on results and the discussion. Finally, section 4 is the conclusion.

2. MATERIALS AND METHODS

Figure 2 illustrates the implementation steps based on the framework. There are six steps in all. However, word-sense disambiguation is at the heart of our system's NLQ processor. All six steps are described in this section.

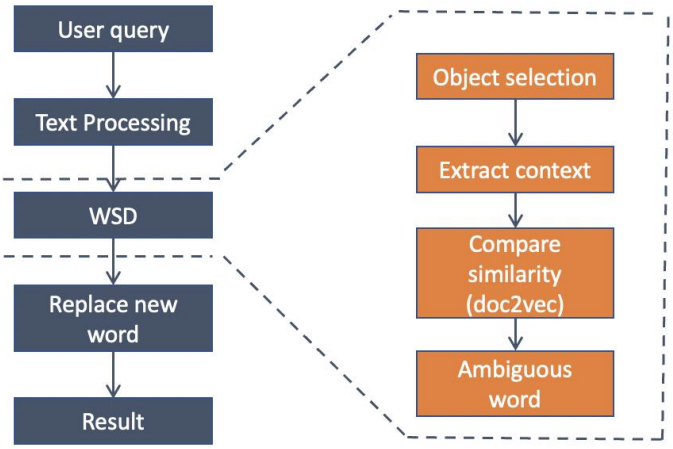

Figure 2. WSD Framework

Step 1: First step in pre-processing, subject will be identified. For example, given a question 'Why do we Muslim need to face the Macar kaabah when praying?'. The identified subject is 'muslim' and its definition is 'believer in or follower of Islam'.

Step 2: This step is to extract all word definition from the document. In this study will extract all useful word and ignore not useful word like 'the', 'to', and so on. To get all the useful word, the document will parse into tokenization and stopword process.

Step 3: This step is to calculated the similarity between the subject, the definition and neighborhood word definition in the document using doc2vec. The similarity score is shown in Table 1. Then, followed by tagging process of the document.

Table 1. Similarity value in original document

Index	Doc2vec similarity value	word/sentences
0		muslim, a believer in or follower of Islam
1	0.8915168046951294	need
5	0.8189916014671326	praying
2	0.7663328051567078	mecca
3	0.5551759600639343	face
4	0.5463523864746094	kaabah

Step 4: The tagged document will be used to build and train doc2vec model. The doc2vec model is created to find the lowest similarity scores between documents in identifying the ambiguous word. This study focuses on verb as an ambiguous word. As seen in table 1, the word 'face' shows the lowest similarity with score 0.56 compared the word 'praying' with the similarity score 0.82. This score shows that word 'face' is an ambiguous word in this document.

Step 5: In the final step, find the synonym word of 'face'. In wordnet, the synonym word of 'face' is 'front'. The synonym word from wordnet replaced the word 'face' in the document. Then, repeat the calculation of similarity score using the same doc2vec model on the updated document. The new similarity score is shown in Table 2.

Table 2. Comparison between new document and old document

	Updated document		**Old document**	
Most similar	Word	Doc2Vec Score	Word	Doc2Vec Score
1	need	0.9070279598236084	need	0.8915168046951294
2	praying	0.8227713108062744	praying	0.8189916014671326
3	front	0.6458628177642822	mecca	0.7663328051567078
4	mecca	0.44962161779403687	face	0.5551759600639343
5	kaabah	0.41808658838272095	kaabah	0.5463523864746094

3. RESULTS AND DISCUSSION

This section discusses on the proposed WSD method in improving the score of ambiguous word by replacing the relevant synonym word in the document. Identified ambiguous word is presented with the low similarity score between word context in the document. The replacement of the synonym word in the document has improved the similarity score from 0.56 to 0.65 for the example of ambiguous word 'face' and the synonym word 'front' as shown in Table 2. The synonym word of 'front' is more relevant to the Subject word of 'muslim'.

4. CONCLUSION

In this paper, a novel approach for resolving word ambiguous on verb in WSD method is proposed. The proposed method is obtained by identifying a Subject as a main context form and calculate the similarity score between subject and others word in the document. The similarity calculation used is Doc2vec by Gensim and Wordnet for the extracting the context. The future work of this proposed method will be applied a Quran ontology as a knowledge base for the purpose of information extraction.

ACKNOWLEDGEMENT

This work was supported by the Universiti Kebangsaan Malaysia with a grant code UKM-TR-024 for providing the opportunity and funding.

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ENHANCED METHOD IN IDENTIFYING RARE DISEASE USING MACHINE LEARNING APPROACH

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ABSTRACT

Rare diseases affect a limited number of people (defined as not more than one in every 2,000 individuals in the European Union, and not more than about one in 1,250 in the USA). The initial diagnosis of rare diseases is difficult because they are infrequent, and doctors could not often see or recognize their symptoms. Since the number of patients with rare diseases is very small compared with common or chronic diseases, it is difficult for machine learning technique to classify rare disease patients, which leads to biased classification results in a majority of patients with rare disease. In this work, with the purpose of overcoming the issue of unbalanced dataset, a weighted cosine similarity classifier is proposed instead of a standard cosine similarity classifier where genetic optimization is applied in selecting the best weight to be used by the weighted cosine similarity classifier. In this study, the Rare Metabolic Diseases Database (RAMEDIS) is used as a case study for unbalanced multi-class dataset. The precision, recall and f1-score for bottom 5and 10 diseases are calculated and compared with the average of other diseases during the iteration of genetic algorithm. The results show that the bias of classification had almost gradually disappeared with the iteration of genetic algorithm.

Keywords: Rare diseases; cosine similarity; imbalanced datasets; genetic algorithm.

1. INTRODUCTION

There are numerous types of diseases in this world. In this work, the focus is placed on a type of disease called the rare disease. A rare disease has a very low prevalence rate, and affects only a small percentage of the population [1]. Recently, rare diseases have gained considerable attention and focus in the world of research. The identification and diagnosis of rare diseases is a difficult process, which is considered a challenge for the medical field. The identification of rare disease, and to distinguish it from chronic illnesses and other symptoms is also an important issue for the public health sector. Furthermore, the development of efficient methods to help with detection and diagnosis is essential in raising awareness about diseases, apart from providing early intervention of diseases [2]. Identification has been made from previous studies where approximately 80% of rare diseases are genetic in nature. However, rare diseases caused by other factors such as exposure to environmental factors, exposure to chemicals during pregnancy, infections and rare cancers are not inherited. Interest in machine learning for healthcare has grown immensely during the last few years [3, 4, 5]. Several machine learning methods, such as the Generative Adversarial Network (GAN), Synthetic Minority Oversampling Technique (SMOTE), and

Feature Selection [6, 7].

Classifier learning with data-sets that are affected by imbalanced class distribution is a challenging problem in the machine learning community. This issue occurs when the number of examples that represent one class is much lower than the examples in the other classes, as in the case of the rare disease. In this paper, focus is made on two-class imbalanced data-sets, where there is a positive (minority) class with the lowest number of instances, and a negative (majority) class with the highest number of instances. The problem is solved either by increasing the number of unbalanced data with balanced data by multiplying the data; or by using intelligent computing techniques such as the generative adversarial network algorithm that multiplies the number of data to become balanced; or by classifying using a technique such as the cosine similarity technique.

The Rare Metabolic Diseases Database (RAMEDIS) system is a platform-independent, web-based information system for rare diseases based on individual case reports. RAMEDIS is one of the most popular multi-classes datasets for rare disease research, which contains more than 80 diseases. The database is available in RAMEDIS (http://www.ramedis.de). This dataset is used as a case study by RAAD to apply machine learning classification. RAAD extracted the features using TF-IDF, then applied machine learning classification using cosine similarity classifier. In this work, enhancement is performed on the work proposed by RAAD with the use of weighted cosine similarity classifier instead of the standard cosine similarity classifier; and genetic optimization is applied in selecting the best weight to be used by the weighted cosine similarity classifier [8].

2. MATERIALS AND METHODS

RAMEDIS database contains the data of 600 patients with 480 symptoms, and has been utilized by previous works in evaluating and validating their proposed solutions.

The main objective of this methodology is to optimize the weight used by the cosine similarity classifier using genetic algorithm. The methodology consists of the following phases:
Feature Extraction Phase:
In this phase, the features of each patient are extracted based on the TF-IDF using equation 1 for terms listed in the symptoms field, in addition to the history terms that exist in the HPO dictionary.

$$\text{TF-IDF (t, d)} = TF(t,d).IDF(t) \tag{1}$$

Where N is number of patients, t is the symptom, d is current patient, TF is number of symptoms that occur in the patient record, and IDF is the inverse of number of patients with symptom t.

Optimization Phase:
In this phase, genetic algorithm is used to optimize the weights for the cosine similarity classifier used in Equation 2. Figure 2 depicts the general genetics algorithm steps, which can be applied to any general optimization problem.

$$cos(X,Y,W) = \frac{\sum_{t \in T} (X_t \times W_t) \times (Y_t \times W_t)}{\sqrt{\sum_{t \in T} (X_t \times W_t)^2} \times \sqrt{\sum_{t \in T} (Y_t \times W_t)^2}} \tag{2}$$

where X_t and Y_t are TF-IDF of symptom t for patient X and patient Y, respectively, and W_t is the weight of symptom t.

The most important part of the genetic algorithm is the fitness function that drives the optimization process to attain to best fitness function.

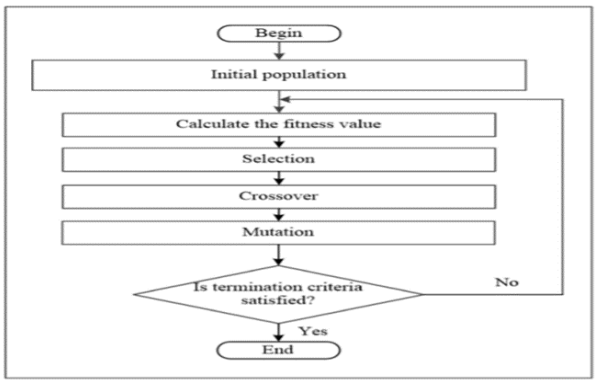

Figure 1. Standard Genetic Algorithm Flow Chart

Table 1. Experiment Settings

Parameter	Value
Number of Population	30
Number of Selected Parents	410
Mutation Probability	5%
Number of Iterations	100

3. RESULTS AND DISCUSSION

The results depicted in Figures 4-12 show the relation between the classification performance for precision, recall, and f1-score measures 5 and 10 bottom diseases and other diseases (which consists of majority of the diseases), and the iteration number of the genetic algorithms. The iteration number 0 indicates the benchmark results where the standard cosine similarity is used with weights equal to one. The classification for all figures starts with bias for the other diseases against 1, 2, and 5 bottom diseases. After each iteration, the weight for cosine similarity classifier is optimized to avoid this bias and the classification performance for 1, 2, and 5 bottom diseases start to be similar to the other diseases. After more iteration is performed, the classification performance for 1, 2, and 5 bottom diseases start to overcome the other diseases due to the selection of optimized weights for cosine similarity that focus on 5 and 10 bottom diseases.

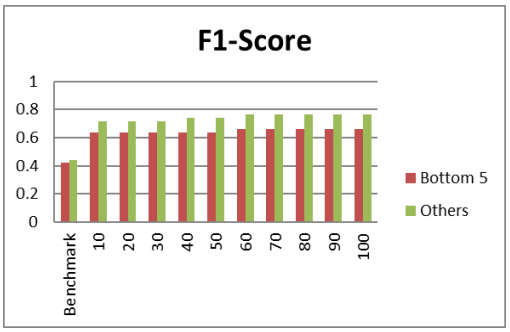

Figure 2. F1-Score Bottoms 5

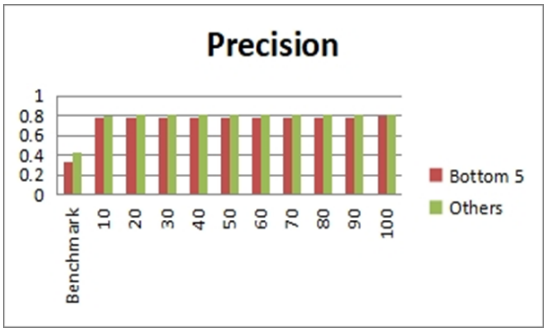

Figure 3. Precision Bottoms 5

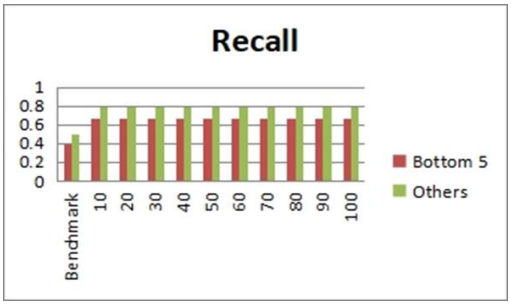

Figure 4. Recall Bottoms 5

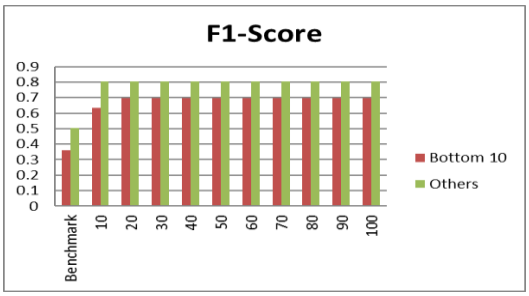

Figure 5. F1-Score Bottoms 10

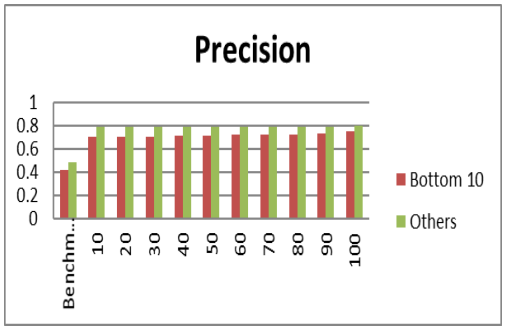

Figure 6. Precision Bottoms 10

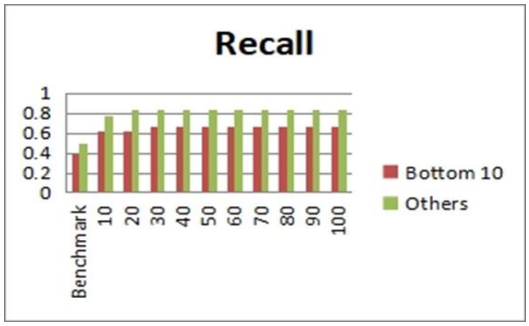

Figure 7. Recall Bottoms 10

4. CONCLUSION

The issue of unbalanced classes is one of the main challenges of machine learning classification, which leads to classification bias of the majority classes over the minority classes. To solve this issue, two approaches are proposed; the first approach is to increase number of records for minor classes; the second approach is to modify the classification algorithm. In this work, the cosine similarity classification algorithm is enhanced through the use of the genetic algorithm in selecting the optimized set of weight to be used by the weight cosine similarity. RAMEDIS is used as a case study for the application of the proposed methodology. In the experiment, the f1-score, precision, and recall are measured for bottom 1, 5, 10 diseases. The results show that the issue of classification bias is resolved when the number of genetic algorithm iteration is increased.

ACKNOWLEDGEMENT

The authors would like to thank everyone who provided valuable suggestions and support in improving the content, quality, and presentation of this paper. This work was partially supported by Universiti Putra Malaysia.

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EVALUATING THE EXTRACT-LOAD-TRANSFORM APPROACH IN DATA INTEGRATION IMPLEMENTATION

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ABSTRACT

The primary purpose of data integration in data warehouse is to consolidate data from various heterogeneous data source. ETL (Extract-Transform-Load) is a traditional approach used to extract, transform and load data into data warehouse environment. Since there exists limitation on ETL approach, many organization move to ELT (Extract-Load-Transform) approach to improve the loading time and performance. Yet not many studies have been done in evaluating the effectiveness of ELT approach in organizations. This evaluation is important to ensure the ELT process can be performed efficiently and effectively. Therefore identifying evaluation factors that can measure the effectiveness of this process is important. There are various factors proposed in previous studies; however studies focusing on the ELT approach are missing and this becomes the objective of this paper. Based on the reviews, there are fourteen factors that can be used to evaluate the effectiveness of the ELT approach where all these factors have been validated by domain experts. The evaluation factors proposed in this study could be used as a reference by system developers in improving the performance of data integration process.

Keywords: data integration; evaluation factors; data warehouse; Extract-Load-Transform; Extract-Transform-Load

1. INTRODUCTION

Organizations need to retrieve a large amount of business data from various locations to make a comprehensive and accurate decision. Thus, consolidation and sharing of data has become an important service among the organizations [1]. This service could be achieved through a data integration process. Since data are accessed from multiple sources, it needs to be integrated and stored in a data warehouse. Data integration is a process of combining data from various locations and stored into a data warehouse environment. The ETL (Extract-Transform-Load) is a key role and a common processing method used in data integration strategies. During this process, business data is extracted from multiple operational databases, transform the data according to the data warehouse rules and regulation, and load it into a single and centralized location. However, due to some unexpected situations, integration processes failed to produce a good output [2]. Among the cause of failures are due to data integration requirements not being met, critical data is difficult to access, long processing times and the resulting data does not meet the standard quality [3]. Moreover, ETL is reported to have some shortcoming in terms of cost, process, performance, and continuous improvement [4], therefore the ELT (Extract-Load-Transform) approach has been used as an alternative [5]. There are many organizations have considered using ELT process because of its performance [4],[5],[6],[7]. A study has been conducted by comparing the ELT and ETL processes using seventeen parameters, among those are performance, process, cost, easy to use, data availability and others [4]. The results suggest that ELT process is better than ETL based on the parameters used. Even though many organizations have started their ELT implementation, however, the impact of ETL implementation has not been investigated in details. Therefore identifying factors that can be used to evaluate the effectiveness of ETL is urgently needed.

2. MATERIALS AND METHODS

The information systems (IS) literature suggests that there are some factors affect the success of a system; however, there are limited discussions on the success factors that affect the ELT implementation in the organizations. These

factors can also be used to evaluate the effectiveness of the ELT approach in terms of its compliance with the data processing standards [1]. Thus, this paper will focus on investigating these key factors.

2.1 ETL vs ELT Implementation

The ETL is a traditional method to integrate and reform data into a unified format. However, in a modern architecture with data warehouse based on cloud technology, the ELT approach has emerged as the newer approach for data gathering and data preparation [5]. Big data phenomena have changed the way how organizations handle huge amounts of data. These data come in various types whether structured, semi-structured, or unstructured. Therefore the data extracted from the sources need to be cleaned, transformed, and enriched before integrating into one data source. Both ETL and ELT approaches serve the same purpose but the difference is in the implementation process. Basically, these two approaches have three main steps:

- Extract: The data from various sources will be extracted. The data can be in any format such as structured data, unstructured, semi-structured images, emails, or voices.
- Transform: The data will be cleaned, processed and converted into the warehouse format
- Load: The data will be loaded into the warehouse and analyzed using any business intelligence and visualization tool.

The difference in these two approaches is on the handling of the data. ETL transform the data from the data source, convert the data into the existing format and load the data into the warehouse. The transformation processes are performed on the data before it is loaded into the warehouse. ELT offers an improvement process to ETL, where the data is loaded first into the warehouse before the transformation process took place. The data does not have to be loaded into a temporary staging area. The advantage of this process is its flexibility that allows the user to save the data to the target database before the transformation process [5]. This will give access to the information whenever the user wants it. Figure 1 shows the ETL and ELT implementation process.

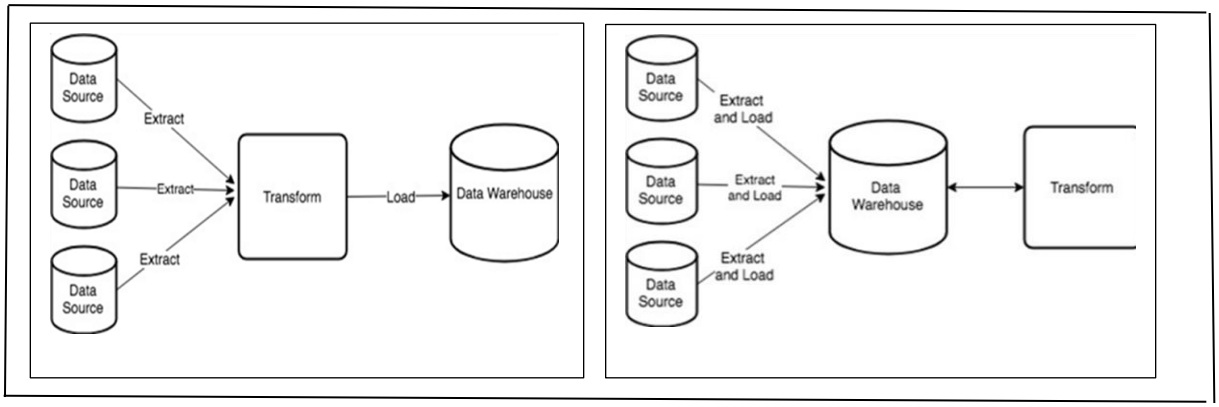

Figure 1. ETL and ELT Implementation Process

Earlier researchers indicate that with the technology advancements, the popularity of ELT has increased [4], [6]. These studies claim that the ELT process is able to improve the data integration process in terms of reducing operating costs, low maintenance and improve the performance when compared with ETL

3. RESULTS AND DISCUSSION

ELT has the potential to improve the ETL approach (which is the traditional method of data processing during data integration), owing to its ability to improve the data processing in terms of cost, better performance and low maintenance [4]. To ensure successful implementation of the integration process, data access between application systems must be done effectively and accurately. Therefore, it is important to identify data integration requirements to ensure this process is successfully implemented. The requirement can be determined by identifying the factors that lead to its success. These factors can be used as a yardstick in evaluating the success of data integration process.

Identifying success factors and used these factors in evaluation is an effective approach where it has been used widely in various domains and studies [1], [8]. However, reviews indicate that not many studies have been conducted in identifying factors in evaluating the success of ELT implementation in organizations [4]. During ELT data processing, it is important to ensure the system achieves its quality level during processing and the resulting data is of good quality. This study refers to fourteen existing data processing models where all of these models considered system quality and data quality factors in identifying the elements of success for data processing. Table 2 displays the evaluation elements used by past researchers in evaluating the success of data processing. From the reviews, fourteen elements are identified where eight elements are classified under system quality factor and six elements are classified under data quality factors. These elements are identified as contributing factors to the success of ELT data processing and could be used in evaluating whether ELT meets system quality and data quality standards. The ELT process is said to be in comply with the data processing standards if the test is successful. Table 1 shows these elements and the criteria in evaluating the ELT process.

Table 1. The Evaluation Elements And Criteria

Factor	Evaluation Element	Evaluation Criteria	Factor	Evaluation Element	Evaluation Criteria
System Quality	Availability	The system should be available 24 hours and should always accessible for use.	Data Quality	Perfection	The data is sufficient and usable
	Responsive	The system reaction time used is acceptable within set expectations and system feedback is achieved; efficient operating performance.		Validity	The data is valid and verified.
	Reliability	No missing data during data transmission		Accuracy	Data is correct, updated and according to the format.
	Usability	The system should be real time and able to accommodate large amounts of data.		Consistent	Data is consistent and the relationship between entities and attributes are also consistent
	Capability	The system needs to be compatible with other systems to enable data transmission		Integrity	Data records and attributes are verified and referred.
	Safety P erfection	The system should be able to transmit data securely over the network and should protect the confidentiality of data.		Timeliness	Data transmission and data reception are according to a set schedule
	Compatibility	The system should be able to resolve inequality issues by using latest technology			
	Maintenance	The level of effort and cost required to keep the system running smoothly.			

The proposed factors and elements are used as a guide in building a conceptual model of ELT implementation evaluation based on the underpinning theories. The system quality and data quality factors are an exogenous variable which is an external variable that affects or impacts the evaluation of data processing in data warehouse. While ELT success is an endogenous variable which is an internal variable that affects the dependent variable. This model states that the success of data integration is the result of the successful implementation of ELT process. Based on the understanding of the theory, the evaluation model is constructed as shown Figure. 2.

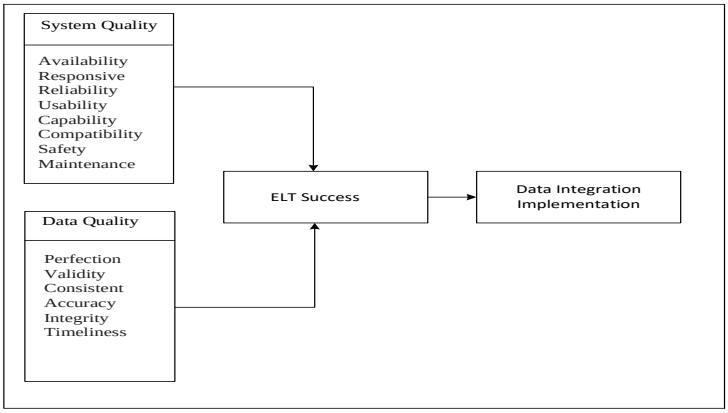

Figure 2. The Proposed Evaluation Model

4. CONCLUSION

The data extracted from various sources needs to be evaluated and cleaned before being transformed into a warehouse. Data needs to be cleaned in terms of errors (such as data duplication, inconsistent data, missing data, and others) which are an important step during the ELT process. Only data that meets the quality such as consistent, accurate, integrity, timely, perfect and valid are stored in the warehouse, which will be used by the organization to make decision. The quality of the data integration processing system, which includes software and system components must be technically sound. The system quality standard such as availability, responsive, reliability, usability, capability, compatibility, safety and maintenance must be met. This study has proposed two important factors in evaluating the effectiveness of ELT processes which are data quality and system quality, and another fourteen evaluation elements as sub-factors of these two factors. This study emphasizes that these are the influence factors and sub-factors that contributes to the success of ELT process and the data integration implementation in the organizations. The evaluation criteria are designed based on the proposed factors whereby the ELT process is said to comply with the data processing standards if it is able to meets these criteria. The current success model cannot be used to evaluate ELT process without some modification. For example, this study found two factors namely data quality and system quality are important in evaluating the effectiveness of ELT process during data warehouse implementation. Fourteen elements have been proposed to further explain the data quality and system quality for the data warehouse. If the ETL process produces quality data then the resulted output is perfect, valid, accurate, consistent, integrity, and timely. For future works, this study will focus on the technical aspect. Further investigation is needed in identifying the evaluation elements from this aspect. However, this issue may vary as the infrastructure of the project is highly dependent on the organization's practices.

ACKOWLEDGEMENT

This research was sponsored by the Research Incentive Grants (Grant No. GGP-2019-024), Centre for Software Technology and Management (SOFTAM) of Faculty of Information Science and Technology, National University of Malaysia (UKM).

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EVALUATION OF BEST PRACTICES OF OFFICIAL GOVERNMENT WEBSITES FOR ASEAN COUNTRIES

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ABSTRACT
This research aims to evaluate, compare, and make inferences about the level of compliance of best practices criteria on official websites of ASEAN governments. We utilised nine free online software/tools to evaluate the vitals web core for the website. According to the findings of this research, the majority of the websites today only meet half of the best practices criteria regarding technology trends, user needs, and search engines requirement.

Keywords: web vital; web performance; web quality; ASEAN e-Government; search engine.

1. INTRODUCTION

Telecommunications technology is continually changing, with more modern hardware, software, and even networks becoming viable. Due to its sophistication, users anticipate information technology more readily attained under contemporary telecommunication technology. Most governments use their websites to deliver critical information, forcing them to consider their website's performance, best practices, user-friendliness, and search engine friendliness to achieve goals.

Whether citizens find value in utilizing these technologies is contentious. This paper sought to evaluate the performance of the ASEAN's official government websites using automated testing tools. We employed comparative analysis to identify several best practices of the website performance, accessibility, usability [1], security, content structure, and Search Engine Optimization (SEO) as the core vital web indicator using these tools: **Dareboost**, **GeekFlare**, **GTMetrix**, **Nibbler**, **PageSpeed insights** (PSI), **Pingdom tool**, **Web Dev tool**, **Website Grader**, and **WooRank** which has common metrics of website evaluation. The main findings of this paper show that the majority of the ASEAN's official website has a low score. Recommendations from the prescriptive analysis are suited for improving a government website and offers the best solutions. These findings could provide new insights for academic researchers, government agencies, and practitioners to measure e-government satisfaction and its impact upon citizen trust [2].

Government websites should be mature enough in terms of core web vital as part of the web 4.0 revolution. The main objective of this research is to see how well ASEAN countries' government websites meet the criteria that are commonly used as the core web vital indicator. Therefore, this research aims to (i) evaluate ASEAN's official government websites using the nine free online tools, (ii) compare the result in a comparison matrix format for each tool used to evaluate each website, and (iii) formulate the degree of compliance of best practices criteria for a website.

2. MATERIALS AND METHODS

This study comprised a simple experiment in which nine online tools/software were used to complete ten evaluations of official government websites for these ten ASEAN countries. This tools/software were chosen since they are supplied free of charge without subscribing to the premium service.
DareBoost uses a web-based interface to examine and monitor the quality of the website. This tool is a no-frills toolbox that tests websites at several points, including desktop and mobile testing. It can test the speed of website's rendering and get a list of recommendations that explain any concerns in a nutshell [3]. **Geekflare Website Audit** is a simple website speed test that gives actionable data about the website. It

gets a series of images of the website loading in addition to metrics like TTFB (Time to First Byte, time for the first byte of information to reach browser), SEO score, performance score, and others. Google offers a Web Vitals model that includes a subset of essential Web Vitals critical for measuring web user experience. LCP (Largest Contentful Paint, which relates to loading), FID (First Input Delay, which pertains to interaction), and CLS are some of the measures (Cumulative Layout Shift, refers to visual stability) [4]. This measurement is covered by **Dareboost**, **GTmetrix**, **PageSpeed Insights**, and **Web Dev Measure**. **Geekflare**, **Pingdom** tool, and **Website grader** focusing on page size, number of requests, and loading time. **Nibbler** and **WooRank** are concentrated on several dimensions like accessibility, content, technologies etc. Table 1 is a list of free online tools for assessing the website.

Table 1. Assessing Website Online Tools

ONLINE TOOLS	TOOLS URL	DIMENSION				FULL MARK
DAREBOOST	dareboost.com	A. Overall 100%				100%
GEEKFLARE	gf.dev/website-audit	B. Performance 100%	C. Best practice 100%		D. SEO 100%	300%
GTMETRIX	gtmetrix.com	E. Performance 100%		F. Structure 100%		200%
NIBBLER	nibbler.silktide.com	G. Overall 10 marks				10
PSI	pagespeed.web.dev	H. Overall 100%				100%
PINGDOM	tools.pingdom.com	I. Overall 100%				100%
WEB DEV	web.dev/measure/	J. Performance 100%	K. Accessibility 100%	L. Best practices 100%	M. SEO 100%	400%
WEBSITE GRADER	website.grader.com	N. Overall 100%				100%
WOORANK	Woorank.com	O. Overall 100%				100%

After inputting their URL, each ASEAN official government website will be analysed automatically using these nine tools. Result for each tool will add up all the dimension marks to be total score, A + B + C + D + C + E + F + G + H + I + J + K + L + M + N + O = 1410. We calculated the percentage of the total score and ranked it. We analysed the degree of compliance with common website criteria based on the total score average.

3. RESULTS AND DISCUSSION

The assessment tool results in a matrix comparison are presented in Table 2.

Table 2. Assessment Results

ASEAN Country	URL	TOTAL SCORE	PERCENTAGE	RANKING
BRUNEI	www.gov.bn	930.2	65.97%	3
CAMBODIA	cdc-crdb.gov.kh	885.6	62.81%	5
INDONESIA	www.indonesia.go.id	909.9	64.53%	4
LAO PEOPLE'S DEMOCRATIC REPUBLIC	www.laogov.gov.la	738.3	52.36%	10
MALAYSIA	www.malaysia.gov.my	835.2	59.23%	6
MYANMAR	www.myanmar.gov.mm	756	53.62%	8
PHILIPPINE	www.gov.ph	951.4	67.48%	2
SINGAPORE	www.gov.sg	1055.4	74.85%	1
THAILAND	www.thaigov.go.th	748.6	53.09%	9
VIETNAM	www.vietnam.gov.vn	757.8	53.74%	7

According to the findings, Singapore had the highest score, followed by the Philippines, Brunei, Indonesia, Cambodia, Malaysia, Vietnam, Myanmar, Thailand, and the Lao People's Democratic Republic.

90% of ASEAN countries (equivalent to 9 out of 10 ASEAN countries) score less than 70% for the standard criteria used to measure a website's performance, accessibility, usability, security, content, and good SEO.

The Lao People's Democratic Republic is the lowest scoring, has to enhance its government website in all dimensions, according to a detailed report. The LCP, requests number, page size, and URL redirection are all performance metrics that need to be addressed. In terms of accessibility, the website should be simplified in terms of image management, links, and background colour. The website should be enhanced from security in best practices, as specific requests do not utilise HTTPS protocol. As well as the SEO dimension, screen size responsiveness, tap targets, and meta tags should be optimised.

According to a complete assessment for the highest scoring ASEAN country, Singapore's website excelled in the categories of accessibility, best practices, and SEO (Table 3). A few changes need to be accomplished in the performance dimension, including LCP, Speed Index, Total Blocking Time, reducing unused JavaScript and CSS, reducing third-party code, and so on. Singapore achieved the highest place in this evaluation, which is in line with the outcomes of the UNEGDI (United Nation E-Government Development Index) survey for 2020 and, which identified Singapore as the only ASEAN country with the highest Online Service Index score (OSI) [5][6][7].

Table 3. Complete Official Government Website Assessment

	Dareboost	Geekflare (%)			Gtmetrix		Nibbler	PageSpeed Insights	Pingdom	Web Dev Measure (%)				Website Grader	WooRank	Total	Ranking	Percentage
	Overall %	performance	Best-practice	SEO	performance (%)	structure (%)	Overall score	Performance %	score (%)	Performance	Accessibility	Best-practice	SEO	Overall %	Overall %			
Brunei Darussalam www.gov.bn	62	40	69	75	54	69	7.2	93	73	49	75	69	79	72	44	**930.2**	**3**	65.97%
Cambodia cdc-crdb.gov.kh	55	50	69	80	53	63	7.6	65	77	39	75	77	81	60	34	**885.6**	**5**	62.81%
Indonesia www.indonesia.go.id	56	24	77	100	35	58	8.9	53	74	34	95	77	99	58	61	**909.9**	**4**	64.53%
Lao People's Democratic Republic www.laogov.gov.la	45	41	54	64	51	34	6.3	83	76	54	69	54	46	25	36	**738.3**	**10**	52.36%
Malaysia www.malaysia.gov.my	65	34	77	80	39	71	6.2	36	76	2	80	77	79	65	48	**835.2**	**6**	59.23%
Myanmar www.myanmar.gov.mm	50	1	77	83	37	17	9	35	67	7	79	77	86	70	61	**756**	**8**	53.62%
Philippine www.gov.ph	55	54	77	83	74	58	8.4	73	74	42	84	85	71	56	57	**951.4**	**2**	67.48%
Singapore www.gov.sg	66	79	85	90	75	72	8.4	62	67	23	95	100	91	72	70	**1055.4**	**1**	74.85%
Thailand www.thaigov.go.th	49	27	62	80	43	34	7.6	43	67	28	88	54	82	37	47	**748.6**	**9**	53.09%
Vietnam www.vietnam.gov.vn	55	48	46	73	60	55	6.8	77	76	56	37	46	62	33	27	**757.8**	**7**	53.74%

4. CONCLUSION

This research successfully evaluated ten official government websites of ASEAN countries using nine automated tools freely we can find on the internet. The evaluation result was formed into matrix comparison for each tool used and added up all the marks to be the total score. Based on the total score, we analysed the degree of compliance with the w ebsite's common criteria and found the e-government website best practices.

The average score for the entire ASEAN country is 856.84 (equivalent to 61%) only. There are still 39% gaps in the criteria that need to be improved for official government websites of ASEAN countries.

There may be discrepancies in the performance findings of a site evaluated during peak and regular hours due to the non-simultaneous execution of these experiments. As a result, a secondary focus may be on concurrent studies on the selected sites.

Based on the criteria used to evaluate the performance and quality of these websites, it appears that some criteria need a particular amount of effort at a certain cost. As a result, a weighted study for these criteria should be considered.

ACKNOWLEDGEMENT

The work was supported by the Fundamental Research Grant Scheme (FRGS/1/2020/ICT03/UKM/02/4) and Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia, Selangor, Malaysia.

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EVALUATION OF COMMUNITY DETECTION ALGORITHMS FOR ARTIFICIAL AND REAL NETWORKS

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ABSTRACT

Community detection is a key task in complex network analysis as it helps to understand the nature and structure of the network. Evaluating the structure of the detection results is challenging because there is no canonical solution. Several researchers have examined the community detection algorithm up to this point, but it is not comprehensive, since the number of algorithms is small, and the experimental data is not representative. The purpose of this paper is to explain the findings of a comprehensive algorithm evaluation of the algorithms and data sets used. We employed 10 community detection algorithms and 5 different types of data sets, including artificial and real networks of varying sizes (small, medium, and large). The metric used is modularity., The experiment found that there is no dominant algorithm for artificial networks, but for real networks of all sizes, Louvain's algorithm has the best performance.

Keywords: Community Detection, Evaluation, Artificial Network, Real Network

1. INTRODUCTION

Various complex problems in domains such as sociology, biology, computer science, communication, academia, and others have been modeled in the form of complex networks throughout the previous decade. One of the fundamental tasks of complex networks is community detection[1]**.** Acommunity is a collection of nodes that are more strongly connected to one another than to any other. Communities are made up of nodes that have common characteristics such as affiliations (friends, clubs, colleagues), shared interests, and shared information (books, movies, web pages, products).

Many researchers have proposed community detection algorithms, but there is no canonical solution that satisfies them. Weak and not universally accepted definitions of community make the process of evaluating algorithm performance a difficult task [2]. Several researchers who evaluate community detection algorithms, include: Yang [3] conducted a study of 230 large-scale ground truth data, by quantitatively evaluating 13 definitions of community structure. Lancichinetti [4] evaluate 9 algorithms, the result is that Infomap, Louvain and Potts models have the best performance. Yang [5] evaluate the performance of 8 community detection algorithms with synthetic data, in addition to measuring NMI and computation time. Pattanayak [6] evaluated 7 community detection algorithms using synthetic networks. Orman [7] evaluated 5 dataset community detection algorithms that are used only on artificial networks. Mittal [8] evaluated 8 algorithms using 4 real network data but only small size. George[9] proposed the CDR algorithm, then evaluated its performance against the 4 algorithms (infomap,louvain,walktrap, and fastgreedy). The data set used is synthetic data and medium size. Cazabet[10] evaluate algorithm performance but focus on dynamic graphs. Mukerjee [11] performed a comparison of 8 detection algorithms against synthetic co-exposure networks. As a result, the Fastgreedy and Louvain algorithms gave the best results.
We provide a more comprehensive and representative algorithm evaluation in this paper, using 11 algorithms with artificial and real data types of small, medium, and large sizes.

2. MATERIALS AND METHODS

Our research method includes 5 steps as follows (method diagram in Figure 1):
1. Generate Artificial Network
We generated an Artificial LFR network with 3 different node sizes (small, medium, large). The LFR

network , proposed by Lancichinetti et al [12], which has size and degree distribution of the community according to the power law.
2. Selected Real Network
We selected 4 real network data sets namely karate(n=34, e=78), cora(n=2708,e=5278) and google plus(n=22355,e=29032). The four data consecutively represent small, medium and large size data.
3. Perform the community detection algortihm
We selected 11 detection algorithms available in the python library: networkx and igraph, it includes. it includes Edge-betweenness, fastgreedy, infomap, louvain, kernighan-lin, leading eigenvector, label propagation, spinglas, walktrap, leiden, markov-clustering,
4. Evaluation Metrics and Property Communitiy
We select modularity for the evaluation metrics because modularity is the most popular matrix [13].
5. Recommendation : suitable algorithm
In this final section, based on the data used, we recommend a suitable community detection algorithm.

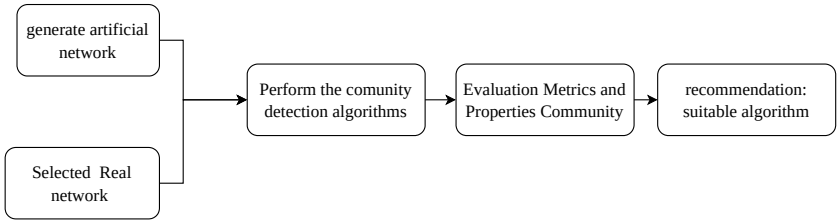

Figure 1. Research Method

3. RESULTS AND DISCUSSION

The performance results of 11 community detection algorithms with 6 data sets in the form of modularity metrics can be seen in Table 1. This table contains the modularity value of the algorithm against the data imposed. The bolded value represents the best value, 'not scalable', indicating the inability of the algorithm to perform computations because the network size is too large The value of "error unconnected" indicates the inability of the algorithm to detect the community because some of the graph elements are not connected.

Table 1. Experimental results of various Community Detection algorithms with various data sets

	Graph					
	Artificial Network			Real Network		
	Small	Medium	Large	Small	Medium	Large
Algorithm	LFR n=300,mu =0.5	LFR graph n=3000,mu =0.5	LFR graph n=20000,mu=0.5	Karate	Cora	GPlus
Edge-betweenness	0.4917	not scalable	not scalable	0.4012	0.1307	not scalable
Fastgreedy	0.4952	**0.8871**	**0.9800**	0.3806	0.8071	0.8978
Infomap	0.4527	**0.8871**	0.9759	0.4020	0.7200	0.8311
Louvain	0.5013	**0.8871**	0.9434	**0.4197**	**0.8129**	**0.9188**
kernighan-linn	0.4539	0.4730	0.4845	0.3717	0.0203	0.0037
leading eigenvector	0.4723	0.6835	0.6043	0.3934	0.7318	0.4999
labelpropagation	0.4115	**0.8871**	0.9358	0.3251	0.6495	0.7310
Spinglas	**0.5173**	0.8802	error-unconected graph	0.3934	error-unconected graph	0.8902
Walktrap	0.4662	**0.8871**	0.9799	0.3532	0.7600	0.8234
Leiden	-0.0138	0.0038	0.0080	-0.0498	-0.0	-0.0003
markov-clustering	0.3570	0.0052	not scalable	0.1655	0.5977	not scalable

Based on the experimental results in Figure 1, we classify the use of appropriate community detection algorithms according to the network size and network type (shown in Figure 2).

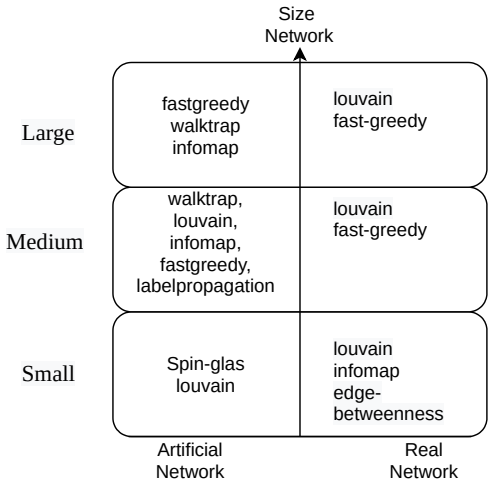

Figure 2. Suitable algorithm community detection based on network type dan network size

4. CONCLUSION

No community detection algorithm is best for all cases. Based on the experimental results, it is found that for small artificial networks, Spinglas and Louvain have the best performance. In the medium size synthesis data, five algorithms have the same best value, namely walktrap, louvain, infomap, fast-greedy and label propagation. Meanwhile, for large synthesis data, fastgreedy, walktrap and infomap are the best choices. On a real network, all types of data sizes (small, medium, large) Louvain has the best performance This can be a recommendation that in the development of community detection algorithms the process of developing or modifying the Louvain algorithm is an option that is worth considering.

ACKNOWLEDGEMENT

This research is supported by the Fundamental Research Grant Scheme :GUP-2020-088 (Geran Universiti Penyelidikan **(GUP) Universiti Kebangsaan Malaysia (UKM)**

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HARNESSING VISUAL INTERACTION CUES FOR RECYCLING EDUCATION ON A MOBILE APPLICATION

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ABSTRACT

This paper proposes a visual interaction cues framework for recycling education using augmented reality (AR). These visual interaction cues are used to guide the users with what elements they can interact with, where to go with regards to the navigation, and what is the information for, pertaining to the content in the proposed mobile AR recycling education application called Recycl-AR. Four dimensions are proposed in the visual interaction cues framework, namely task, markedness, trigger, and characteristic. This framework will be used to specify interaction cues for the Recycl-AR. The framework has the potential to be used in producing new design concepts for visual interaction cues in other mobile augmented reality applications beyond Recycl-AR.

Keywords: Visual interaction cues; augmented reality; recycling education; mobile application.

1. INTRODUCTION

Augmented Reality is a system that enhances the real world with virtual objects through computer-generated sensory inputs such as graphics, sound, video and global positioning system (GPS) data [1], [2]. The concept that is closely related to AR is virtual reality (VR). VR is classified as one of the controlled multisensory communication technologies that allow users to interact with data and it also involves the human senses [3]. Typically, the AR application is able to display graphic design from a computer to the real world where the concept of augmented reality involves the use of a smartphone interface when the user browses the application. Among the purpose of AR being considered and introduced in the learning system is because the application provides cues and feedback visually, auditory and tactile in improving the student experience in the use of applications [4]–[7]. Thus, the learning process becomes more oriented, more flexible in the use of time and space, unaffected by distance and can be adapted according to individual learning styles [8]. This will make learning easier to learn and fun [9]. Among the advantages of AR is the delivery of information based on graphics, audio and video technologies and 2D as well as 3D forms [10]. In addition to the involvement of multimedia in learning in enhancing comprehension in learning through AR applications, the use of visual interaction cues greatly assists users in learning [11]–[13] and appropriately used in multimedia-based learning applications. The visual cues used have meaning in a presentation or display of the information to be conveyed [14].

This study is to rearticulate the lessons and design to lead users across mobile application by understanding these interaction cues and apply these lessons to AR systems while considering the boundaries and fundamental limitations of reality's physical characteristics, which are not often present in application. This knowledge serves as the foundation for a framework that allows to define and compare the many types of interaction cues in AR systems. Moreover, the framework is generative, which implies that it could be utilized to create new AR plans for users' direction. This also has been researched by Billinghurst et al.[15] to develop new interaction vocabularies for AR, rather than simply re-using conventions from other domains that are not appropriate for the AR platform. This paper aims to propose visual interaction cues framework for AR by extending the work of Dillman et al's [16]. The proposed framework is generative—that is, it can be used to inspire new designs for augmented reality to provide guidance to a user. This framework addresses the call by [16] to develop new interaction vocabularies for augmented reality, rather than simply re-using conventions from other domains that are not appropriate for the augmented reality medium. Aside of the design is also to keep away from visual overload through presenting simplest the cues applicable to the object which might be of interest to the users operating collaboratively[17].

2. LITERATURE REVIEW

2.1. Visual Cues

Based from the book written by Bonnie Meyer in 1975, cueing method is the addition of a non- content material component of prose, which offers emphasis to sure elements of the semantic content material or factors out elements of the shape of the content material[11]. The addition of non-content material information (e.g., arrows, circles, and color) to visible representations is named as visual cues as a strategy to direct learners' interest withinside the multimedia environment. Adding visual cues into presentation provides greater decreases in cognitive load compared to other commonly techniques used [18].

2.2. Visual Interaction Cues Framework

When the designer adds visual element in an application, the most significant communication tools of ubiquitous technology nowadays is using visual interaction cues. From technology perspective, they are used to draw attention, provide sensory pleasure and stimulation and communicate about the content [16]. Visual cue is a form of sign, hence, even if they are apparent or not, signs are abundant in our world and are vital to human communication. The commands are at times evident, such as a road sign or a sign in a mall but can also be as subtle as someone gesturing while they are speaking. While signs may take many forms, visual signs in this work, which define as some kinds of visual marking, decoration, or symbol with the purpose of giving a user information about information. Visual interaction cues are elements that guide users' attention in their learning process [19]. Furthermore, mobile AR using visual cues provides greater decreases in cognitive load compared to other commonly used attentional techniques.

Table 1 refers to the original visual interaction cues framework proposed by Dillman et al's and the framework shown three (3) dimensions within the framework: Task, Markedness and Trigger. All of the framework's aspects, the rationale for integrating interaction cues (task), visual design dimension (markedness) and the interaction model (trigger), are research to AR applications via video games.

Task	Discover	Informs the user of objects or points of interest in the environment.
	Look	Informs the user where to put their visual attention in a timely manner
	Go	Provides navigational assistance through environment
Markedness	Subtle	The cue blends into the environment seamlessly
	Emphasized	An object or surface in the environment is highlighted
	Integrated	A cue object is added into the environment
	Overlaid	Cue objects are added atop the viewport
Trigger	Persona	The cue is come with mascot
	Context	The cue is activated by some implicit user action
	Persistent	The cue is always visible

Reference: Dillman et al, 2018

Table 1. Summary of the visual interaction cues framework

2.3. Recycling Education Using Mobile Application

Environmental problems start with the attitudes and behaviors of society in understanding the concept of recycling and of whether they are practicing the recycling initiative continuously or not. Furthermore, some people disagreed that recycling was the most effective approach to address garbage's environmental issues. In addition, due to lack of education on the types, characteristics, and methods of waste disposal can have undesirable effects on humans and the environment as a result, therefore, environmental education should attempt to improve society's awareness, knowledge, attitude, skills, or engagement in order to ensure that this problem is solved successfully[20]. Educating youngsters about the importance and benefits of recycling and encouraging them to get involved in recycling is essential to protect the environment as this agenda is not something that is simple to put into practise. Following this trend, this paper attempts to develop a mobile application with AR engine that aims to create awareness of the importance of recycling education.

The outcome of the study will be an approach by a visual interaction cue via using Augmented Reality in influencing intention to recycling, or even better, change of attitude towards preserving the environmental issues.

3. RESULTS AND DISCUSSION

3.1. Framework Extension

The proposed framework's principal application is for producing augmented reality interaction cues. Visual interaction cues in mobile application offers short addresses of guiding users around the virtual world, hence, even if the solutions do not directly apply to AR advice in the real world, understanding how mobile applications will tackle the challenge might be motivating for AR designs. In this research, the interest lies in AR that uses mobile applications where the AR display severely determines the user's perspective.

Characteristic	Shape	The cue shape with easiest form
	Colors	The obvious color of cue
	Symmetry	The quality of being made up of exactly similar parts facing each other or around an axis
	Text	The main body of other piece as distinct from other material such as notes
	Picture/icon	Represent (someone or something) in an illustration.

Table 2. Extension dimension of the visual interaction cues framework

However, the features interaction visual cues (i.e., characteristic) with AR, it requires more complexity. When information is represented as a cue, how to construct a visual interaction cue with the multiple features cues necessitates the combination of text, color, an embodiment shape, and an icon animation in AR application as shown in Table 2. Rather than exhaustively showing individual cues and referring them to as widgets, this research allows us to characterize the visual interaction cue design. This framework provides a toolbox for AR design to tackle common visual interaction cues with AR application. Figure 1 displays the preliminary interface designs of the Recycl-AR prototype.

Figure 1. Recycl-AR app interface design

The interface design of Figure 1 shown a basic simple design include with information of education about recycling and followed by AR engine for interactive education on proper recycling practices. User will experience the AR application with Recycl-AR mobile application and it will be assisted with a visual interaction cue while using the AR.

4. CONCLUSION

The use of visual interaction cues in mobile application is mixed and shall not be using a single visual interaction cue only. It is important to note that studies on visual interaction cues need to be further studied as to discover new visual interaction cues particularly for use in AR. Furthermore, future AR mobile applications can be developed based from the framework discussed in this paper to generate new design for visual interaction cues on mobile applications. The current study provides a deeper understanding of how visual interaction cues elements work within a proposed mobile AR application to educate on recycling practices called Recycl-AR. The framework is also useful for AR researchers, designers, and developers towards understanding effective navigation and guidance via visual interaction cues within the realm of AR for mobile applications.

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HATE SPEECH DETECTION MODELLING USING WORD EMBEDDING AND DEEP LEARNING

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ABSTRACT

Hate speech have become rampant in Facebook, Twitter, Reddit and YouTube social media nowadays as harmful communication and targeted to either individual or group of people with negative intention. Detection hate speech in Twitter is a non-trivial task as such hatred words could not detected on lexicon approach only since those language are highly subjective which use indirectly language such as irony and sarcasm, contains ambiguity with diverse set of features and different kinds of targets. Hence, this paper propose the methodology to explore the robustness of two embedding model word2vec and GloVe on semantic level content for detection modelling of group name words and individual name words using deep learning method. Preliminary works will be taken on analysis on n-gram feature, sentiment feature and Twitter based feature. At this early stage, three public dataset which worked on multiclassification task of hate speech with different size have been identified and will be experimented for semantic modelling. The classifier performance using machine learning and deep learning approach have been reviewed in the baseline works.

Keywords: hate speech detection; abusive language; offensive language; word embedding; text classification

1. INTRODUCTION

Hate speech have become rampant in Facebook, Twitter, Reddit and YouTube social media nowadays as harmful communication and targeted to either individual or group of people with negative intention. Such language has been attracted many research communities due to its complexity to recognize by human or machines from diversity language terms such as offensive, toxic and abusive. Hate speech are targeting an individual such as cyber-bullying, a politician, a celebrity or particular groups like organization, religion, gender, country [1].The task to automatically detect and control hate speech in Twitter are continue increasing as they incite to commit crimes and violent acts.However, it is a non-trivial task as such hatred words could not depends on lexicon approach only since those language are highly subjective which use indirectly language such as irony and sarcasm, contains ambiguity with diverse set of features in different kinds of targets. In online news, the hatred words are grouped into accusations or lies, humiliating such as dumb and stupid, swearing or bad words and violence such as threatening [2]

Hate speech detection is normally formulated as a supervised learning problem. However, in Twitter social media, some issue found [3] on multiclassification is the mislabelled hatred words as hate speech due to the broad definition between hate speech and offensive language. However, their study found the tweets correctly labelled as offensive tend to contain curse words and often sexist language based on their Twitter corpus.

For this reason, the contents in hate speech and offensive language does ambiguity issue and still unclear for correctly predicted the hate words in the context of target person name or target group name or non-targeted. Therefore, the hatred words ambiguity will be addressed based on group specific name words or target individual name words.

Many texts classification works in literature study have proposed machine learning such as Support Vector machine, Logistic regression, Random Forest and Adaboost on online news media and social media [4],[5],[10]. Recently, deep learning approach such as Convolutional neural network (CNN) and Recurrent Neural Network (RNN) like Long Short-term memory networks (LSTM), Bi-LSTM and Gated Unit Unit (GRU) have proven successfully in Twitter text classification [4] and to multilingual corpus [5] Such deep learning approach showed up to semantic level content to reduce manual feature engineering.Deep learning model needs an initialization approach which not required prior knowledge to learn the important pattern of data. This transfer learning approach known as pretrained word embedding named word2vec proposed in [6] which trained Google news corpus and GloVe [7] which tabulates how frequently words co-occur with one another in corpus and FastText represents each word as an n-gram of characters and helps capture the meaning of shorter words and allows the embeddings to understand suffixes and prefixes. FastText has advantage to provide any words vector representation that are not in the model dictionary which are not provided in Word2vec and GloVe. However, the major drawback of this model is high memory requirement since this model creates word-embedding from its characters and not from words.

A study in [1] proposed the first deep learning experiments on hate speech classification. They investigated neural networks model for hate speech detection using pretrained model GloVe and FastText. Then, the model trained using CNN and LSTM and show it outperform the result from surface features such as n-gram,Bag-of-words (BoW). Study [8] proposed CNN classifier using n-gram feature with word2vec to achieve the best result. Another study in [9] compare CNN and Bi-LSTM model with BERT fine tuning, a methodology of transformers which uses attention mechanism. Attention is a way to look at the relationship between the words in a given sentence [4]. The is our baseline work which achieve high performance on dataset [3]. However, they used pretrained FastText as character embedding.

The class of hate speech and offensive language need to be further explored by looking on the context of group specific words and individual name specific words. Therefore, three research questions RQ1, RQ2 and RQ3 will be addressed in this study. First question begins with *RQ1: What are the performance of group specific words and individual name specific words using word2vec and Glove embedding? RQ2: How Twitter specific feature combined sentiments feature are adequate to judge both hate speech, offensive words and target name words? RQ3: How much training data necessary to achieve high performance on multiclassification problem.* Hence, at first stage, the study propose to explore the robustness of word2vec and GloVe embedding model in semantic content of hate speech to represent the group name words based such as muslims', "islamic", "faggot" and individual name words *"trump", "hitler"*.

2. MATERIALS AND METHODS

The dataset that will be used in hate speech multiclassification task is a well-known public dataset. However, about 55% of the available datasets sizes are small and contain a tiny portion of hate content in literature study [10].

The first dataset we named as Davidson which was proposed by Thomas Davidson et al. [3] and is publicly available.This dataset consists of 24,783 labeled instances distributed over three classes: "Hate", "Offensive" and "Neither". The dataset was built using the Twitter API to collect the sentences that contained compiled hateful terms defined on hatebase.org

The second dataset named HatEval which is part of the SemEval 2019 Task 5 competition by [11] which consists of hate speech detection against immigrants and women. The class distribution of this dataset is about 42% of the data corresponding to a hateful text and about 58% to a non-hateful text.
The third dataset we named as WaseemHovy was proposed by Zeerak Waseem & Dirk Hovy [12] and is publicly available on GitHub. The dataset contains 16,907 labeled instances belonging to three classes:

"Racism", "Sexism" and "Neither". Both Davidson and HatEval dataset use Support Vector Machine for classifier training and WaseemHovy dataset use Logistic Regression.Most of the dataset source repositories are available on GitHub.

3. RESULTS AND DISCUSSION

As preliminary analysis, there are two category features that has been identified on the dataset before pretrained embedding model will be implemented. First, the Twitter specific feature which are the number of exclamation marks, number of question marks, full stop marks, all-capitalized words, the number of interjections and the number of laughing expressions. Second, the sentiment features to be considered are total score of positive words and negative words, the number of positive emoticons, negative emoticons, the number of positive hashtags and negative hashtags. Hence, the early result in this study is our propose methodology to model the hate speech detection. The methodology divided into seven stage as depicted in Figure 1. However, this study is in the early stage on reviewing the level of semantic content on ambiguity problem which could be reached by existing pretrained embedding models in the context of hate speech.

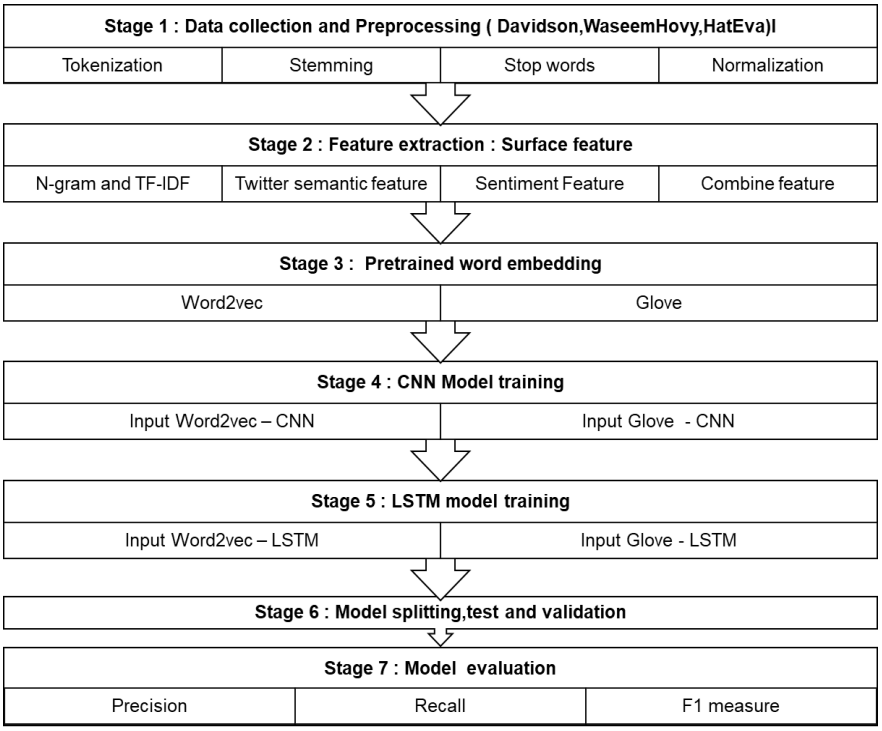

Figure 1. Propose Methodology

4. CONCLUSION

This paper proposes to explore the robustness of two pretrained embedding model on semantic content level for offensive and hate speech classification from the context of group specific words and individual specific words using three public dataset. In future, we will take on the social network analysis to explore on the user behavior features and their profile. Node embedding will be carry out to reduce high dimensionality of data in Twitter.

ACKNOWLEDGEMENT

This paper was supported by Fundamental Research Grant Scheme (FRGS/1/2021/ICT02/UKM/02/1) National Security Cluster from Ministry of Higher Education, Malaysia

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HYBRID-BASED DATA CLASSIFICATION APPROACH FOR IDENTIFYING LEVEL OF PUBLIC DATA PRIVACY IN BIG DATA APPLICATIONS

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ABSTRACT
Big data applications are made up of various data feature categories and typically have low security requirements. To prevent unintentional and unlawful manipulations of such data, a specific classification must be implemented. In this work, we investigate the issue of data privacy for public data in big data applications. We identify and analyze public data in response to confidentiality scope. There are three different levels of confidentiality: low, medium, and high. Data is initially collected from identified platforms, such as websites, mobile apps, and online systems. We then classified them into various entities based on their features and characteristics. The data model is distributed to the appropriate respondents in order to obtain their input (feedback and justification). Then, by using a Naive Bayesian classifier, we analyze and set privacy weightage based on the input from respondents by scaling the data from a low to a high level. This data modelling is then sent back to previous respondents for analyzing user satisfaction. According to the results of our survey, the data privacy classification model meets public expectations while increasing public awareness of the importance of such data. Optimistically, well-organized data classification contributes to better data practices.

Keywords: public data; data classification model; data privacy; Naïve Bayesian classifier

1. INTRODUCTION

The emerging use of big data applications leads to a wealth of information and meaningful resources that bridge communication gaps across the globe. The growth of such digital information platforms offers diverse information sharing opportunities that lead to realizing the culture of knowledge [1-2]. Such data or information is shared and used by the people, governments, and public agencies for various purposes. Note that even though the data can be publicly shared, a specific classification needs to be implemented to ensure unintentional and unlawful manipulations of such data are prevented [3]. The public also always misunderstands and misleads which data needs to be safeguarded and which can be shared. Some information might be unimportant to others but might be vital to some people. In response to the Public Sector Open Data (DTSA) [4] that aims to support the implementation of open data, the public should cultivate the basic skills to evaluate information and determine its importance. By referring to metadata prepared in the Public Sector Open Data Implementation Guidelines [4], every piece of data needed for clear definition and features is provided.

Differential privacy is another big data privacy preservation method that is being widely used. The authors in [5] provide some checklist in understanding the consumer data e.g., critical need and customers' opinions for making effective comparisons among the available products. Their survey facilitates researchers and practitioners to understand how consumers' opinion data can be processed, analyzed, and exploited. Even though their studies are different from our domain, but the public customer's opinions help the researchers to gain a better understanding of producing better product design. Meanwhile, in [6], the data were analyzed using a structural equation modelling technique that concerns the importance of severity, self-efficacy, and perceived vulnerability in data sharing through social networking sites.

In [7-8] a method of enabling analysts to extract useful answers from databases are proposed that containing personal information while offering strong individual privacy protections. The public must be well-informed about the characteristics and behaviors of data to provide privacy awareness. It motivates us to form a data classification model for providing public awareness of their data privacy. Our model consists of two main procedures in order to ensure the correctness of the data catalogue. There is identification and verifying. Both procedures involved other steps in forming data modeling. Identification aims to accurately elucidate public data that has different privacy requirements. For example, some information may be unimportant to others but critical to others. Meanwhile, the verification procedure involves public perception and opinion to ensure that our data modelling is reasonably presented in accordance with public expectations. It is important to get feedback from real users in order to ensure the robustness of the developed data model. From the results, our data privacy classification model helps in better understanding the importance of data while clarifying its security and privacy attributes. This work contributes to a better understanding of the privacy implications of big data applications and their importance in digital media content.

2. DATA CLASSIFICATION METHODS

In developing the data privacy classification model (Figure 1) there are two procedures comprised.

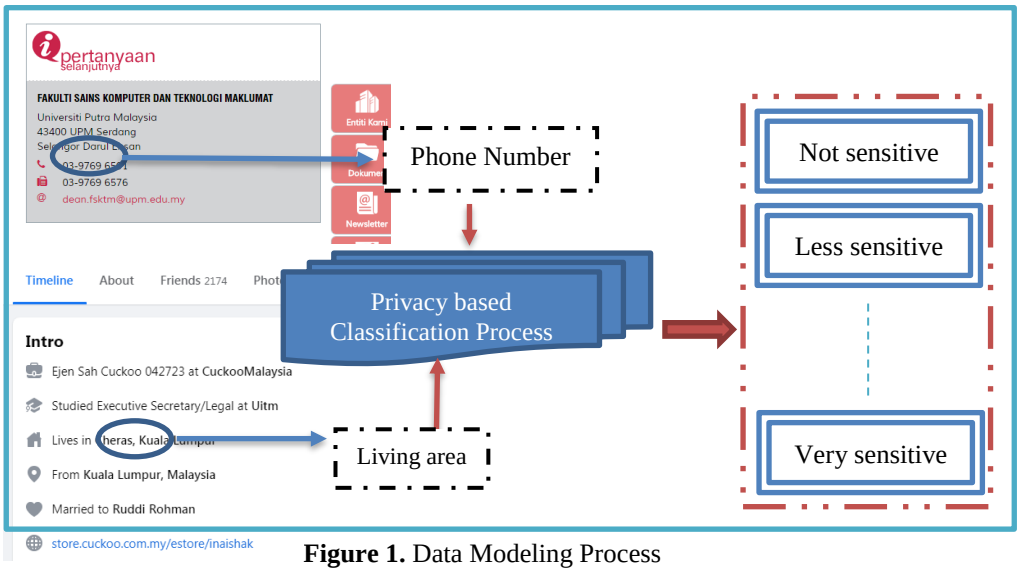

Figure 1. Data Modeling Process

2.1 Identifying

This procedure consists of several activities as follows.

2.1.1 Collecting data from open big data applications

Initially data is observed and collected from online platforms, such as websites, mobile apps, and online systems, also visible public information e.g., car plat number and street number. Only the data attribute is gathered and being used in this work.

2.1.2 Filtering the data

The attributed of data is then classified according to their processing requirements. We classified into three groups of data attributes, low, medium and high in accordance to level of privacy. Low means the data did not require any privacy, medium means there is some sort of privacy to be implemented into it, and high refers to the data that required privacy setting on it.

2.1.3 Identifying respondents

Implement sampling process, which includes several important processes such as determining sampling techniques, identifying respondents and making sampling. The sampling process will be documented by clarifying the sampling method used.

2.2 Verification

This procedure consists of several activities as follows.

2.2.1 Analyzing public perception in data attributes

In this activity, an instrument is developed for obtaining replies from the respondents that identified earlier. The respondents are required to identify by clicking the level of privacy of the listed data attributes. Definition of our low, medium and high privacy levels are thoroughly elucidated in the instrument. The responds have then been analyzed.

2.2.2 Amending the data using classifier algorithm.

The data attributes are further designed using classifier algorithm. The classifier algorithm is designed based on heuristic nature used to count on how frequent the data been chosen for the privacy level versus identified weightage that set for each privacy level. We then amended the data model and refers it as second version

2.2.3 Analyzing public feedback in attribute-based data privacy model

Set of questionnaires is developed by using a 5-point Likert scale to obtain feedback from respondents who have been determined earlier. The responds are then been analyzed.

3. RESULTS AND DISCUSSION

The sample respondents are sampling based on age are 13 to 20-years old, 21 to 30-years old, 31 to 50-years old and more than 50-years old. Due to the numbers at each sampling group is not balanced, we then accumulated normalization value from the total respondents for merely considering top 30 respondents' answers from each group. In this work we successfully identified 30 data attributes from various sources (Figure 2). We eliminate the redundancy of data by filtering the attributes' features similarity.

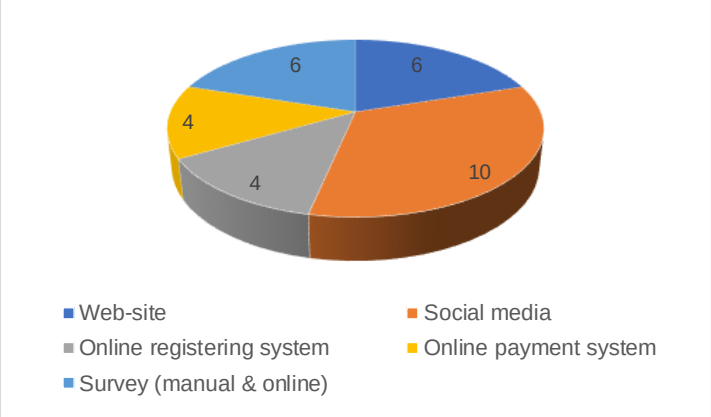

Figure 2. Data Collection Distribution based on Sources

Based on Figure 3, it shows that most respondents convey positive feedback. The result also shows that, on average, 80% of respondents are satisfied with the privacy data model by considering both fully satisfied and satisfied feedback. Even though our number of data attributes is relatively small, nearly all of them are satisfied with the data attributes listed. We also collected their comments, and some of the comments mentioned that the data attributes are close and are used in their daily activities. There are also some suggestions to form a similar methodology in designing other data privacy models, i.e., critical and confidential data.

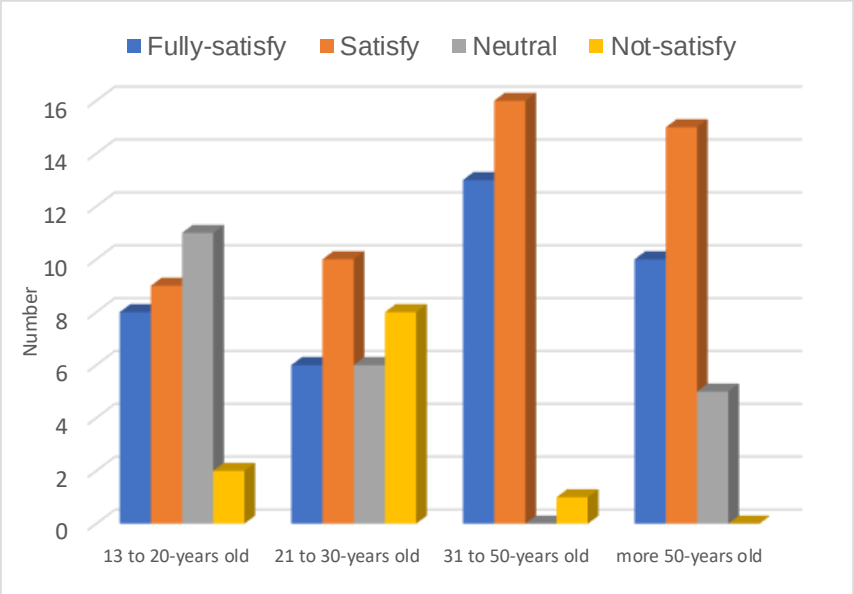

Figure 3. End-user Satisfaction Survey towards the Privacy Data Model

4. CONCLUSION

We believe the data model is more accurate when the real users or data players get involved in the data modeling process. A better understanding of the features and behaviors of electronic data or information helps in designing better data traceability and transparency solutions. It further helps to regulate and refine digital procedures for data sharing and privacy. On the bright side, this work can be extended to a wider scale of respondents as their perspectives and justification are valuable for future data privacy modelling improvement.

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INFORMATION MANAGEMENT: INVESTIGATION INFORMATION MONITORING FRAMEWORK IN ROYAL MALAYSIAN POLICE

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ABSTRACT

Information monitoring is a practice in information management that needs to be implemented to uphold the principles of transparency, accountability and compliance. The investigation information monitoring framework (IIMF) is expected to guide a proactive action by the monitoring team in an effort to ensure that police investigations are carried out in accordance with correct procedures and with integrity. This study monitors the process of creation of investigation information (input), the use of investigation information (process), and the results of the use of investigation information (output). To develop IIMF, the following things need to be implemented; (i) identify procedures and elements necessary to monitor investigation information; (ii) identify the features of doubt used to detect inaccuracies in investigation information; (iii) validate that the development and use of IIMF is capable of ensuring the transparency of police investigations. The scope of this study does not involve investigation procedures but focuses on police investigation information. IIMF contributes to the effectiveness of police investigation information management which ensures compliance while increasing police accountability.

Keywords: Information Management; Information Monitoring; Investigation Information

1. INTRODUCTION

Information is the core of life and has the power to determine the ups and downs of an organization and national sovereignty. Effective information management can turn information into a valuable asset [1] if implemented optimally. The use of valuable information plays an important role in ensuring that organizations, especially in the public sector, can function efficiently, effectively, and remain competitive. The information created, needs to be monitored and audited to support the principles of transparency, accountability and compliance [2].

Information monitoring is a good practice that optimizes the use of information as an objective assessment to check whether an organization's services follow procedures, comply with the law and lead to desired outcomes [2]. Whereas information auditing is central to effective organizational information management [3]. Monitoring and auditing of information leads to efficient management and gives a positive perception of the organization [4]. While it is good management practice [5] that information monitoring faces challenges such as limited guidelines, no standard method as well as organizations that are often confused about what to monitor and how to implement it.

The efficiency of information management is the fundamental to the effectiveness of law enforcement agencies especially police institutions [6]. Early research on information management covered a wide range of organizational activities ranging from acquiring and integrating information from various sources, to information processing and finally disseminating information to the right people at the right time [4]. Monitoring the process of information management is necessary to ensures compliance that lead to the sustainability of the organization [7].

According to Smallwood (2019) [7], information monitoring involves reviewing and examining various aspects of information management such as ensuring information is created and recorded appropriately, security procedures, ensuring records are maintained, and workflow processes through sampling to ensure compliance with policies and procedures. Information monitoring can be done through internal audit or external audit and must be practiced routinely.

Although information monitoring is one of the important components in information management, police forces have traditionally chosen to practice secrecy and non-disclosure [8]. This makes the monitoring of police investigation information [8] difficult to implement although monitoring of police investigation information is important to ensure that investigations are carried out transparently and in accordance with proper procedures [2].

The Royal Malaysian Police (RMP) is a civil force that aim to enforce the law, preventing and detecting crime, arresting and prosecuting offenders, and collecting security intelligence to preserve the law, peace and security of Malaysia. These organization often receive negative perceptions, especially from the public on issues of integrity [9].

The Department of Integrity and Standards Compliance (JIPS) is a RMP compliance unit established on 25 July 2014 [10] as a monitoring and internal control mechanism that can help restore perception and restore public confidence in RMP [11]. This department functions to receive complaints or information about the misconduct of police officers through various channels before starting an investigation [12].

Independent Monitoring Agencies in Malaysia such as the Enforcement Agency Integrity Commission (EAIC) function to receive complaints about police misconduct, investigate and hold hearings on complaints received. However, there is no task to monitor RMP investigation information as a proactive measure to detect irregularities in the police investigation listed in the agency's functions. The mechanism to strengthen the integrity of the RMP depends on complaints from various parties that are reactive instead of a proactive information monitoring method.

Information monitoring refers to the process or activity of observing and examining the development or quality of information of an activity systematically over a set period of time (reprinted from Oxford Dictionaries). To ensure the quality of police investigation information, a monitoring framework that can determine the level of compliance needs to be developed. Monitoring of police investigation information also enables feedback and recommendations to the investigator [7].

A framework that monitors police duty information known as the Early Intervention (EI) system is adopted in several police departments such as the San Jose Police Department and the New Jersey State Police. The system involves the systematic collection and analysis of information on the performance of police personnel aimed at identifying members at risk of engaging in misconduct [13]. The systems, however, did not monitor the police investigation information done by the police personnel. Monitoring the police investigation information is important to ensure that investigations are carried out transparently and in accordance with proper procedures. Information monitoring methods enable JIPS and EAIC to act proactively to detect doubts in police investigation information. In addition, the information monitoring framework is expected to contribute to the effectiveness of police investigation information management which ensures compliance while increasing the police accountability.

2. MATERIALS AND METHODS

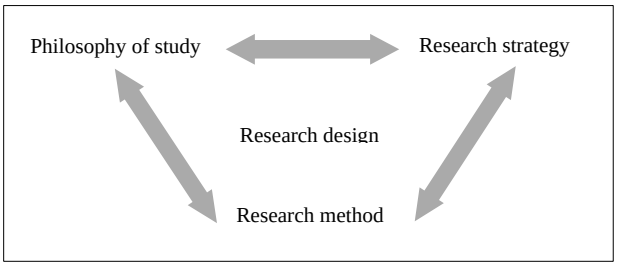

Figure 1. Research design – the relationship between philosophy, strategy and research methods

Figure 1 shows the relationship between the design, philosophy, strategy, and research methods used in this study. This study uses qualitative methods as a study design based on pragmatic philosophy. The research method was adapted from the scientific method of Savin-Baden & Major (2013) [14] and the research process of Sekaran & Bougie (2016) [15]. Table 1 shows the operational framework for the development of the IIMF study.

Table 1. Operational framework for the development of IIMF study

Phase 1 Planning and preliminary study	**Phase 2** Data collection and analysis	**Phase 3** Framework development and Evaluation	**Phase 4** Validation	**Phase 5** Reporting
Research Goal: Developing an investigation information monitoring framework: a case study in Royal Malaysian Police	**Objective a:** To identify procedures and elements that is necessary to monitor police investigation information.	**Objective b:** To identify the features of doubt used to detect inaccuracies in investigation information	**Objective c:** To validate that the development and use of IIMF is capable of ensuring the transparency of police investigations.	Report writing
• Preliminary study • Literature review • Hypothesis • Research design	• Develop data collection instrument • Data collection • Data analysis	• Framework drafting • Framework draft evaluation • Framework improvement • Framework development	• Identify validation method • Validate IIMF • Update and improve IIMF based on expert views	

3. RESULTS AND DISCUSSION

Information monitoring is necessary to ensure transparency and accountability in the operations of an organization. The effectiveness and efficiency of police investigation can be ensured by developing an investigation information monitoring framework. The IIMF works to detect flaws in investigation information and is expected to ensure transparency in the investigation process.

The use of IIMF is a proactive approach that detects inaccuracies or doubts in police investigation information instead to wait for complaints from the public who are dissatisfied with police investigation information. A proactive approach aims to ensure the transparency of police investigation information and increase the integrity of the police investigation team thus creating a positive public perception of the police force.

4. CONCLUSION

The framework produced in this study provides a procedure that can be used by investigating officers, audit teams, and monitoring agencies when conducting monitoring of investigative information and acting proactively to detect doubts in investigative information. Studies also have the potential to trigger awareness of the importance of the role and efficiency of information management.

ACKNOWLEDGEMENT

The authors would like to acknowledge the support of Information Governance Lab Research Groups, FTSM, UKM in providing facilities for this research. This article is supported under research university grants GUP-2019-061.

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METHODOLOGICAL AND PARAMETRIC COMPARISON FOR NAMED DATA NETWORKING MOBILITY

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ABSTRACT

Due to in-network caching, new technology has been proposed called Named Data Networking (NDN) that have a variety of function rather than traditional Internet technology. is a consumer-driven network design. The design proposes to replace IP addresses with identified content. In this study, we will show and explain the methods required to investigate mobility issues in NDN. The solution design is implemented using the ndnSIM NS-3 simulator. Moreover, mobility assistance was examined using two scenarios: Abilene and Grid topology. The performance evaluation uses a simulation study, just like the benchmark solution. For random topology that has been used for the testbed, the simulation analyses overall performance in terms of cost signaling, content transmission latency, and content delivery handover. As a result, the mobility scheme performs NDN methodology suitable for small and medium networks.

Keywords: Network analysis model; named data networking; ns-3 simulator; performance evaluation; simulation investigation.

1. INTRODUCTION

NDN is a completely new type of architecture based on the IP architecture that makes the Internet work [1]. The NDN was built around six architectural principles: IP is the network layer that connects everything. It has built-in security, and device to device communication concept, Flow which is the self-regulating and independent plane for routing and forwarding will help to maintain the proper data delivery balance, and users can choose and compete [2]. Internet hourglass architecture: A thin part is at the center of the universal IP network layer as shown in Figure 1. Upper and lower-layer technologies can be changed to be used in different places worldwide. They are also designed for network communications on their own. Because more and more people use the Internet to share data, point-to-point communication protocols can't help. People now mostly share information on the Internet [3].

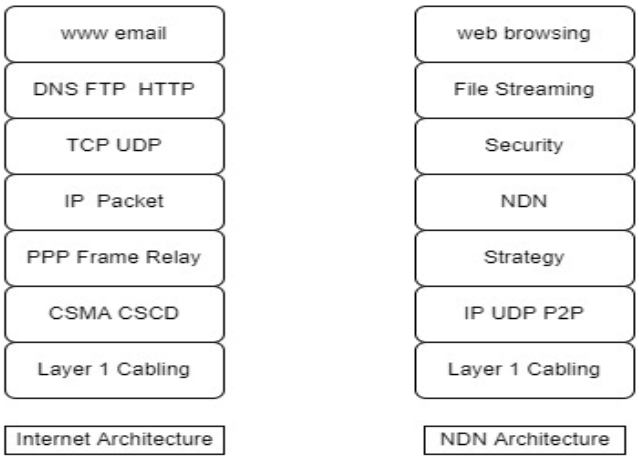

Figure 1. Comparison between Current Internet and NDN Architecture

NDN is a network that its users can reach the content directly to the producer itself by using naming instead of IP address In this case, a user sends an Interest packet (I_Packet) with a content prefix (prefix). Content is ready to be accessed when the consumer is ready to grab it. If not, the router records the Interest's interface in PIT and looks up the FIB for information about the content filled by the Named Based Routing (NBR) protocol. The Interest is forwarded on. Some routers or content providers will send back information to people who have asked for it. NDN is a network that its users run. stored in CS, then sent down the line. This study will discuss NDN methodologies such as KITE [4], PMSS [5], and Hybrid [6] and their parameter setup.

2. MATERIALS AND METHODS

Based on NDN architecture, the ndnSIM simulator can be implemented on a network layer protocol model where it can operate on any protocol on link layers such as point-to-point, CSMA and wireless as well as the implementation of IPv4 and IPv6. The advantages of the ndnSIM simulator can implement heterogeneous scenarios such as NDN over IP. The ndnSIM simulator uses the C++ programming language to enable several modules in the NDN to operate such as PIT, FIB, content storage, network and application surface as well as forwarding strategies. The use of this structured module allows any component to be modified. NS3 has been patented using the GNU GPLv2 license to reduce the writing of model procedures in simulations. The ns3 simulator uses the C++ library as the main program as no graphics version is provided. NS3 can be used in windows operating systems by adding MinGW modules. To run traffic testing, the Wireshark app can be combined with the NS3 simulator Several methods running for NDN testbed especially on mobility perspectives such as KITE, PMSS, and the latest technology is Hybrid Indirection Method.

2.1. KITE Methodology

Operation of Kite technology is a server that located between consumer and producer is called rendezvous server (SR) and this RV always be trace by NDN producer that known as KITE. As shown in. Figure 2m KITE operational between transmission Interest_packet from consumer through accessing producer by storing the location through the RV. A single route prefix is assumed for simplicity. KITE will swap the public keys to create confidence. It is signed by the mobile producer and has a special trace tag in the name. The SR will acknowledge the Data Interest for the location of the producer and return signed tracing data to the mobile producer via the same path as the TI. Intermediary forwarders establish or update FIB entries for the mobile producer data prefix, trace.

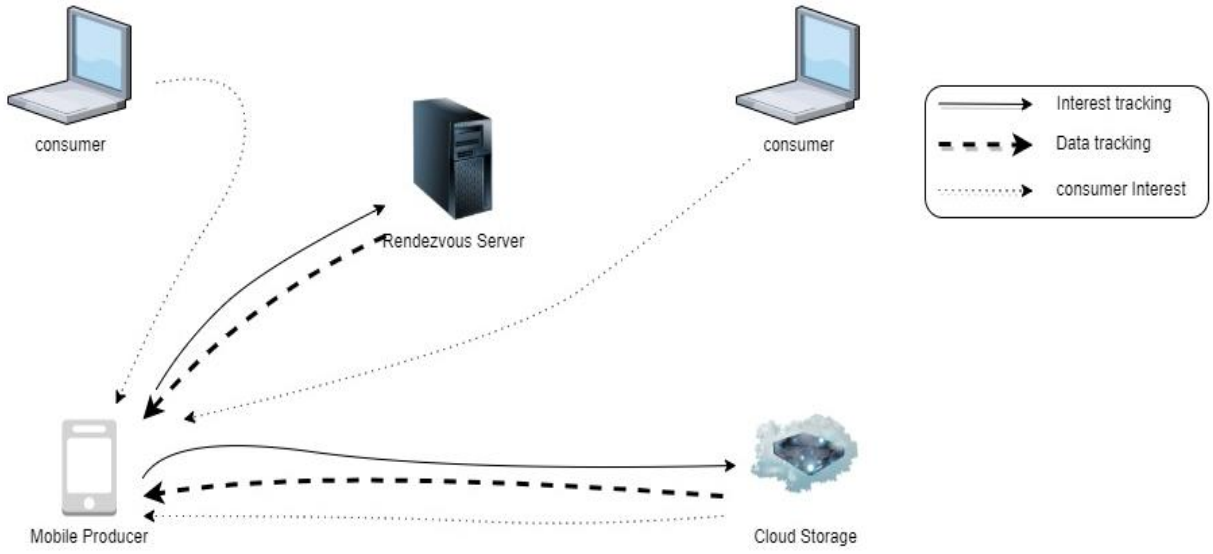

Figure 2. KITE Operation

2.2. NDN Methodological Parameter Setup

Table **1** shows the detail of the parameter setting such as network size, speed of mobility, mobility model that has been used, and simulation software that has been on each testbed. for various NDN methodological on mobility perspective.

Table 1. Parameter setup for NDN Methodological

Mobility technique	Network size (m^2)	Distance router NDN from AP	Mobility producer quantity	Mobility speed (m/s)	Interest range (ms)	Segment size (bytes)	Mobility Model	Simulation Software	Benchmark comparison
Kite	400x400	11 nod / 100 m	1	2	100	1024	Random WayPoin tMobility Model	ndnSIM	Kite
PMSS	400x400	100m	1	50, 200, 350ms	100, 200, 300	1024	Random WayPoin tMobility Model	ndnSIM	MBMA, CDBMA, CDBMA, IBMA
Hybrid NeMo	Combination of Achor and anchorless methods Introduction to BIT						Model Develop ment		In the process of testing

3. RESULTS AND DISCUSSION

There are several performance metrics to be measured to evaluate the performance of the NDN mobility such as signaling cost and latency.

3.1. Signaling cost

Referring to the equation describes the calculated cost of the requirement as a result of the movement of NDN content from the router's home producer to the router destination. So some parameters become measures such as the size of the network used, N number of nodes in the network, R as well as the number of producers used, c. The cost of declaring depends on the value of the network size, N, and the number of nodes in the network, R. The higher the network size value, the cost of the requirement will increase. Table 2 shows the parameter of the signaling cost equation.

$$C_{basic} = \frac{1}{R} + N(1) \times c + \left(1 - \frac{1}{R}\right) \times \frac{2}{R} \times N(2) \times c + \left(1 - \frac{1}{R}\right)\left(1 - \frac{2}{R}\right) \times \frac{3}{R} \times N(3) \times c + \ldots\ldots + \prod_{k=1}^{R-1} \left(1 - \frac{k}{R}\right) \times \frac{R}{R} \times N(R) \times c$$

Table 2. Parameter of Signaling Cost

Parameter	Units	Description
N	m^2	Network size
R		Number of nodes
c		Number of producers

4. CONCLUSION

This article review comparison methodological on NDN mobility and performance parametric; a simulation software that has been used for evaluating the NDN testbed specifically on mobility purpose. NDN is one of the options based on is naming concept that is relevant to be chosen compared with other technologies. Due to its hierarchical naming nature, NDN is the best architecture that will fulfill current Internet issues nowadays especially on mobility. This study examines the tools required to investigate problems in NDNs.

ACKNOWLEDGEMENT

The authors would like to acknowledge the support of Network Communication Lab Technology (NCT) Research Groups, FTSM, UKM in providing facilities for this research. This article is supported under the Fundamental Research Grant Scheme FRGS/1/2019/ICT03/UKM/02/1.

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NAMED ENTITY RECOGNITION ON HEALTH INFORMATIC USING MACHINE LEARNING APPROACH

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ABSTRACT

With the development of the Internet and the advent of the era of big data, people often need to retrieve and extract information from large amounts of data, texts, and documents. There are many professional terms in the field of medical health informatics. This makes it very difficult for non-professionals to perform information retrieval and information extraction. In this case, the Named Entity Recognition (NER) task focusing on health informatics can effectively solve this problem. The goal of this paper is to use machine learning methods to achieve the task of medical NER (MNER) and find the best method from various methods through comparative experiments. The project chose to use the Flair framework because it provides an environment that works well with various approaches. The results show that models using conditional random fields (CRFs) outperform models using recurrent neural networks (RNNs) and long short-term memory networks (LSTMs). Finally, by adjusting the parameters of the word embedding and sequence tagging modules, the model is optimized for training to recognize the full text, not just the context of the entity. The results show that the method using the full text can be better.

Keywords: Medical Health Informatics; Named Entity Recognition; Machine Learning; Recurrent Neural Network; Conditional Random Field; Long and Short-Term Memory.

1. INTRODUCTION

Text extraction has become an essential tool for health informatics research. The most fundamental text extraction task is recognizing named entities (NER) criteria in Health Informatic document, such as drugs, symptoms, diseases, etc. Current NER methods rely on predefined features that capture the specific surface properties of entity types, properties of the particular local context, background knowledge, and linguistic information. This NER step traditionally tries to identify and classify entities mentioned in the text into predetermined categories, such as the name of the person, organization, location, expression, time, amount, monetary value, percentage, etc. [1].

Named Entity Recognition (NER) is one of the components in natural language processing. This component is also an important process in extracting information from unstructured text form and natural language. The name entity can help users easily identify the main topic of a document. Extracting key entities in the text can help organize unstructured data and track important information. This process is also important if users have to deal with large text data sets. NER is a subtask of information extraction that seeks to locate and classify named entities mentioned in unstructured text into predefined categories which have been mentioned before. Nowadays, NER has been used in many fields such as Natural Language Processing (NLP) and Ontology learning.

Early NER was achieved through handcrafted rules, but with the increase in the number of data and corpora and the need for more named entity recognition, a trend is moving away from handcrafted rules and towards machine learning approaches. Machine learning (ML) is the study of computer algorithms that improve automatically through experience and data use. It is seen as a part of artificial intelligence. Machine learning algorithms build a model based on sample data, known as "training data, " to make predictions or decisions without being explicitly programmed to do so. Machine learning algorithms are used in various applications, such as in medicine [2], email filtering [3], speech recognition [4], and computer vision [4]. In the field of ontology learning and NLP, the ML method is also of great significance. Combining the ML

method with NER for concept extraction can effectively improve the performance of the model. Although the machine learning method also has problems, it is still an important method for named entity recognition tasks at this stage.

This project aims to investigate the use of machine methods to solve the Medical NER (MNER) task of extracting specific named entities (such as diseases, symptoms, etc.) from healthy medical texts. There are related model methods in previous studies, but these methods have not been compared. This project hopes to find the optimal model by comparing the machine learning methods (CRF, RNN, LSTM) commonly used in MNER tasks. Moreover, most of the previous studies do not use the entity context or only use the entity context. This paper hopes to use the word embedding method of full text annotation to optimize the model.

2. LITERATURE REVIEW

The current approaches of NER can be roughly classified into three main categories: Rule-based approach, Machine Learning (ML) approaches, Hybrid approaches. In Table 1, we enumerate the application of these methods in related research on the task of Medical Named Entity Recognition:

Table 1. Summary of Previous Research Based on MNER

Author	Language	MNER Approach	Entity Extracted	Result
Daniel Hanisch et al. [5]	English	ProMiner (Rule-based)	protein, gene, transcripts	F-measure above 0.8
Asma Ben Abacha et al. [6]	English	MetaMap+(Rule-based)	problems and treatments	About 0.6 accuracy
Shaodian Zhang and Noémie Elhadad [7]	English	Stepwise Unsupervised Learning approach (ML)	Problem, treatment, protein, DNA, RNA, Cell type, Cell line	F-scores= 53.1
Yukun Chen et al. [8]	English	Conditional random field (CRF) and support vector machine (SVM) ML	Problem, treatment, test	F-measure =0.80
Maryam Habibi et al. [9]	English	Long short-term memory network-conditional random field (LSTM-CRF) ML	Chemicals, diseases, species, gene/protein, cell lines	F1-score about 0.8
Sara Keretna et al. [10]	English	Lexicon-based and rule-based (Hybrid)	Drug	F-score achieved 66.97%
Pir Dino Soomro et al. [11]	English	Partial Decision Trees, Naive Bayesian Decision Table and Non-Nested GE(Hybrid)	Drug	F-score about 0.850

3. METHODS

The motivation of this project is for non-professional people who have difficulties in obtaining medical expertise due to professional terms in medical and health information articles. Since the Flair framework provides convenience for combining various model methods. This project uses the Flair framework to conduct comparative experiments using different machine learning methods in the MNER task. Then use the word embedding method combined with the full text (original embedding in Flair is using context of the entities) to optimize the model. The basic flow of training an MNER model in the Flair framework is shown in Figure 1 below:

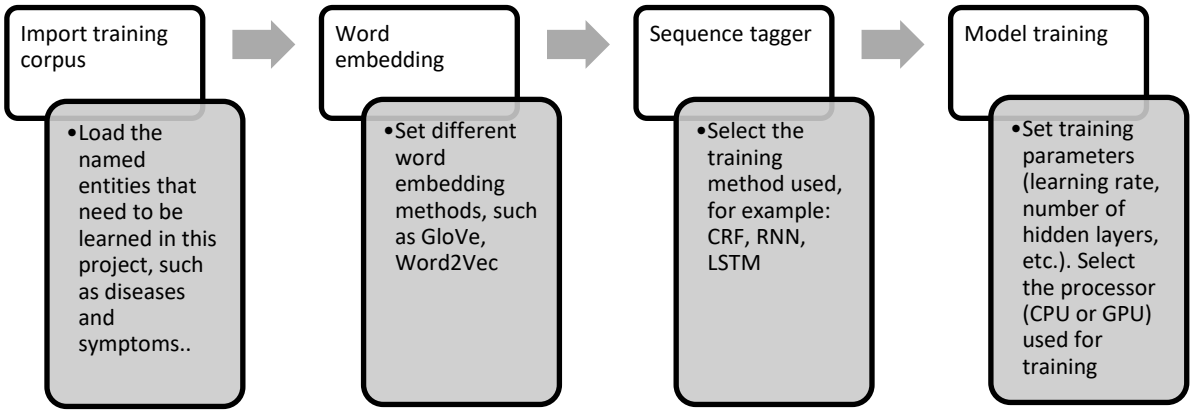

Figure 1. The Flair Framework for MNER

After the model training is completed, it will be provided to the Flair experimental module and the model will be evaluated using relevant health informatics literature.

4. RESULTS AND DISCUSSION

For the health medicine NER task, the demand for the accuracy of named entity recognition is the highest. However, accuracy is not the only indicator to measure the quality of a model. We need to evaluate the model from more aspects. Considering that compared to simple NER tasks, there are more types of named entities in health and medicine, so we choose the evaluation indicators to be Accuracy, Precision, Recall, and F1 scores in this project.

This article chooses the NCBI disease corpus as the training data. The following Table 2, shows the performance of each method in this model:

Table 2. Result of MNER Approaches on NCBI Disease Corpus

METHODS	ACCURACY	PRECISION	RECALL	F1-SCORES
RNN	0.6396	0.6982	0.8839	0.7802
CRF	0.7073	0.7918	0.8689	0.8286
LSTM	0.6532	0.7410	0.8464	0.7902
LSTM-CRF	0.7194	0.8421	0.8297	0.8358
LSTM-CRF using full text	0.7261	0.8513	0.8256	0.8382

The experimental results in the table above show that CRF in a single model outperforms RNN and LSTM, while the LSTM-CRF model, which mix two methods, is best. The word embedding method combined with the full text can slightly improve the overall effect of the model.

5. CONCLUSION

This study shows experimentally that in the MNER task trained using the NCBI disease corpus. The CRF model outperforms the RNN model and the LSTM model. The hybrid LSTM-CRF model works best. Based on this model, the full-text embedding method can be used to slightly improve the overall effect of the model.

ACKNOWLEDGEMENT

This work was supported partially by Universiti Kebangsaan Malaysia under Research Grant FRGS/1/2019/ICT02/UKM/02/2.

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NATURAL LANGUAGE PROCESSING FOR ARABIC TEXT SUMMARIZATION USING DEEP LEARNING TECHNIQUES

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ABSTRACT

In recent years, text summarization has seen renewed interest, and has been experiencing an increasing number of researches and products especially in English language. However, in Arabic language, little works and limited researches have been done in this field. We adopted Recall-Oriented Understudy for Gisting Evaluation (ROUGE) as an evaluation measure to examine our proposed technique and compare it with state-of-the-art methods. Finally, an experiment on the Essex Arabic Summaries Corpus (EASC) using the ROUGE-1 and ROUGE-2 metrics showed promising results in comparison with existing methods.

Keywords: Machine Learning; Deep Learning; Natural Language Processing; Arabic Text Summarization.

1. INTRODUCTION

Automatic text summarization (ATS) is a technique designed to automatically extract salient information from related documents, which helps to produce a summarized document from a related set of documents [1]. Nowadays, the amount of text data is increasing rapidly in areas such as news, official documents, and medical reports, so there is a need to compress such data using machine learning techniques, and text summarization can assist in extracting the significant sentences from various related documents [2]. The main problems related to document summary are redundancy, noisy information, incoherency, and diminished readability [3]. Text Summarization is one of those applications of Natural Language Processing (NLP) which is bound to have a huge impact on our lives. One method that deals with natural language processing (NLP) is ATS, which extracts the important sentences from related documents. Many researchers have focused on examining European languages and English at the Text Analysis Conference (TAC) and the Document Understanding Conference (DUC), however, there is a shortage of research on the Arabic language [4]. There are many types of methods that can classify text summarization, and summarization. Our research has examined multi document text summarization based on extracting related and significant information from the Arabic language within a generic context [5]. The main goal of this study is to introduce a domain specific document text summarization model and exploit them for the purpose of generating highly relevant summary sentences.

1) To investigate state-of-the-art of text summarization approaches proposed in Arabic language,
2) To analyze the limitation of current approaches and the peculiarity of Arabic language, which have posed challenge to the task of Arabic text summarization.
3) To propose the main lines of a new approach, which combines semantic information extracted from Arabic WordNet and rhetorical structure theory (RST), one of the most widely, used discourse theories in natural language processing.

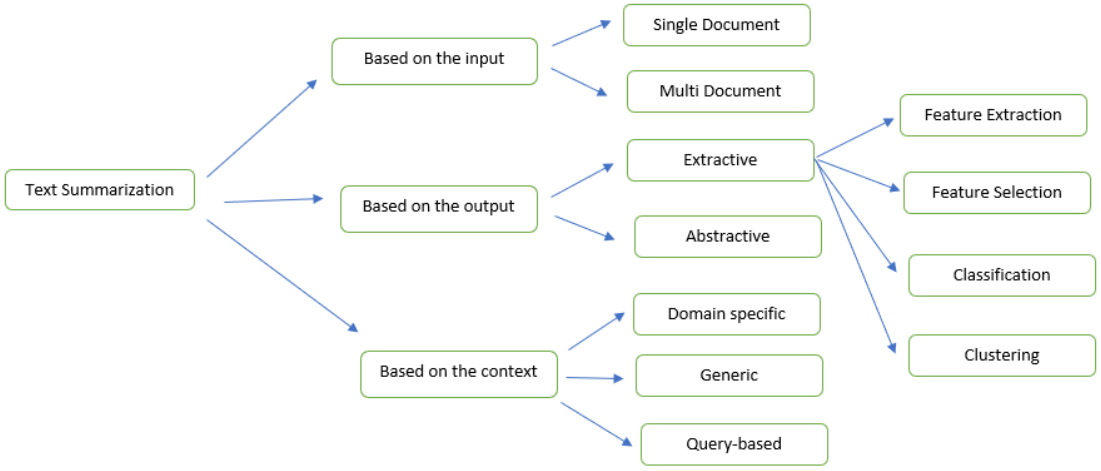

Figure 1. Process of Text Summarization Taxonomy

Text summarization is one of the most important applications of Natural Language Processing (NLP). It is an essential tool for assisting and interpreting text information. The goal of automatic text summarization is to abbreviate one or more texts into shorter version conserving their information contents and overall meanings [6]. This will help the reader to decide if a document covers desired information with minimum effort and time loss.

Following the above objectives, we investigated extractive summarization, commonly used text summarization methods. We implemented extractive summarization using TextRank [7] and TF-IDF algorithms [8].

2. BACKGROUND

We describe the standard approach for text extractive summarization learning based on the attentive TextRank, TF-IDF, ROUGE-N and BLEU Metrics, and the challenges it faces in text representation and generation. The goal of a model under this framework is to maximize the probability of generating correct target sequences.

2.1. Natural Language Processing

Natural Language Processing (NLP) is a field in Computer Science that focuses on the study of the interaction between human languages and computers [9]. Text summarization is in this field because computers are required to understand what humans have written and produce human-readable outputs. NLP can also be seen as a study of Artificial Intelligence (AI). Therefore, many existing AI algorithms and methods, including neural network models, are also used for solving NLP related problems. With the existing research, researchers generally rely on two types of approaches for text summarization: extractive summarization and abstractive summarization [10].

2.2. Text Extraction

Extractive summarization means extracting keywords or key sentences from the original document without changing the sentences. Then, these extracted sentences can be used to form a summary of the document.

2.2.1. TextRank

TextRank is an algorithm inspired by Google's PageRank algorithm that helps identify key sentences from a passage [7]. Using this idea, one can create a graph of sentences connected with all the similar sentences and run Google's PageRank algorithm on it to find the most important sentences. These sentences would then be used to create the summary. TextRank is an extractive and unsupervised text summarization technique. Let's take a look at the flow of the TextRank algorithm that we will be following:

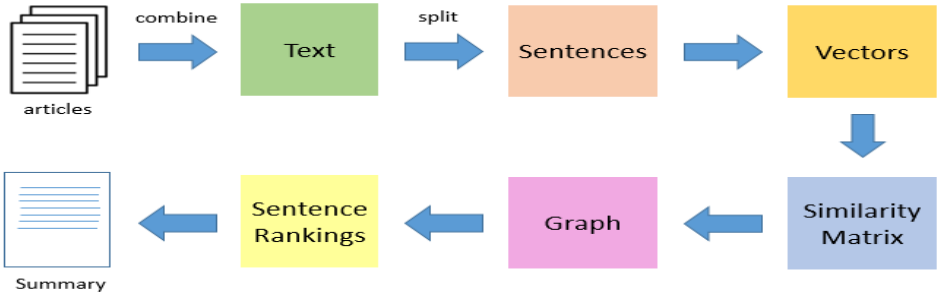

Figure 2. TextRank Flow Chart

2.2.2. TF-IDF

Term Frequency-Inverse Document Frequency (TF-IDF) is used to determine the relevance of a word in the document [8]. The underlying algorithm calculates the frequency of the word in the document (term frequency) and multiplies it by the logarithmic function of the number of documents containing that word over the total number of documents in the dataset (inverse document frequency). Using the relevance of each word, one can compute the relevance of each sentence. Assuming that most relevant sentences are the most important sentences, these sentences can then be used to form a summary of the document.

TF-IDF Formula:

1) TF (t, d) = count of t in doc / number of words in doc -→1
2) IDF (t) = log(N/(df + 1)) -→2
3) TF-IDF (t, d) = TF (t, d) * log (N/(df + 1)) -→3

2.3. ROUGE-N AND BLEU METRICES

ROUGE stands for Recall-Oriented Understudy for Gisting Evaluation. It is a set of metrics that is used to score a machine-generated summary using one or more reference summaries created by humans. ROUGE-N is the evaluation of N-grams recall over all the reference summaries. The recall is calculated by dividing the number of overlapping words over the total number of words in the reference summary [11]. The BLEU metric, contrary to ROUGE, is based on N-grams precision. It refers to the percentage of the words in the machine generated summary overlapping with the reference summaries [12]. ROUGE-N is considered the most popular one. It counts the number of overlapping units between the computer-generated summary and the reference summaries which can be computed using the following formula:

$$\text{ROUGE - N} = \frac{\sum_{S \in Summ_{ref}} \sum_{N-grams \in S} count_{match}(N-gram)}{\sum_{S \in Summ_{ref}} \sum_{N-grams \in S} count(N-gram)}$$

where V is the length of the N-gram, Count match (N - gram) is the maximum number of the common N-grams between the set of reference summaries (Summref) and the generated summary, and Count (N - grams) is the total number of n-grams in the reference summary. There are many variations of ROUGE-N depending on the unit size. The most used ones which are used by DEC 2007 are ROUGE-1 and ROUGE-

2. Since ROUGE-N is a recall-oriented measure, Precision P, Recall R, and F-score can be defined as follows:

$$P = \frac{|grams_{ref} \cap grams_{gen}|}{grams_{gen}}, R = \frac{|grams_{ref} \cap grams_{gen}|}{grams_{ref}}, F1 = \frac{2PR}{P+R}$$

3. CONCLUSIONS

Text summarization is considered very useful for readers to understand the main idea of provided long text and saves time and effort. Although there are many studies related to text summarization of different languages, Arabic text summarization is considered a greenfield for exploring and doing new research. This study shows the best algorithm used to provide higher accuracy and quality for Arabic text summarization for single and multi-values summarization.

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RECOGNISING MALAYSIA TRAFFIC SIGN WITH RAINDROP DISTURBANCE USING DEEP LEARNING

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ABSTRACT

Traffic sign recognition is served as part of the advanced driver assistance systems, which play a role in recognising the traffic signs on the road and alerting drivers. In Malaysia, road accidents have remained one of the top principal causes of death in recent years. Other than the driver's carelessness, changeable weather conditions such as rain challenge the visibility and recognition of the traffic signs. Hence, we develop a road sign recognition system with convolutional neural network (CNN) to identify the Malaysia traffic sign with raindrop disturbance. A total of 9 different combinations of epoch and dropout rate are used in this study. A Convolutional neural network with 15 epochs and dropout rate of 0.2 achieved the highest accuracy of 99.68% on the traffic sign recognition testing set.

Keywords: Deep learning; Image recognition; Convolutional neural network; Malaysia traffic sign; raindrop disturbance

1. INTRODUCTION

Nowadays, there are many studies on traffic sign recognition due to its importance in the Advanced Driver Assistance System as well as autonomous driving. The traffic sign recognition system assists in monitoring driving and alert drivers of traffic rules based on the traffic signs classification. Although the Vienna Convention and Manual on Uniform Traffic Control Devices are the global major standards on traffic sign development [1], it is still a challenging computer vision task as traffic signs in different countries might have a certain degree of differences. Numerous research has been carried out in this field. According to Lau, Lim and Gopalai [2], Convolutional Neural Network (CNN) as a deep architecture neural network has higher accuracy on both the testing set with and without Gaussian white noise compared to radial basis function neural network (RBFNN), which is a shallow architecture neural network. Neoh, et al. [3], on the other hand, utilised 13 different pre-trained CNN models and retrained only their top layers to recognise Malaysia traffic signs. It was reported that the DenseNet169 achieved the highest accuracy of 98.33%. Islam and Raj [4] proposed a road sign detection and recognition system. Artificial neural network (ANN) based on custom feature extraction was used for recognising 10 classes of traffic signs. Although they achieved an accuracy of 100%, a small testing dataset with only 10 traffic signs images is not convincing enough to argue the consistency of ANN.

In Malaysia, road accidents have remained one of the top principal causes of death in recent years [5]. Lau, Lim and Gopalai [2] suggested the environmental condition could affect the accuracy of the traffic sign recognition system. Poor weather conditions will affect the traffic signs recognition by the human as well as computer vision systems. Furthermore, Malaysia is a country with a tropical climate where rain is a common weather condition. To our best knowledge, there is no existing research investigating the recognition of Malaysia traffic signs in poor weather conditions, specifically in rainy conditions. Our objective is to develop a deep learning algorithm to recognise Malaysia traffic signs with raindrop disturbance using CNN.

2. MATERIALS AND METHODS

2.1. Data

Extended Malaysian Traffic Sign Dataset (EMTD) [6], which consists of 1413 Malaysia traffic sign scenes, is used in this study. We extracted a total of 2540 traffic sign images from the scenes in EMTD and resized them into 32 x 32 pixels. The 2540 traffic sign images are grouped in 71 classes. We eliminated the classes with less than 10 images to avoid model overfitting if these classes rely heavily on dataset expansion in section 2.2. There are 50 classes of traffic signs with a total of 2449 traffic sign images after elimination. Figure 1 shows the distribution of traffic signs classes before and after elimination.

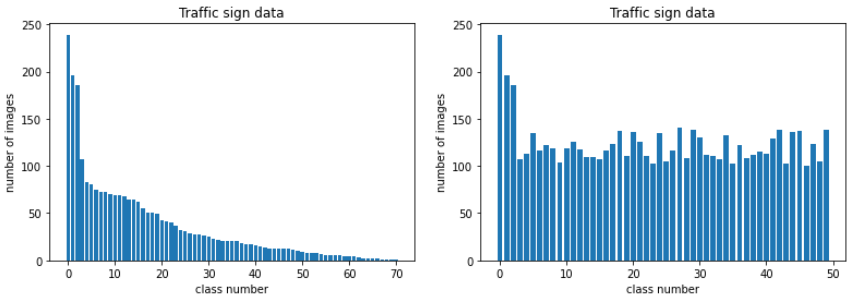

Figure 1. Distribution of traffic sign images extracted from EMTD before elimination (left) and after elimination with dataset expansion (right)

2.2. Research methodolgy

In Figure 1, it is shown that the distribution after the traffic sign images are expanded to a total of 6200 images by combining the original images with the randomly transformed images to reduce the class imbalance issue. 10 to 15 raindrops are added at random positions on all the traffic sign images using OpenCV library in Python. Two steps of data pre-processing are applied. First, equalisation is used to standardise the lighting of the images. Second, normalisation is used to rescale the images pixel values into smaller values which is between 0 to 255 into 0 to 1. Then the images are randomly assigned into training set, validation set and testing set following the proportion of 60% (or equivalent to 3720 traffic sign images), 20%, 20%, respectively.

There are three characteristics of Convolutional Neural Network (CNN) including local connectivity, parameter sharing and shift invariant, that make it effective in image recognition. Table 1 shows the CNN architecture with 11 layers where the pre-processed RGB traffic sign images are feed. During training process, the images are augmented on-the-fly to closely mimic real-world road scenarios to increase the model generalisation. Some of the images are shown in Figure 2. The model is trained using Adam optimiser with learning rate 0.001, categorical cross-entropy loss function and batch size of 50. In each epoch, 2000 batches of image data are trained. The dropout layer is used as a regularisation technique to reduce overfitting. A total of 9 models with number of epochs of 10, 15, 20 and dropout rate of 0.1, 0.2, 0.3 are constructed. Keras library in Python is adopted in this study and it is executed with the processor CPU Intel Core i5-8265U with 8GB of Random Access Memory (RAM).

Table 1. CNN architecture

Layer	Detail
1st	Convolutional layer, filter size: 5x5, quantity of filter: 60, activation function: ReLU, stride: 1
2nd	Convolutional layer, filter size: 5x5, quantity of filter: 60, activation function: ReLU, stride: 1
3rd	Max pooling layer, pooling size: 2x2, stride: 2
4th	Convolutional layer, filter size: 3x3, quantity of filter: 30, activation function: ReLU, stride: 1
5th	Convolutional layer, filter size: 3x3, quantity of filter: 30, activation function: ReLU, stride: 1
6th	Max pooling, pooling size: 2x2, stride: 2
7th	Dropout layer
8th	Flatten layer
9th	Dense layer, quantity of nodes: 500, activation function: ReLU

10th	Dropout layer
11th	Dense layer, quantity of nodes: 50, activation function: softmax

Figure 2. Examples of the augmented traffic sign images in training set

3. RESULTS AND DISCUSSION

3.1. Results

Table 2 shows the results of training Malaysia traffic signs images with raindrop disturbance using 9 different combinations of a number of epochs and dropout rate. A satisfactory mean accuracy of 99.00% with a standard deviation of 0.33 is obtained. From Table 2, it is observed that combinations 2 and 3 are overfitted as their accuracies in the training set are higher compared to the testing set. Furthermore, the higher the epoch value used to train the CNN model, the longer the program takes to execute. In spite of that, the model trained with more epochs is not having higher accuracy. Out of the nine combinations, combination 5 (CNN with 15 epochs and dropout rate of 0.2) is selected as it is achieved the highest accuracy of 99.68% on the testing dataset.

Table 2. Results of training CNN with 9 different combinations of epoch and dropout rate

Combination	Epoch	Dropout rate	Accuracy (%)			Program execution time (in minutes)
			Training	Validation	Testing	
1	10	0.1	99.01%	99.11%	99.03%	80
2	15	0.1	99.06%	98.87%	98.79%	114
3	20	0.1	99.23%	99.11%	98.55%	152
4	10	0.2	98.66%	99.11%	99.19%	84
5	15	0.2	98.85%	99.19%	99.68%	114
6	20	0.2	98.87%	99.27%	99.11%	154
7	10	0.3	98.14%	99.35%	98.95%	77
8	15	0.3	98.18%	98.95%	98.95%	116
9	20	0.3	98.62%	98.79%	98.71%	159

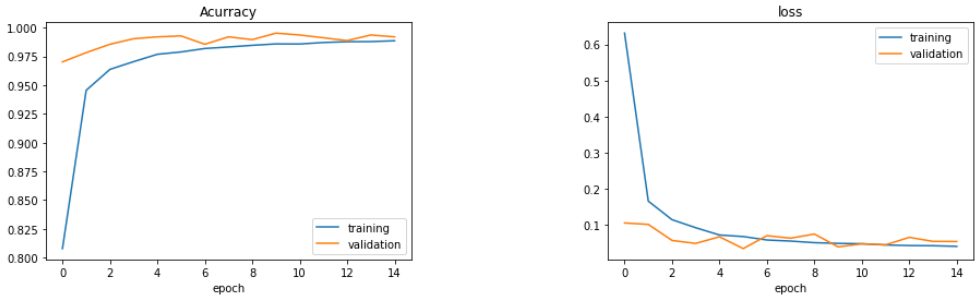

Figure 3. Accuracy (left) and loss (right) over epoch of the selected model

3.2. Discussion

Referring to Figure 3, the training accuracy at the first epoch is 80.79%, and it increased up to 94.55% at the second epoch. The highest training accuracy was obtained at the fifteenth epoch. The validation

accuracy of the model was higher compared to training accuracy due to the application of dropout layer. The loss was the highest at the first epoch. It was observed that the model was in an efficient learning process as the training loss decreases for 73.59% after the second epoch, and further decrease over epoch. Meanwhile, the validation loss oscillates with decreasing trend. Hence there is no strong indication that the model is overfitting. However, the model might suffer from minor predictive errors as it has high testing accuracy (99.68%) and low loss (0.0409) after all the 15 epochs. Based on the result, a 60km/h speed limit road sign is misclassified as 50km/h as both are white circular signs with a red border and number written in black at the centre. The misclassification due to the highly similar characteristics indicates that more training data are needed such that the algorithm provides a higher accurate classification rate. Out of 1240 testing images, 1236 images are correctly classified. Thus, the overall accuracy is 99.68%.

Table 3. The macro and weighted precision, recall and F1 score

Method	Measure		
	Precision	Recall	F1 score
Macro average	99.69%	99.73%	99.71%
Weighted average	99.69%	99.68%	99.68%

As in Table 3, both the macro precision and weighted precision are the same, which is 99.69%. F1 score should be focused on as a compromise between recall and precision. The macro F1 score is slightly higher than the weighted F1 score. This might be due to the occurrence of false negatives at those traffic sign classes with more testing images.

4. CONCLUSION

In conclusion, our study proposed a CNN as an image recognising system for Malaysia traffic sign with raindrop disturbance. An accuracy of 99.68% is obtained with a CNN with 15 epochs and a dropout rate of 0.2. In future work, a detection algorithm can be applied so that traffic signs with raindrop disturbance can be detected in the real-time environment before the recognition tasks.

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RECOMMENDATION SYSTEM BASED ON USERS' RATINGS BY UTILIZING COLLABORATIVE FILTERING

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ABSTRACT - Consumers' interest in skincare products has shown a significant spike across the globe lately. Consumers generally relied on best seller products charts or in-store shopping assistants to get recommendations on skincare products. These approaches are ineffective, as everyone's skin conditions vary. To determine whether a consumer is compatible with a particular product, recommendation systems are needed to provide customized product recommendations based on users' preferences. This study focuses on developing a skincare products recommendation system based on users' ratings. Collaborative filtering technique is used to generate predictions about skincare products which the users might be interested in by gathering and comparing preferences from the user's community based on the ratings given to that item by other users who have similar tastes to the target user.

Keywords: Collaborative Filtering; Recommendation System; Skincare Products.

1. INTRODUCTION

The Malaysian skincare products market was worth $804.5 million in 2019 and is predicted to reach $1,288.7 million by 2027, growing at an annual rate of 8.1% from 2021 to 2027 [1]. Along with the interest spike in skincare products, many customers flock to beauty products counters to seek product recommendations. This is unproductive and time-consuming. The enormous amount of information online also made it difficult for consumers to make decisions. As a result, there is a pressing demand for a customized recommendation system[2]. Numerous recommender systems have been presented to alleviate the information overloading problem and make the decision process easier. Collaborative filtering and content-based filtering are the two most widely used techniques. A hybrid approach that combines the two techniques was recently presented to optimize the benefits of both.

This study focuses on using collaborative filtering (CF) to recommend skincare products to users. CF filters and evaluates items through the opinions of other people, and generates recommendations based on similarity on users' past rating. The recommendation system will be evaluated by comparing the predicted and actual ratings given by users to specific products. This paper starts by discussing related work, data used and methodology, followed by results and discussion, and finally conclusion and limitations faced.

Users' information, such as clicks, likes, and purchases, is used in collaborative filtering recommendation techniques [2]. CF is the most effective for generating individualized recommendations [3]. Ifada et al. found that CF for movie recommendations always outperform hybrid techniques based on any top N position in precision and NDCG measures [4]. Study by Ujkani et al. proved that CF recommendation systems enable better buying experiences [5]. Mao employed CF algorithms to offer prospective products of interest to new users based on their behavioral traits when shopping online [6]. To improve the results

of the CF in personalizing tourist route recommendations, Yi and Gang combined system user preference with traditional user similarity [7, 8].

2. METHODOLOGY

This section discusses the steps to develop a collaborative filtering based recommendation system.

2.1 Business Understanding

This stage focuses on comprehending the business objectives and requirements, then converting this information into a data science task. This paper focuses on how to create a web-based recommendation engine to assist users in finding appropriate skin care items.

2.2 Data Collection

This paper uses an existing dataset from a study conducted by Gorina scraped from Sephora's e-commerce website [9]. It contains data about users' past ratings for the products they purchased, which is essential in developing a collaborative filtering recommendation system.

2.3 Data Preprocessing

Machine learning algorithms may generate less intelligible findings if the input is insufficient or contains unnecessary information. Pre-processing will be performed to handle a variety of issues, including noisy data, redundancy data, missing data values, and so on, to ensure the data quality.

2.4 Exploratory Data Analysis

Exploratory data analysis (EDA) is done to investigate the dataset in detail and to discover and comprehend the knowledge contained in our data before we begin analyzing and modeling it.

2.5 Data Analysis and Modeling

This paper focuses on using collaborative filtering (CF) to generate skincare products recommendations. The data is split into training and testing set in an 8:2 ratio. Machine learning models from Python's Surprise library will be used to predict users' ratings on the product, including Singular Value Decomposition (SVD), SVD ++, Non-negative Matrix Factorization (NMF), k-Nearest Neighbors (KNN) inspired algorithms (KNN Basic, KNN with Means, KNN Baseline, KNN with Z-Score) and Co-clustering. The models are optimized with GridSearchCV to aid in selecting best parameters [10]. The process of how they generate CF recommendations can be broken down into four parts in general.

2.5.1 User-item Rating Matrix Construction

Users' product ratings are collected, cleaned, processed, and converted to create a user-item rating matrix.

2.5.2 Similarity Computation

Similarity metrics are employed to evaluate similarity, e.g. cosine-based similarity (COS), Pearson

correlation coefficient (PCC) and Euclidean distance-based similarity (EDS) [11]. We sort each user's similarity with other users after computing the similarity between them.

2.5.3 Neighborhood Selection

The optimal k-nearest neighbors are selected to establish the similarity threshold, and users above the threshold are selected as the target user's neighbors, based on the outcome of the user similarity ranking.

2.5.4 Rating Prediction and Item Recommendation

The machine learning models will then utilize the similarity between the users as a weight to determine the target user's forecast of the unrated item and build a Top-N list of items to recommend to the user [11].

2.6 Model Evaluation

Root Mean Square Error (RMSE) and Mean Absolute Error (MAE) are used as evaluation metrics to ensure the performance of the recommendation system as in studies by Li and Gang [3,8]. RMSE is calculated by taking the average of all squared discrepancies between the true and predicted ratings and then square root the result. It is most useful when significantly large errors are undesirable. MAE is calculated by taking the average of all absolute value disparities between the true and predicted ratings.

2.7 Deployment and Feedback

The best model will be deployed to develop an application using Streamlit to generate skincare products recommendations for the users. Feedback received from the users will be used for further improvement.

3. RESULTS AND DISCUSSION

RMSE and MAE are used as the evaluation metrics to evaluate how well the engine can predict the products ratings given by users. All algorithms are optimized with hyperparameters tuning.

Table 1. Evaluation Metrics Scores of the Algorithms

Algorithm	RMSE	MAE
SVD	1.3030	1.0660
SVD ++	1.3033	1.0605
NMF	1.3035	1.0660
KNN Basic	1.3308	1.0842
KNN with Means	1.3462	1.0567
KNN Baseline	1.3073	1.0655
KNN with Z-score	1.3453	1.0558
Co-clustering	1.3461	1.0679

The wider the gap between RMSE and MAE, the more irregular the error. Our results showed minor differences between RMSE and MAE, so the models performed well. The top 3 performing algorithms in terms of RMSE are SVD, SVD++ and NMF.All algorithms obtained an average RMSE of 1.30-1.35. Algorithms with top 3 MAE scores are KNN with Z-score, KNN with Means and SVD++. All algorithms contribute an average MAE of 1.05 to 1.08. SVD++ algorithm is the best because it ranks 2nd for RMSE

and 3rd for MAE. However, to ensure functionality of the recommendation engine, it is best to have the RMSE and MAE values as low as possible. We might need to inspect and improve the nature of the dataset, because a very high-performance CF recommendation system needs an exceptionally large set of data, so relevant comparisons can be made using users' past preferences based on their similar interests. SVD++ is deployed to build a skincare products recommendation engine using Streamlit. The data product 'Skin O'Clock' is published and made available to the public. It allows users to get skincare products recommendations, by comparing users' profile with other users' past product ratings using CF.

4. CONCLUSION

This project uses collaborative filtering to recommend skincare products by computing users' similarity. SVD++ algorithm performed best in predicting users' ratings. Future investigation can be done on the implementation of users' reviews, natural language processing and other recommendation techniques like content-based filtering and hybridization.

ACKNOWLEDGEMENT

This research was supported by the Impact-Oriented Interdisciplinary Research Grant Programme (IIRG) Universiti Malaya (IIRG005B-2020SAH).

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RESULTS ACCEPTABILITY OF E-VOTING SYSTEM USING BLOCKCHAIN TECHNOLOGY

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ABSTRACT

Voting is a democratic activity that has been utilized over the years as an important means of expressing ideas and conversations among people in democratic countries. This article aims to facilitate and safeguard the voting process by creating a confident online voting system for voting and referendums. With blockchain technology, users' data is secured from theft, and Eavesdropping and voting disturbance is prevented from ensuring voting integrity. The blockchain encrypts votes to safeguard all votes against falsification. This approach is not only aimed at governments but at all public and private entities. For example, governments can hold referendums or elections, and anybody with a legal age and a government voting card can vote. This eliminates the old procedures and eliminates ballot boxes, sticks in the long lineups, and delays, which cost governments a lot of time, effort, and money. Any organization or private company that wants to conduct polls or surveys or to collect opinions from society may easily utilize this method to contact them. The approach helps the authorities concerned to achieve outcomes promptly without delay, bearing in mind variations between government and commercial organizations.

Keywords: Blockchain Technology; Electronic Voting System; Trust; Result Acceptability; Etherium.

1. INTRODUCTION

The fast growth and exquisite expansion of technology in many aspects of existence make living relatively easy for all humanity [1]. The voting process is a democratic activity that has been utilized as the primary means by which people express their views on topics and debates that affect them [2]. The electoral process is essential in democratic nations because it occurs regularly with people who have attained the legal age and are entitled to vote to allow the people to select their government representatives. This is why it is urgently necessary to guarantee the integrity of the elections by ensuring that people may vote easily and securely [3]. Many nations confront authoritarian regimes which are not characterized by election integrity and transparency. An election system based on integrity, security, the protection of votes from tampering, manipulation, and repetition is a solution that many governments want to enhance, demonstrate credibility and transparency with their citizens [4] to achieve results quicker. Voting is the procedure employed in democratic regimes to allow people to choose their representatives and their government. Therefore, there is an urgent need to guarantee the integrity of elections by providing people with safety and security to vote comfortably [3]. One of the proposed solutions is using blockchain technology to guarantee high performance and safety, and can be nations' future to grow blockchain applications [5]. Today's growing interest in blockchain technology is attributed to the electronic currency Bitcoin, which was developed in 2009 [7] and considered a digital currency used in financial transactions [4].

Citizens suffer from credibility and safety when it comes to their votes in the elections. Some of them skip voting to prevent turmoil and wait in lengthy queues [3]. Many difficulties are connected with conventional voting procedures during elections, such as voting fraud, stuffing of extra ballot papers, fabricating certain documents, counting problems, and delaying the announcement of results. All these problems make it difficult for governments to vote. A secure, trustworthy, and quick method for solving these issues is an excellent idea [4]. In some countries, like India, voting centers (kiosks) are problematized. They need staff to manage these centers since they are located separately from specific areas, and voters must travel long distances to vote. This reduces the number of citizens who take part in elections [4]. On another hand, many examples of electronic voting technologies have been utilized for optical scanning, punch cards, and voting centers (kiosks). It covers many kinds of networks such as the mobile network, private usage of a computer network, and the Internet's use of social media.

However, with technological progress, these traditional electronic voting techniques have altered, and the research community has become more interested in the smart contracts of blockchain technology [8]. It will also be used in referendums and surveys, in governmental and private companies, to know the views of persons on a particular subject or service, and in institutions or community groups that wish to know social perspectives on a specific topic in a speed, efficiency, and security way.

A new blockchain electronic voting system was developed using and tries to fix the difficulties associated with existing voting systems. Then a questionnaire was distributed among the members of Majlis Perwakilan Pelajar UUM to study their trust in the e-voting system's results.

2. MATERIALS AND METHODS

A data record is introduced into the blockchain network by having it approved and verified by a majority of other nodes on the network. This makes the publishing or refilling of data or acting in the network difficult for a fraudulent node, as other nodes on the network prevent their attempts. The first block in the blockchain, the configuration block, does not have the previous block hash field.
A private blockchain was developed using Etherium. The block is the one that carried the transaction to all the nodes. Each block has an index, a timestamp (in Unix time), a list of transactions, a proof, and the hash of the previous block. Each new block contains within itself the hash of the previous block. the blockchain blocks are having:

- Each "transactions" contain only 1 vote by design.
- "Member_id" remains not encrypted because we need it to find the user's private and public key in the PHP server part for decryption
- "payload" is the encrypted data that is base64 encoded
- "signature" is the signature (that is base64 encoded) of payload to verify its authenticity

The frontend of the system was built using PyCharm, PHP, phpMyAdmin, MySQL, Visual Studio Code, and Google Cloud Engine.

3. RESULTS AND DISCUSSION

The data was collected from respondents who were 48.4% from Majlis Perwakilan Pelajar UUM, 45.3% are students that involve in campus election organizing besides that the balance 6.3% are normal students. Most of the respondents were chosen with prior experiences in campus election. Figure 1 shows the exposure of the respondents towards blockchain technology. 70.3% of them have heard about it before, 20.3% have not heard about it and 9.4% are not sure.

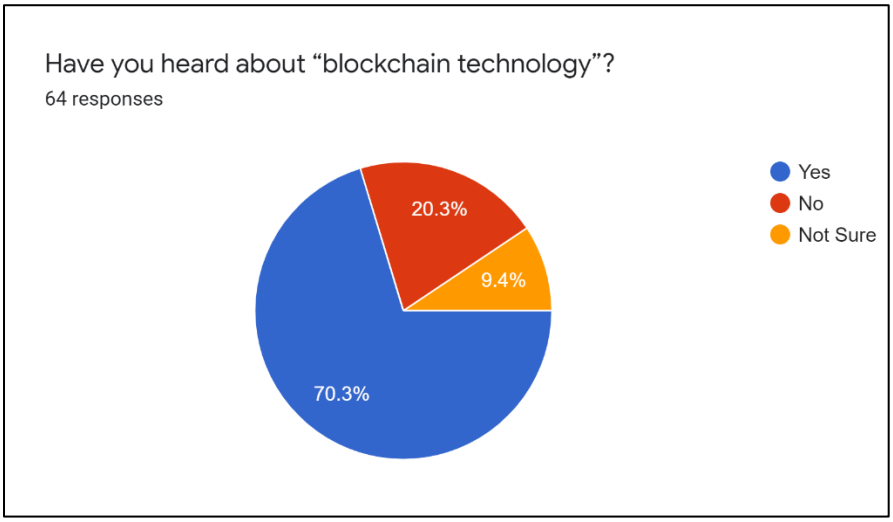
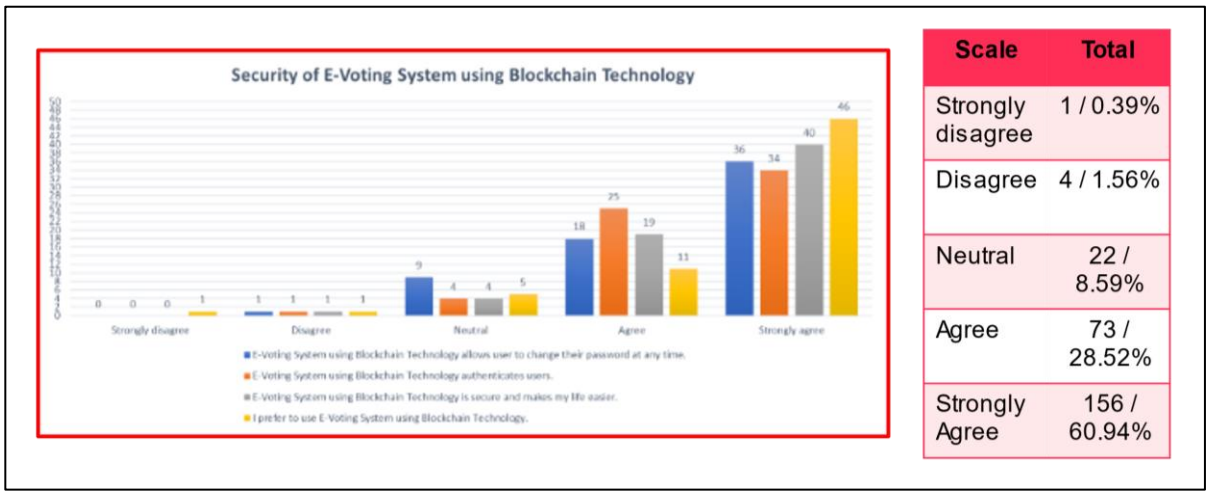


Figure 1. The respondent exposure towards blockchain technology

The respondents were asked if they used any E-Voting System before. 87.5% of them have used it before, 7.8% have not used it and 4.7% are not sure. Hence, the results in figure 2 show that the majority of them think that the blockchain-based e-voting system results can be trusted more than other e-voting systems.



Scale	Total
Strongly disagree	1 / 0.39%
Disagree	4 / 1.56%
Neutral	22 / 8.59%
Agree	73 / 28.52%
Strongly Agree	156 / 60.94%

Figure 2. The respondents answers towards the Security of the E-Voting System using Blockchain Technology

4. CONCLUSION

E-Voting System using Blockchain Technology is usable to assist user to make a secure vote and use the system successfully. In conclusion this system can be implemented in university campus election with further updates and improvement. Furthermore updates will take place in this website as maintenance purpose for improve our system.

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REVIEW ON CYBERSECURITY MATURITY MODEL

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ABSTRACT

The cybersecurity maturity model was created to assess the maturity of an organization's cybersecurity strategy and help the organisation take its level of cybersecurity capabilities to the next level. Each maturity model uses several different definitions for each level. Although there are several cybersecurity scenarios and cybersecurity models in the literature review, it was found that there is a lack of research and knowledge on the models as well as the level of effectiveness of cybersecurity maturity used in specific sector. Measurements of the maturity level of existing models were found to lead to certain criteria. The study will be conducted more comprehensively in order to create a secure environment in cyberspace for an organisation to identify and track the level of progress in their cyber security. This was accomplished by a comprehensive evaluation of studies published between 2016 to 2021 using strategies based on identification, screening, and eligibility on several established databases such as Emerald Sight, IEEE, Scopus, Web of Science and Science Direct followed by quality appraisal, and data extraction and analysis. Three main themes were also discovered based on the thematic analysis: (1) cybersecurity issues and factors (2) cybersecurity maturity and (3) factors influencing the effectiveness of cybersecurity maturity. As a result of the categorization method used in this article, it has been determined that there are certain barriers to increasing the use of the cybersecurity maturity model. The study showed the status of cybersecurity concerns on the current cybersecurity maturity, indicating that they have not developed based on the existing cybersecurity maturity model for the organizations requirements then converged sufficiently to allow for the organizations' adoption of a general solution or a broad variety of specialized techniques.

Keywords: *Cyber security; Maturity; Model; review*

1. INTRODUCTION

Cyber security is a term that refers to all actions that an organisation must take to ensure the security of data and information in all forms of digital electronics. To build a secure environment, organisations should be able to measure and monitor the effectiveness of their cybersecurity strategy [1]. One of the important methods for assessing the state of the cybersecurity capabilities of an organisation is to have a set of criteria or indicators structured to help achieve a level of maturity and capability on an ongoing basis [2].

Therefore, this paper focuses on identifying the criteria that contribute towards the impact on the level of maturity of cybersecurity in organisations and improving the performance of cybersecurity strategies in organizations. Even though there are a few cybersecurity scenarios described in the literature, limited research has been done on how a organisations security policies and guideline are regarded to be effective in practise and the models' implementation [3]. However, the approach used cannot provide an assessment of the cyber security maturity according to the organisational environment, such as sectors, culture, and governance [4]. This is because the evaluation dimension used in most models is more focused on acceptance of the solution in general or using a variety of specific techniques [4]. It shows that a non-specific model developed for public universities in Malaysia has a different structure than others.

The existence of various variations of the existing maturity model is due to organisational specialisation factors that cause the need for specific model selection criteria based on the needs and desires of the organization [3], [5]. Meanwhile, the maturity model that has been developed is also less practical as it is difficult to adopt by organisations [5], [6] especially in higher education sector. This is because most models have their own scope and are difficult to adapt to the needs of the organisation as a whole [6].

In this paper, there are a few cyber security models has been discovered current used in the organisations.

2. CYBER SECURITY MATURITY MODEL

The maturity model is a well-known standard instrument for assessing performance. The Institute of Software Engineering (ISE) introduced the Capacity Maturity Model (CMM) in the 1980s [7]. Maturities are built on this basic paradigm of maturity. This methodology optimises processes using a process model. A process model represents a constantly evolving list of tasks and procedures [8]. Research by Caralli (2013) distinguished three categories of maturity models: progression, capability, and hybrid [9] [10].

Five process maturity tiers of the basic capability maturity model are initial, repeatable, specified, managed, and optimised. This strategy does a five-tiered, best-practice, and efficient system evaluation of each system [11][7][12]. The security maturity model aims to uncover ways to improve security and proposes a technique of rate-based advancement.

3. MATERIALS AND METHODS

This segment will highlight the above full-text review findings [13]. First step is question formulation. Three questions have been suggested to assist in structuring the response to the question of what is the current, difference and characteristics of the cybersecurity maturity model available.

Second step is finding. Three systematic processes of identification, screening, and eligibility proposed by Shaffril et al. (2018) were employed to retrieve the relevant articles.

In step three, the selection and evaluation of the paper have been made. The proposed study's concept is a cybersecurity maturity model. Thus, “cybersecurity”, “maturity”, and “model” appear in the search criteria for papers.

Step four is to evaluate and interpret the final pool of publications to uncover new information, distinctions, and features between existing cybersecurity maturity models from reading each paper individually.

Last step is reporting and utilising results section summarises all research in terms of the data gathered through concepts, literature reviews, case studies, and reports [14].

4. RESULTS AND DISCUSSION

This section ended with a list of criteria for evaluating the models, and those criteria were established there. Table 1 was created after the systematic review's analysis of cybersecurity capability maturity models yielded comparisons between the models.

Table 1 indicates that various models have common qualities, such as domains and levels, but also have differences, such as implementation level and guidelines, field of application, and assessment. The paper's second study was to investigate the models' age and maturity. According to Table 1, cyber security maturity models are used by a variety of targets but are most frequently used by businesses with vital assets for cyber security assessment; hence, goal two is met. They do, however, differ in a few aspects, including the depth of evaluation and the application sector.

Table 1. Comparison of Cyber Security Maturity Model

Model Name	Year	Purposes	Target	Level	No of Attribute /Domain	Evaluation method	Ref.
1) Cyber security Maturity Model Certification (CMMC)	2020	To protect information from the Defense Industrial Base sector (DIB).	U.S. Department of Defense (DoD)	5	6 main dimensions	Assessment by third-party auditors	[15] [16]
2) National Capabilities Assessment Framework (NCAF)	2020	NCSS- *National Cyber Security Strategy*) for European countries	National	5	17 domains	National Self -Assessment Methods	[15] [16]
3) NIST Framework	Published first in 2014. Updated 2018	A framework intended to guide security and risk management activities in organizations.	Organization	4	5 main functions	Organizationa l Self-Assessment Methods	[17] [18]
4) Qatar Cyber security Capability Maturity Model (Q-C2M2)	2018	Provides a workable model that can be used for benchmarking, measuring, and developing Qatar's cyber security framework	Organizations in Qatar	5	5 domains	None	[15]
5) Cyber security Capacity Maturity Model for Nations-CMM	Created in 2014 and updated in 2016.	Increase the scale and effectiveness of cyber security capability enhancement internationally	National	5	5 dimensions	Organization' s assessment	[6]
6) Cyber security Capability Maturity Model (C2M2)	2014	Assist organizations to evaluate and make program improvements and strengthen the resilience of their cyber security operations.	Organization of all sectors, types, and sizes	4	10 domains	Self - Assessment Methods and toolkits	[14], [20],
7) National Initiative for Cyber security Education Capability Maturity Model (NICE)	2014	Determine or guide organizations on various aspects of cyber security workforce development, planning, training, and education.	Organizations in the US	3	4	Self - Assessment Methods and organizations toolkits	[21]
8) The Community Cyber Security Maturity Model – CCM2	2006	Determine the latest community status in cyber readiness and prepare the community according to the direction based on their preparation.	Community (local or state government)	5	6 primary dimensions	Community assessment	[8], [18]

5. CONCLUSION

The findings of the literature demonstrate that there has been a lack of studies on model implementation. This suggests a need for knowledge of existing models and their assessment methods. Although the approaches identified are entirely focused on cyber security, adoption may be difficult.

ACKNOWLEDGEMENT

The authors would like to express their gratitude to the anonymous reviewers and the Editor for their insightful comments on the article, which aided in its improvement in terms of quality and presentation.

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THE INFLUENCE OF PERSONALITY TRAITS ON CYBERLOAFING IN EDUCATIONAL SETTING

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ABSTRACT

The COVID-19 pandemic has altered numerous facets of everyday life globally, including professional and educational environments. As a result, the changes in nature in workplace and educational settings inevitably increase the rate of cyberloafing activities. Moreover, cyberloafing activities are correlated with individual performance, especially in an educational setting. Hence, the study aims to explore the influence of personality traits on employee cyberloafing behaviors in an educational setting. The research adopts a quantitative method based on the Big Five Inventory-2 scale, which will be used to obtain data. The study will employ a convenience sampling approach. Therefore, the expected outcome of the study will be to identify the influence of personality traits and the dominant variables that determine the employee cyberloafing behavior. The personality traits of openness, conscientiousness, extraversion, agreeableness, and neuroticism (OCEAN) are projected to have a causal relationship with employee cyberloafing behaviors. Conclusively, the study will add a new perspective to the existing literature on cyberloafing, particularly from the perspective of developing countries in an educational setting.

Keywords: big five inventory-2; big five personality traits; cyberloafing; educational setting

1. INTRODUCTION

The exponential growth of internet usage and connectivity unavoidably creates an environment conducive to cyberloafing behaviors. Furthermore, according to [3], the estimation of global internet usage will reach 5.3 billion internet users by 2023, up from 3.9 billion in 2018. In addition, younger generations are keener on adapting to internet use, which is a norm in today's world [1, 11]. Furthermore, cyberloafing activities are becoming increasingly prevalent because of all the new ways people can communicate online and use their phones while working and studying [12, 14].

Cyberloafing is associated with the voluntary use of the internet and other technological devices during scheduled class times for non-study purposes [1, 4, 7]. In short, it can be described as the use of the internet for non-academic purposes during any form of educational session [7]. Several studies have been conducted to assess the influence of personality traits on cyberloafing behaviors in educational settings [1, 8, 9, 11]. However, regardless of its capacity to shed light on personality trait literature, there is still a deficiency of experimental evidence. Consequently, this study aims to examine employee personality traits that influences cyberloafing behavior based on the Big Five Personality Traits assessment.

2. MATERIALS AND METHODS

The study will adopt a quantitative design with a structured design of questionnaires. The design will be constructed to obtain data from respondents based on openness, conscientiousness, extraversion, agreeableness, and neuroticism (OCEAN) assessment. Therefore, the strategy used to examine the causal relationships between the variables will be formed on the Big Five Inventory-2 scale. It will use 30 items to hierarchically assess the domains and can be completed in around 5 to 10 minutes by respondents.

2.1. Sample and data collection

The distribution of the questionnaires will be done using online surveys using a convenience sampling technique. Respondents will be recruited from local universities and the sample size will be 351 respondents. This research will use university employees as the sample because they are perceived to be more technology-savvy and spend more hours on the internet for work and leisure purposes [13, 14]. Furthermore, as the time for data collection will be in the upcoming months, the inclusion criteria are active university employees.

In addition, the assurance of anonymity of respondent profiles and data will be kept confidential and for educational purposes only. Personality trait factors will be used as the basis of research design, and the scale indicators will range from strongly disagree (1) to strongly agree (5) based on the Likert-scale continuum. Table 1 summarizes the lists of personality traits and the hypotheses to be tested in the study.

Table 1. Personality traits [6] and propose hypotheses
Reference: John et al., 1991

Personality traits	Hypotheses	Description
Openness	H1	Openness will influence employee cyberloafing behaviors
Conscientiousness	H2	Conscientiousness will not influence employee cyberloafing behaviors
Extraversion	H3	Extraversion will affect employee cyberloafing behaviors
Agreeableness	H4	Agreeableness will affect employee cyberloafing behaviors
Neuroticism	H5	Neuroticism will affect employee cyberloafing behaviors

3. DISCUSSION

3.1. Discussions

Cyberloafing is generally associated with the voluntary behavior of internet usage for non-work purposes [10, 13, 15]. Nonetheless, several studies [8, 9, 11] proposed a direct causal relationship between personality traits and cyberloafing behaviors. Hence, the aim of the study is to examine the influences of personality traits on employee cyberloafing behaviors. The research questions that serve as guidance for the study are the following:

1. What are the influences of big five personality traits on employee cyberloafing behaviors?
2. What are the relationships between big five personality traits on employee cyberloafing behaviors?

In the study context, the traits will be structured into five categories to examine the impact of the personality traits on employee cyberloafing behaviors. The big five personality traits consisted of the traits of openness, conscientiousness, extraversion, agreeableness, and neuroticism (OCEAN) [6]. On the other hand, people with openness characteristics are very interested in the world, other people, and new things [6]. Openness traits are projected to have an influence on employee cyberloafing behaviors. In addition, multiple studies [8, 9, 11] support the notion of openness having an impact on cyberloafing behaviors.

Alternatively, people with conscientiousness traits are typically structured and detail-oriented [6]. Moreover, conscientiousness variables are predicted to have a negative influence employee cyberloafing behavior. This is due to the differences in thoughts and levels of undertaking by the employee [2, 8]. Nevertheless, excessive cyberloafing activities will lead to a decline in employee performances, emotional fatigue, and other disruptions of well-being [10, 15].

Consecutively, extraversion traits are excitability, friendliness, talkativeness, assertiveness, and a high level of emotional expressiveness [6]. Extraversion is predicted to have a significant influence on cyberloafing behaviors. Moreover, due to the tendency to be involved in active communication, employee may engage in cyberloafing behaviors such as online chatting, updating social media status, and posting live videos

from their mobile gadgets [5, 9]. Therefore, the nature of extraversion will influence their cyberloafing behaviors and eventually affect their work performance.

Additionally, most personality traits are posited to have a constructive relationship with cyberloafing behaviors in an educational setting. In addition, agreeableness is a personality dimension that encompasses characteristics such as trust, altruism, kindness, affection, and other prosocial behavior [6]. As such, agreeableness traits are projected to have a crucial influence on employee cyberloafing behaviors. This is due to their nature of favoring helping and being considerate toward other people [11, 13].

Nevertheless, neuroticism is a personality trait that manifests itself through sorrow, moodiness, and emotional instability. Consequently, neuroticism is posited to have an influence on employee cyberloafing behavior. Several studies [9, 14, 15] found that employee with higher neuroticism are more likely to engage in cyberloafing activities. The study will aid researchers and employee in determining the optimal amount of time spent on cyberloafing in their daily lives.

The results we hope to achieve from the study are to identify the influence of personality traits on employee cyberloafing and determine the relationships between personality traits and cyberloafing behaviors. Consecutively, it will further benefit researchers who study personality and cyberloafing among people. Moreover, the cyberloafing behavior needs to be assessed to evaluate its impact on employee work performance. Conclusively, the study will help management and policymakers formulate the best internet policy for their organizations in the long run.

4. CONCLUSION

The study will provide the ground for more research in the direction of personality trait analysis and cyberloafing in an educational setting. As such, it will be a needed intervention and will assist policymakers in dealing with cyberloafing behaviors by formulating the needs of policy that best fit to their organizations.

ACKNOWLEDGEMENT

This paper supported by the Universiti Kebangsaan Malaysia Project (TAP-K011456). The authors wish to express gratitude to the editors and all the anonymous reviewers for their insightful comments and feedback.

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TRANSFORMATION OF TRADITIONAL FARMING TO SMART FARMING IN THE CONTEXT OF THE INTERNET OF THINGS

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ABSTRACT

Traditional agriculture is highly dependent on human participation and experience. Therefore, it is not possible to guarantee crop yield and quality while expanding the production scale. In recent years, based on the continuous development and innovation of IoT and ICT technologies, the concept of smart farming has started to receive the attention of researchers and farmers. Most existing smart agriculture applications and research are conducted under controlled environments such as greenhouse farming, vertical farming, and hydroponic farming, etc. Few studies have shifted attention to large-scale arable agriculture, thus neglecting the scalability of the system. In this research, we propose a framework to separate the device layer and control layer of the farming system and thus to reduce computation stress and energy consumption of wireless sensors themselves. An autonomous learning intermediate layer is set up to optimize network performance and dynamically schedule the entire system.

Keyword: smart farming; WSNs; network performance; RL; fog nodes.

1. INTRODUCTION

With the continuous evolution of science and technologies, applications based on big data, the Internet of Things (IoT), artificial intelligence (AI) have become a major trend of the time. The development of state-of-the-art tools and ICT has contributed to technological innovation and in many industries. Traditional agriculture has also begun the transformation path to smart farming. Over the past few years, many agricultural initiatives have been launched, for instance, “Farming 4.0” in Europe, “Future Farm” in the UK, and “Online Farm” in Japan. Intending to increase yield to meet the food needs of humans, they promoted these projects or research to optimize the structure of agriculture and to precisely make use of resources, Thus, agriculture will be conducted in a sustainable, efficient and intelligent manner. What is Smart Farming? Smart farming is based on a variety of sensing nodes (humidity, soil moisture, carbon dioxide, PH, images, etc.) deployed in agricultural production sites and wireless sensor networks (WSNs) to realize the series of tasks like intelligent sensing, early warning, monitoring, intelligent decision making, etc. With the availability of pre-mentioned smart devices and technologies, smart farming provides farmers with a new agricultural model of precise planting, intelligent decision-making, and visual management.

Existing smart farming systems focus on IoT-based architectures [1] to connect agricultural equipment and upload the sensed data to a database or cloud through a wired or wireless sensor network. IoT-based vertical farming [2] is designed to connect agricultural devices together via WSNs. It is a simple sensing framework with a cloud database for data storage, but other than building connection of the physical layer, there is no further data processing and analysis for better decision-making. Nor Syafikah Pezol et al. [3] proposed an IoT-based fuzzy logic farming system to optimize the use of resources with the help of pre-defined thresholds. Similar work also has been done by [4]. There is no data management module proposed for data analysis and modeling. [5] conducted research on smart farming decision support system (DSS), which solve the deficit faced by some smart farming frameworks, that is

utilization of real-time or historical sensing data to train a mathematical model for prediction and other farming tasks. However, there are no built-in higher-dimensional models to carry out complicated tasks. Through extensive literature review, most of the research favors agricultural solutions or proposes conceptual frameworks for IoT-based smart agriculture, which put their efforts on the farming system physical layer connectivity construction. Another type of research direction is biophysical processes simulation system like GPFARM [6] or APSIM [7], which offers the scenarios such as soil properties, water balance, residues, nutrients, etc. for simulating the outcomes that various agricultural decisions have brought.

To the best of our knowledge, much of today's research on smart agriculture is about how to create a connected agricultural intelligence environment using existing tools and technologies, which is evaluated under scale-down real deployment. These studies generally ignore, for example, the scalability, real-time responsiveness, and dataflow scheduling during system operation, which are key indicators for ensuring the efficiency and effectiveness of a large-scale smart IoT-based farming system in the era of Big Data. Consequently, in the process of promoting agricultural modernization, building a practical agricultural IoT solution, or offering an IoT-based smart farming conceptual framework, it is important to take the network-level performance (latency, packet loss, throughput, network topology design, etc.) into account. We should be careful about designing and constructing "device layer" and "network layer" at the same time. If we disregard the performance of the "network layer", that the entire agricultural system will not be implemented seamlessly and will not be able to play its appropriate role especially in a large-range deployment scenario.

2. PROPOSED METHODS

To solve the energy consumption problem of wireless sensor networks, most research focuses on energy-efficient routing algorithms such as the LEACH series. However, the protocol is written into the sensors, due to the limited computational ability of sensors, which may lack adaptability of changing topology. In a large-range deployment scenario (extensive coverage), latency issues should be addressed to meet the need for a fast response for various real-time tasks. Thus, many tasks need to be handled at the near-field end and dataflow should be distributed appropriately. To solve the common problems of current intelligent agricultural systems such as scalability, latency, real-time response, dynamic planning, an IoT-based WSN smart farming framework (Figure 1) is proposed. The solutions are given in the following aspects:

i. To separate the infrastructure layer from the control layer by taking software defined framework and virtualization techniques, which leads to the dynamic balance of the computational load, the reduction of energy consumption of the wireless sensors, and the increase of system scalability.
ii. To improve the real-time response capability of the system by establishing a fog computing node collection in the near ground to tackle tasks needed immediate correspondence.
iii. To adopt reinforcement learning (RL) algorithms inside the control server to dynamically plan and optimize the entire network performance based on some positive feedback(rewards).
iv. To process and fuse data at the near-ground end, which helps reduce useless information transmission to the cloud and further improve the system performance.

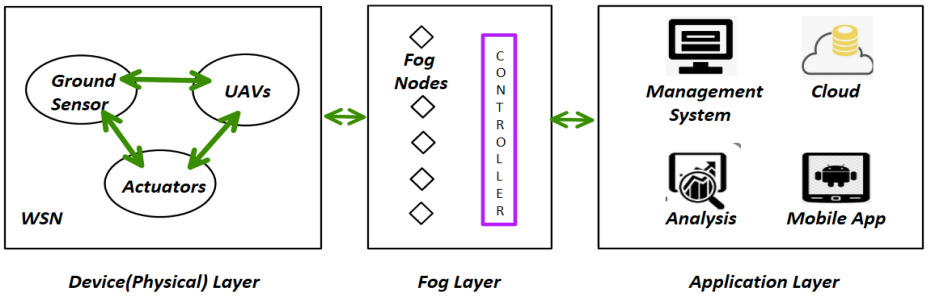

Figure 1. Smart Farming Conceptual Framework

3. CONCLUSION

For this research, we plan to optimize and scale up the current IoT-based smart farming system from the aspect of network performance, which is often overlooked by many research studies. For those studies of smart farming systems, previous related research or projects put their focus on devices connectivity construction, which are evaluated through scale-down real deployment. The problem is generally ignored that is scalability. Ensuring scalability is achieved with the premise of guaranteed network performance. Integrating and virtualizing heterogeneous physical layer resources for dynamic allocation and planning are done through reinforcement learning algorithms. This integration-based dynamic management comes into play when growing demand requires scaling up agricultural systems. In the future, more complex and real-time tasks can be built upon the proposed structure to help farmers make better decisions and to achieve agricultural sustainability.

ACKNOWLEDGEMENT

This research is supported by the Fundamental Research Grant Scheme (FRGS) under the project No. FP006-2020.

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TRENDS ON TRACKING DYNAMIC COMMUNITY DETECTION: 2017-2021

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ABSTRACT

Nowadays, structural network analysis has often been described as the potential solution in the complex network. Specifically, the tracking of community detection and evolution in temporal networks is a crucial and important issue. Even though it is a hot topic, this is quick review has been discussed on those issues and the future directions of this strategy. This review was motivated by the continuously updating in network structure evolving over time. Therefore, this paper will highlight the most preferred recent literature on tracking dynamic community detection and evolution through visualization. A keyword search yielded 96 peer-reviewed journal articles, which were then filtered using inclusion criteria from the Web of Science (WOS) and Scopus databases. However, only 58 articles were utilized as the final articles to be examined after the inclusion and exclusion process. A themed review was carried out, and the 3 final themes (approaches) were identified: 2-stages clustering (7); evolutionary clustering (45); and generative model (6). The results benefit the future study on tracking community detection and evolution in temporal networks and can be a guideline for the academics (beginners) and researchers to apply in the real-world problem.

Keywords: Dynamic community detection; Community evolution; 2-Stages clustering, Evolutionary clustering; Generative model

1. INTRODUCTION

One of the important issues in meso-structure is how to detect or track the communities. Many studies have concentrated on the static approach, and various surveys on community detection have been published. However, our real-world system or network was evolving with time [1]. Then, a dynamic method must be emphasized in a temporal network or also called dynamic community detection (DCD). DCD is defined as the process of finding relevant communities in a network that changes over time [2]. There are different ways for a dynamic community to evolve. Temporal communities have several transitions; birth, death, merge, split, resurge, or reappearance [3]. Tracking community evolution is an algorithm, or it is defined as tracking the community operation to track community birth, death, merger, and split. Community evolution is a succession of events following each other in the sequential snapshots within the social network. The dynamic social network's quick and unpredictable changes make it a fascinating yet difficult subject to solve [4].

Different researchers proposed a similar classification in track community evolution in temporal networks. Therefore, this quick review paper proposed three themes as the most preferred approaches based on reading and understanding from previous researchers' exploration. However, despite increasing publications on community detection and evolution, no review paper has discussed recent trends on tracking community detection and evolution from 2017 to 2021. Hence, this paper will answer one question for further understanding.

RQ: What are the current trends on tracking dynamic community detection and evolution from publication 2017-2021?

2. RESEARCH METHODOLOGY

The term "thematic review" was used by ATLAS.ti to define this research's theme analysis literature review [5]. [6] define thematic analysis as the process of discovering patterns and themes in a topical reading. The next stage is to recognize the pattern and create themes to reveal the patterns in dynamic community detection (refer Figure 1). The selection of literature was performed according to several selection criteria: 1) publications from 2017 - 2021, 2) Have at least keyword(s) community detection or community discovery, 3) Focusing on temporal network or dynamic network.

Table 1. Search strings from Web of Science (WOS) and Scopus

Database	Keyword Search strings	Results
WOS	TOPIC: ("dynamic community detection" OR ", community evolution across time" OR "tracking community evolution" OR " evolution events in social networks ") Refined by: LANGUAGES: (ENGLISH) AND DOCUMENT TYPES: (ARTICLE) AND DOCUMENT TYPES: (ARTICLE) Timespan: 2017-2021.	49
Scopus	*(TITLE-ABS-KEY (* "Dynamic Community Detection" *) OR TITLE-ABS-KEY (* "community evolution across time" *) OR TITLE-ABS-KEY (* "tracking community evolution" *) OR TITLE-ABS-KEY (* "evolution events in social networks" *)) AND DOCTYPE (* ar *) AND PUBYEAR >* 2016 *AND (LIMIT-TO (PUBSTAGE ,* "final" *)) AND (LIMIT-TO (LANGUAGE ,* "English" *))*	47

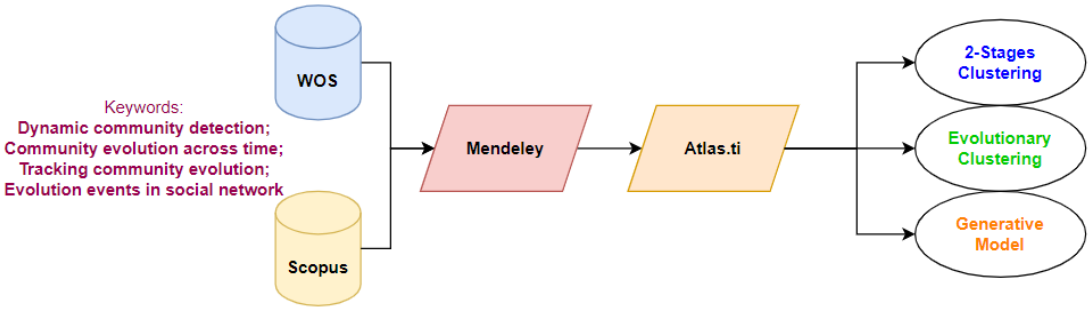

Figure 1. Process of Thematic Review

3. RESULTS AND DISCUSSION

The data is broken down into two sections: quantitative and qualitative.

3.1. Quantitative results

In this work, community structure researchers chose 36 different types of journals based on quantitative. The top popular selections journal to publish for community detection and evolution in temporal networks are Physics A, IEEE Access, and Knowledge-Based Systems. In terms of geographical dissemination, pattern of publication on tracking community detection and evolution research have become popular and are on the rise in China every year. USA and Iran also has increased publication by year, followed by Italy. And the rest countries for Algeria, Australia, India, Pennsylvania, Spain, and UAE are still new in this study.

3.2. Qualitative results

In the qualitative section show on the themes found to answer the research question. Three themes were developed: 2 Stages clustering, Evolutionary clustering, Generative Model. It is emerged from the selected publications and the ideas are borrows elements from [7]–[12].

A 2-Stages clustering

Two-stages clustering or also called the independent approach, is developed based on existing community detection algorithms and adapted to suit the temporal nature of social networks [13]. The main idea is to detect communities independently at each time step (snapshot), then match those communities with the ones detected in the previous step using a similarity metric [14] such as Jaccard and Inclusion. Refer Figure 2 for the step and Figure 3 for the result of Two stages clustering.

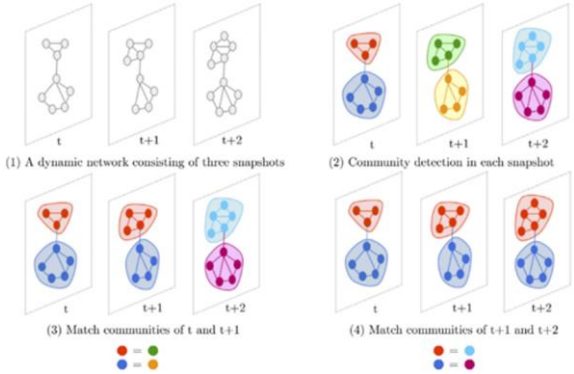

Figure 2. Two Stages Clustering (Dakiche et al., 2019)

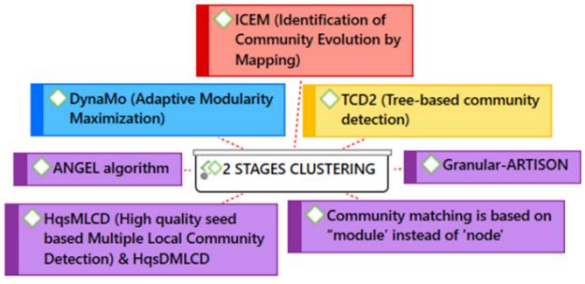

Figure 3. Results of Two-Stages Clustering

B Evolutionary clustering

Evolutionary clustering is also called dependent clustering. In Figure 4, the detection of communities at a given time t (present) is dependent on those identified at time t–1 (prior), obviating the necessity to match communities and bringing smoothness to the community identification process [16]. This paper has shown that more than four divisions of methods are to be applied; (a) Multi-objective based, (b) Non-negative Matrix Factorization (NMF) based, (c) Spectral clustering, and so on.

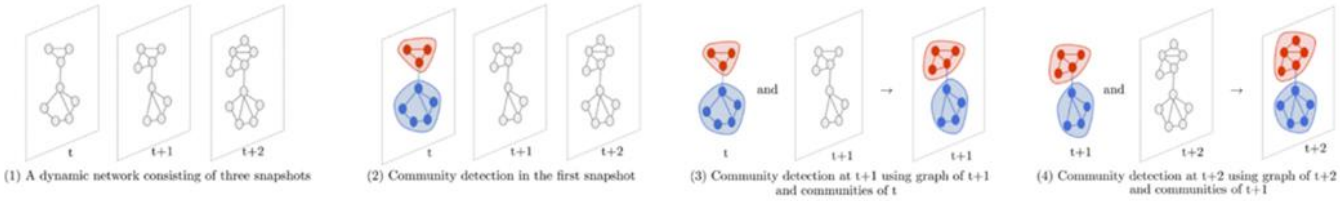

Figure 4. Evolutionary Clustering (Dakiche et al., 2019)

Figure 5. Results of Evolutionary Clustering

C Generative Model

Another method that works directly on temporal networks is the generative model. The network is no longer viewed as a series of pictures, but rather as a series of changes. The goal is to create and sustain communities in an online environment by adding and removing nodes and edges (refer Figure 6).

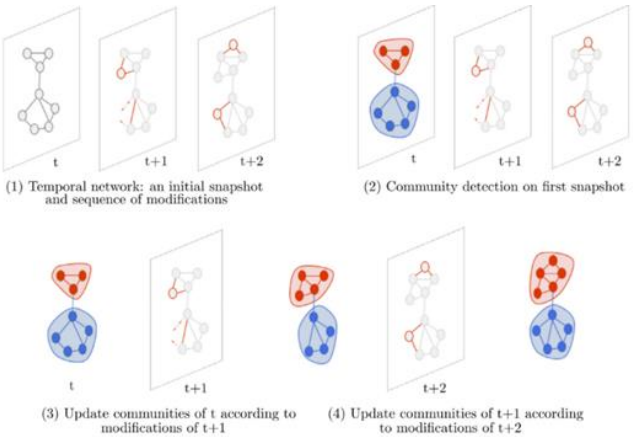

Figure 6. Generative Model (Dakiche et al., 2019)

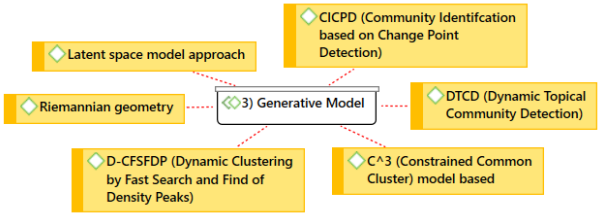

Figure 7. Results of Generative Model

4. CONCLUSION

Two approaches were used in the 58 publications that were reviewed within this paper. The first approach is the quantitative section that shows the data numerically from Atlas.ti. Despite the increased interest in this topic, quick review has been conducted on those issues or the strategy's future directions. This paper has listed three main themes as the approaches for tracking dynamic community detection: 2-stages clustering (7), evolutionary clustering (45), and generative model (6). The most common theme that researchers used in exploring the issues were evolutionary clustering. Compared to the others, there were fewer researchers who touched them experimentally. The key contribution of this paper has been to show the pattern of existing method in dynamic community detection and evolution from 2017-2021. Challenging in tracking dynamic community detection and evolution is because of the massive data sizes with time-varying, heterogeneous coevolving data, frequent data updates, domain-dependent, and so on.

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WEB SECURITY AWARENESS OF IT GRADUATE STUDENTS: CASE STUDY

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ABSTRACT

Nowadays, the security of web applications has a serious importance as Internet publication is increasing rapidly with huge variety of activities. The functionality of web applications should be insured beside the immunity from many types of vulnerabilities. There are many attackers who can bring harm to the operation of the web application and the safety of the users' information. Checking the web application vulnerabilities can be easily done using the penetration tools from Kali Linux. In this research, we tried to study the level of security awareness of final year students in IT related fields at University Utara Malaysia (UUM). Qualitative and quantitative analyses were done to evaluate the level of awareness of a selected group of users and web admins. Based on the results obtained, most of the users are aware of the importance of web application security and cares about their own personal information but they do not know how to insure that they are safe online. As for web admins, after seeing a live demo on their websites using Kali Linux's tools, they were aware that their websites should be secured but they did not know how to achieve this goal and the preliminary outcomes of this quantitative survey identified admins' enthusiasm to learn cybersecurity skills.

Keywords: Security awareness; Web vulnerabilities; Penetration tools; IT students; Web applications security.

1. INTRODUCTION

The security of the web application is a procedure of safeguarding the online services and websites from different type of security threats. There are many vulnerabilities in web application that can bring problems to many users like having confidential information being revealed, disruption of services, and identity thief. Even though, there are many ways to detect vulnerabilities and protect the web applications, but everyday new vulnerabilities are being discovered enabling attacks against the application's users and admins. Therefore, it is important to have prevention against these kinds of security threats.

In the cyber world, there are many types of web application vulnerabilities that can be used by the attackers [1]. One of the common web application vulnerabilities is SQL injection (SQLi) [2]. It is an attack that uses a web application vulnerability to allow an unauthorized hacker to use some SQL queries to access the database. The hacker can also change user permission, manipulate, or remove sensitive data from the database [3].

Other security vulnerabilities of web application can cause data breach. Data breaches happen when an attacker successfully manages to infiltrate a data source and extract sensitive information [4]. This can happen by accessing a computer or a network to steal local files or by bypassing the network security remotely targeting mainly organizations or companies.

The Cross-site Scripting (XSS) is also a web application attack where the attacker can insert some malicious code onto a web application that will trigger when the victim loads it [5]. The most common way is either added to the end of a URL or posted directly onto a page that displays user-generated content. In technical terms, it is a client-side code injection attack.

We are using Kali Linux is a Debian-based Linux distribution system aimed for advanced Penetration Testing and Security Auditing. In the official documentation, it mentions that Kali Linux have specifically geared to meet the requirement of professional penetration testing and security auditing.

There are many types of penetration tool available in Kali Linux. We used some of these penetration tools like: Burp Suite [6], SQLmap [7], and Cross Site "Scripter" (XSSer) [8] to test the web applications of some final year projects.

2. MATERIALS AND METHODS

This paper is studying the level of cyber security awareness of students from IT-related departments at University Utara Malaysia. The study was done with two phases. First, a web forum was developed and a questionnaire was spread among 31 users to check their awareness. In the second phase, some website developers were interviewed regarding the security of their web application projects those were made to fulfill the graduation requirements. A penetration testing on injection attack using Kali Linux was demonstrated on those web applications show that they have some vulnerabilities. Later, a questionnaire was given to them asking about their web development skills and experiences.

3. RESULTS AND DISCUSSION

An analysis was conducted on the responses to the post-task questionnaire on Web Application Security awareness. This section is to measure the awareness among the users about the Web Application Security. Based on the respond collected, most of the users are aware and care about the web application security when they are browsing online as shown in Figure 1.

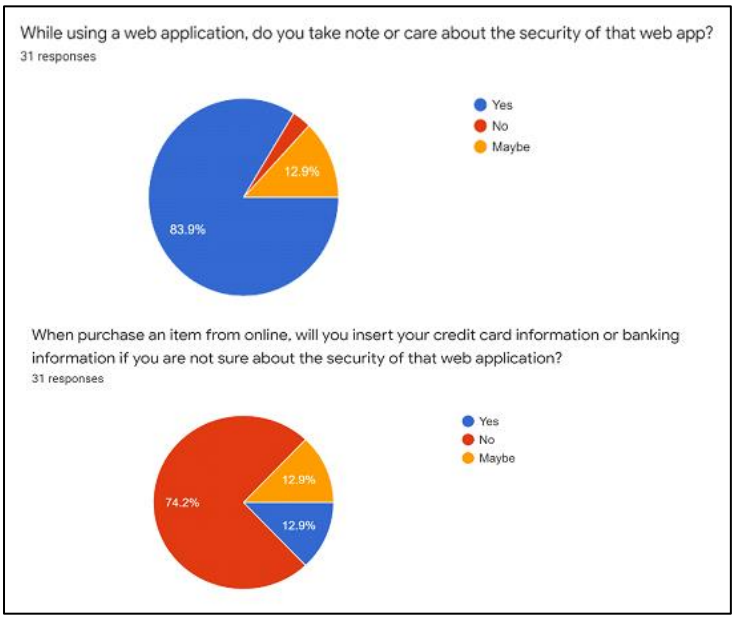

Figure 1. Users care of the security of the web application.

They are also aware that personal information such as banking information can be leak if the web application not secure. However, the majority of them cannot recognize whether the web application they are browsing is secured or not as shown in Figure 2.

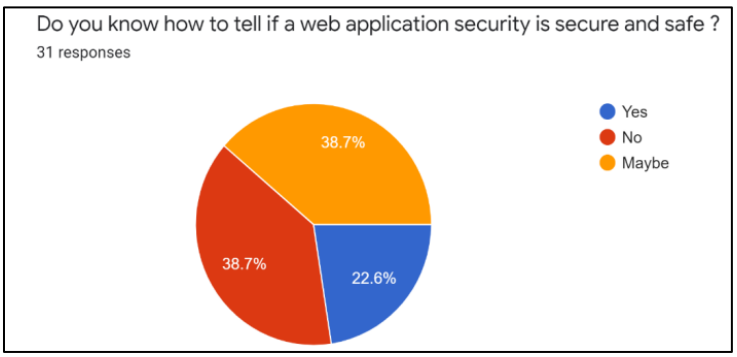

Figure 2. Users practical knowledge on the security of the web application.

Later, the students were asked to rate a forum web application and give their suggestions as normal users to improve it. From the suggestion given, we can conclude that the users care about the appearance of the websites more than other important concepts. The results are also showing random answers when they were asked if the web forum is secured or not. Figure 3 show the website security is secure and safe.

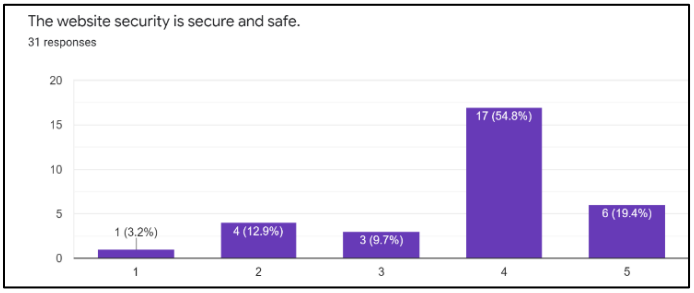

Figure 3. Rating the website security and safety

After that, based on the responses collected from the selected admins, they have not heard about the web application vulnerabilities Cross-Site Scripting (XSS) before. Other than that, they also know that the website that they have developed, the security is not fully implemented as in Figure 4. Therefore, after using the penetration tools from Kali Linux to run a penetration testing on their websites, they have agreed that they need to check their websites for any vulnerabilities and based on that, they can improve them to enhance the security.

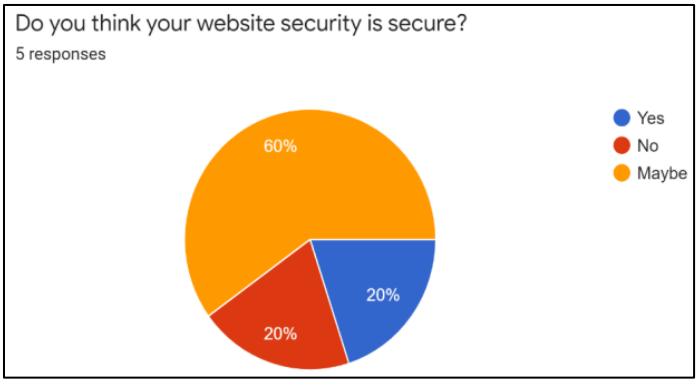

Figure 4. Admins' responses regarding the security of their web applications

4. CONCLUSION

As a conclusion, the IT students are learning the basics for web and mobile applications development in their 4 years university journey. They have many theoretical backgrounds about the importance of cyber security and how serious it can be, but most of them are failing to implement this knowledge on their projects. Based on the results obtained, most of the users are aware of the importance of web application security and cares about their own personal information but they do not know how to insure that they are safe online. We believe that the students are in need of understanding more on other web application vulnerabilities and penetrations tools to help them built more secured applications.

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