UNIVERSITI KEBANGSAAN MALAYSIA
The National University of Malaysia

FAKULTI TEKNOLOGI DAN SAINS MAKLUMAT
Faculty of Information Science and Technology

CENTER FOR CYBER SECURITY
FACULTY OF INFORMATION SCIENCE AND TECHNOLOGY

RESEARCH CENTER FOR CYBER SECURITY

MISSION

To develop cutting-edge models and solutions of cyber resilience through research, education and consultation.

VISION

A reputable academic and frontier research center for cyber resilience that able to sustain communities and organization from modern cyber threat landscape

ABOUT **CYBER**

UKM have been conducting research in the field of Computer Security since 2000 at the Faculty of Information Science and Technology and also at the Faculty of Engineering and Built Environment. Computer and network security issues has also gained the attention of the Center for Information Technology, UKM with the establishment of UKMCert.

Efforts to foster cooperation between UKM and Cyber Security Malaysia (CSM) has started since 2010. In 2013, an agreement was signed between UKM and CSM to implement cyber security training program in UKM. As a result of the agreement, Master of Cyber Security and Cyber Security Professional Certification programs were conducted. In addition, FTSM also build research collaboration with other stakeholders such as the Royal Malaysian Police (PDRM) and SIRIM Malaysia in line with the motto UKM as the Guardian of the Nation.

To further strengthen the research, teaching and services in the field of cyber security in UKM, Cyber Security Center was established after the proposal was agreed unanimously in the Senate meeting dated 25 January 2017.

Currently, this center is driven by 17 principal researchers and more than 50 postgraduate researchers under five research labs focusing on the different aspects of security:

1. Information Governance Lab
2. Cyber Intelligence Lab
3. Digital Forensics Lab
4. Computer Security and Software Verification Lab
5. Network Communication and Technology Lab

OBJECTIVES

- To drive strategic intervention on public and enterprise cyber security policies, procedures and best practices.
- To develop innovations that focusing on the predictive, preventive, detective and responsive controls in cyber security.
- To produce talents of professional and practitioner in cyber security.
- To provide advisory service on the fundamental and practice aspects in relation to cyber security landscape.

CSAM
CYBER SECURITY
ACADEMIA MALAYSIA

Akademia Keselamatan Siber Malaysia or Cyber Security Academia Malaysia also known as CSAM was one of the resolutions highlighted from the round table discussion on 15 November 2018, an event co-located with Cyber Resilience Conference 2018 (CRC2018). Then, CSAM initiative has been strengthen in the second series of the round table discussion on 28 January 2019 at the International Islamic University Malaysia (IIUM). The discussion has reached an agreement to formalize and establish CSAM under the Majlis Dekan ICT (MaDICT). Finally the formation of CSAM has been approved in MaDICT meeting and it was founded on 23 April 2019. CSAM secretariat consist of academicians in the field of cyber security and representatives from each institution was approved in MaDICT meeting on 11 July 2019

MANAGEMENT TEAM

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COORDINATORS

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MASTER OF CYBER SECURITY

LIST OF COURSES

INFORMATION SECURITY MANAGEMENT (TX6144)

This course gives a conceptual overview and practical approach to information security management. It focuses on risk management, business continuity management and incident management.

FUNDAMENTALS OF DIGITAL FORENSIC (TD6104)

This course introduces the methodology of conducting digital forensics related cases, including the standards and guidelines of handling quality investigation. This course also includes forensic laboratory and challenges in present and future digital forensics.

NETWORK SECURITY (TX6124)

This course introduces the concept and knowledge of network security protocols and its applications. Topics covered include application level security, transport level security, IP security, network management security and wireless network security.

CYBER LAW ANDETHICS (TX6134)

The main aim of the course is to enable participants to analyse the phenomena of cyber crime, legal and investigation/ evidential issues. This will enable participants to associate the evolution of criminal behaviour and technology advancement. Such knowledge will also inculcate the culture of cyber security and ethics among participants.

ETHICAL HACKING AND PENETRATION TESTING (TX6244)

This course concerns with assessing target networks and systems to identify security vulnerabilities from both internal and external threats. Participants will learn how to perform penetration testing and ethical hacking procedures.

INTRUSION DETECTION AND PREVENTION (TX6224)

The course covers methodologies, techniques and tools for monitoring events in computer network for preventing and detecting unwanted activities as well as recognizing and recovering from malicious behaviour.

SECURITY AUDIT AND ASSESSMENT (TX6254)

This course introduces techniques in internal audit, and security control in ICT environment including the networks, applications and operating systems

DIGITAL MEDIA FORENSIC ANALYSIS (TD6314)

This course is about forensics analysis on various types of digital files; documents, audio, video and images. This course also discusses about file structure and analysis method. At the end of the course, participants should be able to understand digital forensics case solution and writing forensic case report.

DATA RECOVERY AND ANALYSIS (TD6214)

This course introduces the fundamental of data recovery and analysis methods for different types of digital devices and scenarios. Participants will be exposed to the advance techniques and methods in analyzing evidences on cyber world. Participants will also be exposed with software tools based on artificial intelligence techniques.

CYBER THREAT INTELLIGENCE (TX6364)

This course will teach the student in the tactical, operational and strategic level of cyber threat intelligence skills. Further, through this course, it able to create better security teams, more efficient and accurate incident response and the student more aware of the evolving threats landscape.

DIGITAL BANKING AND FINANCIAL SERVICES (TX6334)

This course aims to provide understanding on the application of technology in banking and other financial institutions. The module covers financial system components and digital banking system which consists of banking network infrastructure, bank core applications, as well as online banking. Security measures and standard practiced by banking and financial institution to ensure security of the system, will be discussed.

CYBER SENTIMENT ANALYTICS (TX6354)

Analytical sentiment of social media resources could leverage the operational aspect, strategic and prediction analysis. Social media is highly potential as a vector in cyber domain. Therefore, this course discusses the analytical approach to social media focusing on cyber domain.

FINANCIAL TECHNOLOGY AND RISK (TX6344)

The module covers various type of FinTech and its risk, especially payment gateway, digital wallet. and Secure Electronic Transaction protocol. Regulations and standards that govern FinTech will also be discussed. The discussion continues with the block chain and cryptocurrency, from the perspective of security.

STRATEGIC INFORMATION (TX6314)

This course will give student a holistic view of information and understanding itsimportance as the strategic source to organizations and the strategy for managing it. This course addresses the fundamental concepts and operational issues surrounding strategic information handling in organizations, thus, It equips students with the necessary basic knowledge and competencies and the need to utilize information efficiently and effectively.

ORGANIZATION-WIDE CYBER SECURITY STRATEGY (TX6414)

In this course, students will be exposed to current cyber threat through the analysis of cyber security annual reports by reputable organization

CYBER SECURITY IN STRATEGIC STUDIES AND INTERNATIONAL RELATIONS (TX6324)

This course introduces cyber security from the disciplines of strategic and security studies. Students will be exposed to the approaches and paradigms of cyber security in the languages of politics and international security. Students will learn-about cyber policy and strategy, cyber conflict ranges from cyber warfare to cyber espionage.

INFORMATION GOVERNANCE
RESEARCH LAB

ABOUT

Information governance (IG) is a holistic approach to managing information at organizational level in support of and comply with regulatory, legal risk, environmental and operational requirements. It implements policies, procedures, processes, roles, control, standards, metrics, technology and people where appropriate to treat information as a valuable business asset. The discipline encompasses more than conventional records and information management (RIM) when it incorporates information privacy; security and protection; risk and compliance; audit, e-discovery; creation, preservation and deletion of information; analytics; big data; IT management; business operations; and business intelligence. The current area of interests in this Lab are Long Term Digital Preservation; Content Management; ICT Governance; Data Governance; Information Security; Data Privacy; Risks Management; Legal Compliance; Litigation Readiness; and Records Management. This lab explores new policy and framework outlining acceptable behavior for managing, organizing, and sharing of information.

MEMBERS

1. Assoc. Prof. Dr. Mohamad Shanudin Zakaria (Head of Lab)
2. Dr. Ahmad Tarmizi Abdul Ghani
3. Dr. Umi Asma' Mokhtar

SELECTED PUBLICATIONS

- Muaadh Mukred, Zawiyah M. Yusof, Fahad M. Alotaibi.2019. Ensuring the productivity of higher learning institutions through electronic records management system (ERMS). *IEEE Access*
- Waleed AlKhofani, Zawiyah M. Yusof, Hazura Mohamed,2019. Challenges in implementing digital records management in Arabic countries. *Journal of Technical Innovation in Modern Engineering and Science*
- Muaadh Mukred, Zawiyah M. Yusof, Umi Asma' Mokhtar, Wan Fariza Wan Faizi, 2019. Taxonomic framework for factors infl uencing ERMS adoption in organizations of higher professional education. *Journal of Information Science*
- Nazilah Ahmad@Ahmad Arifi n, Umi Asma' Mokhtar, Zaihosnita Hood, Sabrina Tiun, Dian Indrayani Jambari, 2019. Parental awareness on cyber threats using social media. *Jurnal Komunikasi*
- Siti Narimah Jamali, Mohamad Shanudin Zakaria, Siti Nabila Jamali, 2018. A risk management approach to the development of an early warning system: a case for Tasik Chini. *Asia-Pacific Journal of Information Technology and Multimedia*
- Ahmad Tarmizi Bin Abdul Ghani, Mohamad Shanudin bin Zakaria, 2018. Method for designing scalable microservice-based application systematically: a case study. *International Journal of Advanced Computer Science and Applications*
- Ahmad Tarmizi Abdul Ghani, Mohd Shanudin Zakaria, 2017. A Method for Analyzing and Designing Microservice Holistically. *International Journal of Advanced Computer Science and Applications.*

SUBJECTS OFFERED

Postgraduate Subjects

- TTTTP6014 Information Policy and Ethics
- TTTX6134 Cyber Law and Ethics
- TTTX6144 Information Security Management
- TTTX6254 Security Audit and Assessment

Undergraduate Subjects

- TTTT3013 Computer Ethics and Social

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RESEARCH FOCUS

Research Areas	Definition	Aims
Information Management, Information Management System, Records Management	Information management (IM)/IM System environments are comprised of legacy information resident in line of business applications, Enterprise Content Management (ECM), Electronic Records Management (ERM), Business Process Management (BPM), Taxonomy and Metadata, Knowledge Management (KM), Web ContentManagement (WCM), Document Management (DM) and Social Media Governance technology solutions and best practices. The focus of IM is the ability of organizations to capture, manage, preserve, store and deliver the right information to the right people at the right time. Records management (RM) is the supervision and administration of digital or paper records, regardless of format. RM activities include the creation, receipt, maintenance, use and disposal of records. In this context, a record is content that documents a business transaction. The goal of RM is to help an organization keep the necessary documentation accessible for both business operations and compliance audits.	This outcome of this research aims to propose a framework/model that leads to change in the way people use information and records to engage in knowledge focussed activities. The framework/model shall: fulfil the focus or goal of research area, and adhere to the principles of IM/RM body of knowledge, and discover unique or new attributes to manage information and records, and be able to make changes in patterns of people and/or organizations, or use for decision-making, and for the coordination, control, analysis, and visualization of information in an organization.
Information Governance, Policy & Ethics: Long Term Digital Preservation; Content Management; ICT Governance.	Information Governance (IG) is a strategic approach to maximizing the value while mitigating the risks associated with creating, using, and sharing enterprise information	This research aims to define the specification of decision rights and an accountability framework: that ensure appropriate behaviour in the valuation, creation, storage, use, archiving and deletion of information. that includes the strategies, processes, roles and policies, standards and metrics to ensure the effective and efficient use of information in enabling an organization to achieve its goals.
Information Security, Data Privacy; Risks Management.	Information security refers to the processes and methodologies which are designed and implemented to protect print, electronic, or any other form of confidential, private and sensitive information or data from unauthorized access, use, misuse, disclosure, destruction, modification, or disruption	This study aims to effectively resolve information related issues and create processes to prevent future occurrence of issues related in security. The outcome will be in a form of framework/model of policies, process, or strategies to protect information from wrong party. The outcome must include: a series of documented, agreed, understood policies, procedures, and process that define how information is managed in a business to lower risks and vulnerability and increase confidence in an ever-connected world

COMPUTER SECURITY AND SOFTWARE VERIFICATION

RESEARCH LAB

ABOUT

The Computer Security and Software Verification Lab seeks to conduct cutting edge research in the specific areas of cyber security such as steganography, authentication, privacy, computational cryptography and security verification. Each of these areas has its own aims (Table 1). To ensure that the results of the research will reach the relevant academic communities, we strive to disseminate them in recognized publications (Table 2). Besides that, the results will also be communicated in specific subjects offered by this lab (Table 3)

MEMBERS

1. Prof. Dr. Zarina Shukur (Head of Lab)
2. Assoc. Prof. Dr. Ravie Chandren Muniyandi
3. Dr. Rossilawati Sulaiman

Computer Security & Software Verification

SELECTED PUBLICATIONS

- Ilyas Khudhair Yalwi Dubi, Ravie Chandren Muniyandi, 2019. Performance investigation of VoIP over mobile WiMAX networks through OPNET simulation. *International Journal of Advanced Computer Science and Applications*
- Ghassan Muslim Hassan, Khairul Azmi Abu Bakar, Mohd Rosmadi Mokhtar, 2019. Merge between cyclic prefix and training sequence for CFO estimation techniques on OFDM systems. *Journal of Theoretical and Applied Information Technology*
- Arash Ghazvini, Zarina Shukur, 2018. A serious game for healthcare industry: information security awareness training program for Hospital Universiti Kebangsaan Malaysia. *International Journal of Advanced Computer Science and Applications*
- Nadeem Alherbawi, Zarina Shukur, Rossilawati Sulaiman, 2018. JPEG image classification in digital forensic via DCT coefficient analysis. *Journal of Multimedia Tools and Applications*
- Roham Amini, Rossilawati Sulaiman, Abdul Hadi Abd Rahman Kurais, 2018. CryptoROS: a secure communication architecture for ROS-based applications. *International Journal of Advanced Computer Science and Applications*
- Ali Abduljabbar Ali, Khairul Azmi Abu Bakar, 2018. Energy aware fault tolerant topology control algorithm. *Journal of Theoretical and Applied Information Technology*
- Mustafa Raad Hammoodi, Ravie Chandren Muniyandi, 2018. An improved harmony search algorithm for optimized link state routing protocol in vehicular ad hoc network . *International Journal of Engineering and Technology*

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RESEARCH FOCUS

Research Areas	Aims
Steganography	The aim of this research is to find new algorithms that can hide various types of secret messages in multimedia carriers. The algorithm shall improve steganography requirements; capacity, transparency and robustness as dimensions of quality.
Authentication	The aim of this research is to find new methods, protocols or techniques that can authenticate someone or something, with usability, efficiency and security as dimensions of quality.
Privacy	The aim of this research is to find new methods or techniques to secure personal data so that only authorize users can have access to the data. The methods should be easy to use, efficient and resist against malicious attacks.
Computational Cryptography	The aim of this research is to find new computational algorithms of existing cryptography mathematical models, with time and/or space complexity as dimensions of quality.
Applied Security Verification	The aim of this research is to prove mathematically that algorithms, methods or techniques satisfy some security properties aided by an automated proving tool. In this research, the findings will be in a form of mathematical theorem. Furthermore, the aesthetics view (trivial, difficult, deep or beautiful) of the theorem is an additional knowledge.
Software Security	The aim of this research is to find a new way to protect software against attacks. The findings must maintain the software efficiency, yet secure the software. It should also be systematic and applicable.

SUBJECTS OFFERED

Postgraduate Subjects

- TTTX6114 Computer Security
- TTTX6124 Network Security
- TTTX6234 Software Security
- TTTX6334 Digital Banking and Financial Services
- TTTX6344 Financial Technology Security and Risk

Undergraduate Subjects

- TTTK2223 Theory of Computer Science
- TTTN3513 Computer and Network security
- TTTN4133 WAN Technology
- TTTK2103 Computer Network Technology

DIGITAL FORENSIC
RESEARCH LAB

ABOUT

The word forensic is defined as a process of collecting, analysing and reporting about the data that may subsequently become evidence in the criminal justice system. Thus, digital forensic is about forensics involving the digital devices such as computers, CCTV, mobile phones, cameras and so on. With the proliferation of such equipment, the evidence is increasingly likely to be generated through such media. For example, in cases of paedophilia, incriminating evidence is often found on computers, laptops, mobile phones, server or cloud. With such examples, the needs for the research in digital forensics are required to help and ease the task of the law enforcement in handling, analysing and presenting the digital evidence for the criminal investigation. Digital Forensics is responsible to overcome the problem in digital forensics area by involving with the latest research focusing on the digital forensic readiness, enhancing the current framework, developing forensics tools and towards big data and analytics of digital data.

MEMBERS

1. Assoc. Prof. Dr. Siti Norul Huda Sheikh Abdullah (Head of Lab)
2. Dr. Khairul Akram Zainol Ariffin
3. Dr. Kok Ven Jyn

SELECTED PUBLICATIONS

- Aditya Raj, Gunjan Gautam, Siti Norul Huda Sheikh Abdullah, Abbas Salimi Zaini, Susanta Mukhopadhyay, 2019. Multi-level thresholding based on diff erential evolution and TsallisFuzzy entropy. *Image and Vision Computing*
- Siti Norul Huda Sheikh Abdullah, Abbas Salimi Zaini, Bedir Yilmaz, Azizi Abdullah, Nor Sakinah binti Md Othman, Ven Jyn Kok, 2019. Contour based tracking for driveway entrance counting system. *International Journal of Integrated Engineering*
- Anahita Ghazvini, Siti Norul Huda Sheikh Abdullah, Masri Ayob, 2019. A recent trend in individual counting approach using deep network. International Journal of Interactive Multimedia and Artificial Intelligence Khairul Akram Zainol Ariffi n, 2019. Cyber security, soc, information security strategy, defense in depth. *2019 ASEAN Workshop on Information Science and Technology*
- Bedir Yilmaz, Ven Jyn Kok, Mei Kuan Lim, Siti Norul Huda Sheikh Abdullah, 2019. Perspective-aware loss function for crowd density estimation. *International Conference on Machine Vision Applications*
- Rami Sihwail, Khairuddin Omar, Khairul Akram Zainol Ariffi n, 2019. A Survey on Malware Analysis Techniques: Static, Dynamic, Hybrid and Memory Analysis. *International Journal on Advanced Science, Engineering and Information Technology*
- Ven Jyn Kok, Chee Seng Chan, 2018. Granular-based dense crowd density estimation. *Multimedia Tools and Applications*
- Khairul Akram Zainol Ariffi n, Rozita Mohd Mokhtar, Abdul Hadi Abd Rahman, 2018. Performance analysis on LEACH protocol in Wireless Sensor Network (WSN)under black hole attack. *Advanced Science Letters*

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RESEARCH FOCUS

Research Areas	Aims
Data Sanitization	This study aims to develop technique and procedure used to ensure that the deleted data are unable to be accessed by any unauthorized person. The data sanitization procedure contributes for an effective information security approach.
Cloud/ IOT / Cryptocurrency Forensics	This study aims to propose a new model to enhance an existing process of investigating cloud, IOT environments that utilized servers around the world to host customer data. If a cyber-incident happens, legal jurisdiction and the laws that govern the region present unique challenges. The model improves forensics requirements such as confidentiality, integrity, non-repudiation and authentication.
Digital Forensics Frameworks & SOP	This research aims to develop Digital Forensics (DF) framework and standard of procedure in relation to process of collecting, analyzing and reporting about the data that may subsequently become evidence in the criminal justice system. DF framework is the vital key in conducting a successful forensic investigation.
Audio, Image and Video Forensics Analysis Tools	This research aims to conduct multimedia comprising audio, image and video forensics that abides DF procedures using new developed or existing algorithms in forensics tools. The algorithms shall provide reliable computer analysis and digital evidence collection.
Crowd Analytics	This study aims to conduct anomaly analysis for crowd events. The algorithms as well as data driven anomaly methods enhance the detection of abnormal events accurately.
Fake Multimedia Detection and Deep Learning	This study aims to propose a new fake multimedia detection using handcrafted via machine learning methods and auto-crafted via deep learning methods. The new detection algorithm increases the accuracy and predictive performance of fake multimedia detection approach.

SUBJECTS OFFERED

Postgraduate Subjects

- TTD6134 Fundamental of Digital Forensics
- TTD6234 Data Recovery and Analysis
- TTD6334 Digital Media Forensics Analysis
- TC6044 Image Processing and Computer Vision

Undergraduate Subjects

- TTTK4013 System Administration and Networking
- TTTK3033 Operating System
- TTTC2013 Introduction to Artificial Intelligence
- TTTK3813 Media Processing Techniques

CYBER INTELLIGENCE
RESEARCH LAB

ABOUT

Meanwhile Cyber Intelligence focuses on the fundamental and applied research in cyber intelligence informatics, social media analytics, malware analysis and, penetration testing and ethical hacking. It has the capabilities of modelling the human in cybersecurity, social-media-based cyber-situational understanding, and intelligent information gathering and analysis. Cyber Intelligence is also interested to apply Artificial Intelligence, Machine Learning, and Natural Language Processing into new products to make the cyberspace more secure and trusted.

MEMBERS

1. Assoc. Prof. Dr. Masnizah Mohd (Head of Lab)
2. Dr. Wan Fariza Paizi @ Fauzi
3. Ts. Mohd Zamri Murah

SELECTED PUBLICATIONS

- Azianura Hani Shaari, Mohammad Rahim Kamaluddin, Wan Fariza Paizi, Masnizah Mohd, 2019. Online-Dating Romance Scam in Malaysia: An Analysis of Online Conversations between Scammers and Victims. *GEMA Online® Journal of Language Studies*
- Masnizah Mohd, Wan Fariza Paizi @ Fauzi, Kok Ven Jyn, 2019. Kesedaran Keselamatan Siber. *Bangi, Selangor: Penerbit UKM*
- Mohammed AbuHamad, Masnizah Mohd, 2019. Data categorization and model weighting approach for language model adaptation in statistical machine translation. *International Journal of Advanced Computer Science and Applications*
- Ghassan Muslim Hassan, Khairul Azmi Abu Bakar, Mohd Rosmadi Mokhtar, 2019. Merge between cyclic prefi x and training sequence for CFO estimation techniques on OFDM systems. *Journal of Theoretical and Applied Information Technology*
- Wan Noor Hamiza Wan Ali, Masnizah Mohd, Wan Fariza Paizi@Fauzi, 2019. Cyberbullying Detection: An Overview. *Proceedings of the 2018 Cyber Resilience Conference*
- Ahmed Hussain Ali, Loay Edwar George, AA Zaidan, Mohd Rosmadi Mokhtar, 2018. High capacity, transparent and secure audio steganography model based on fractal coding and chaotic map in temporal domain. *Multimedia Tools and Applications*
- Masnizah Mohd, Wan Fariza Paizi@Fauzi, Amri Jasin, 2018. Teknik pengukuhan perangkak tumpuan melalui modul pengesan bahasa bagi capaian web bahasa melayu. *GEMA Online Journal of Language Studies*
- Mohd Zamri Murah, Abdullah Ahmed Ali, 2018. Web assessment of Libyan government e-government services. *International Journal of Advanced Computer Science and Applications*
- Abdullah Ahmed Ali, Mohd Zamri Murah, 2018. Security Assessment of Libyan Government Websites. *Cyber Resilience Conference (CRC) 2018*

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RESEARCH FOCUS

Research Areas	Aims
Cyber Intelligence Informatics	The aim of this research is to find advanced method in intelligence informatics to support the integration of human intelligence with machine intelligence. Huge social media data is useful to enhance situational awareness and decision support in cyber-situational understanding. The advanced methods provide deeper understanding and insights for enhanced decision-making process.
Malware Analysis	The aim of this research is to utilize the use of machine learning algorithms for malware classifications towards automated dynamic malware analysis. The algorithm shall improve malware analysis by enhancing feature selection process to detect and classify the malwares.
Penetration Testing and Ethical Hacking	The aim of this research is to investigate advanced hacking methodologies across multiple browsers, mobile platforms and devices in finding new vulnerabilities. The focus of penetration testing and ethical hacking has now shifted to various hacking attacks to cloud computing platforms. The methodologies should be robust, effective and dynamic against new vulnerabilities.

SUBJECTS OFFERED

Postgraduate Subjects

- TX6244 Ethical Hacking and Penetration Testing
- TTTX6354 Cyber Sentiment Analytics
- TTTX6364 Cyber Threat Intelligence

Undergraduate Subjects

- TTTC2013 Introduction to Artificial Intelligence
- TTTP2043 Fundamental of Text Processing and Analytics
- TTTC2453 Machine Learning
- TTTC3213 Data Engineering
- TTTC2273 Soft Computing

NETWORK & COMMUNICATION TECHNOLOGY
RESEARCH LAB

ABOUT

The Network and Communication Technology (NCT) group is actively engaged in various areas related to Information and Communication Technologies (ICT). We look on the innovative research in computer and communication networks toward Fourth Industrial Revolution (4IR). NCT lab also explores new algorithms, methods, protocols, techniques and applications in Mobile Cellular Communications, Satellite and Space-based communications, Internet of Things (IoT), Internet of Vehicles (IoV), Network Mobility, Smart Grid Computing, Robotics, Embedded Sensors, Radio Frequency Identification (RFID) Applications, Information Centric Network (ICN), and Software Defined Network (SDN). We also focus on theoretical research in the interdisciplinary area between communications, networking, and social science. Currently we absorption research related on 5th Generation (5G) and Big Data too. Each of these areas has its own challenge; research advances are needed to ensure the continued evolution and enhancement of the solution and publish the research outcome in recognized academic publications. Besides that, the result will also be communicated during specific subjects offered by this lab.

MEMBERS

1. Assoc. Prof. Dr. Rosilah Hassan (Head of Lab)
2. Dr. Azana Hafizah Mohd Aman
3. Ts. Dr. Mohammad Kamrul Hasan
4. Dr. Khairul Azmi Abu Bakar

Network & Communication Technology

SELECTED PUBLICATIONS

- Amjed Sid Ahmed, Rosilah Hassan, Nor Eff endy Othman, Nor Idayu Ahmad, Yassir Kenish, 2019. Impacts evaluation of DoS attacks over IPv6 neighbor discovery protocol. *Journal of Computer Science*
- Rosilah Hassan, Khairol Amali Bin Ahmad, Khaleel Ahmad, 2019. Introduction to the special issue on opportunistic network and its security challenges. *Scalable computing: practice and experince*
- Azana Hafi zah Mohd Aman, Rosilah Hassan, Aisha- Hassan A. Hashim, and Huda Adibah Mohd Ramli, 2019. Investigation of internet of things handover process for information centric networking and proxy mobile internet protocol. *Mehran University Research Journal of Engineering & Technology*
- Mohd Zaki Ibrahim, Rosilah Hassan, 2019. The implementation of internet of things using test bed in the UKMnet environment. *Asia-Pacific Journal of Information Technology and Multimedia (APJITM)*
- Mushtaq Mohammed Abdulnabi, Rosilah Hassan, Nor Eff endy Othman, Azizah YaAcob, 2018. A fuzzy-based buffer split algorithm for buff er attack detection in internet of things. *Journal of Theoretical and Applied Information Technology*

SUBJECTS OFFERED

Postgraduate Subjects

- TTTN6384 Computer Network
- TTTN6014 Network Design and Simulation

Undergraduate Subjects

- TTTK2133 Data Communication and Telecommunication
- TTTK2103 Introduction to Computer Networks
- TTTN3513 Network and Computer Security

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RESEARCH FOCUS

Research Areas	Aims
Mobile Cellular Communications	The aim of this research is to find new algorithms and protocols for the Next Generation Mobile specifically for the access technologies, routing, mobility, interference, attenuation, resource allocation that can efficiently establish the communication link with its dimension of quality. Example currently, the 5G mobile cellular communications system is a major shift in the way mobile communications networks operate. New network typologies, access networks and the like were defined and implemented.
Satellite and Space-based communications	The aim of this research is to find new methods, mechanisms of the link budgeting, attenuation, and communication protocols with possible broad applications in defense, naval communication, homeland security as well as the consumer that can connect and communicate efficiently with the standard Quality of Services (QoS). We focuses on QoS parameters in cellular mobile communication such as delay, throughput, bandwidth and security.
Internet of Things (IoT)	This research aims to identify new methods, protocols, topologies and the design concepts for various application of IoT: smart city, Internet of Vehicles (IoV), Internet of Medical Things (IoMT) RFID, and Data Mining. The findings shall enhance the performance of the respective applications with the standard quality. Besides that, the research aims to create algorithms and schemes to present, analyze and process data collected by sensors. The measurement of different sensed data such as pressure, temperature, light, and object detection is one of the potential hypotheses to solve many complex problems by combining them with Big Data using ICN architecture.
Smart Grid Computing	This research aims to find new or enhance methods, protocol, link infrastructure and techniques for smart grid communication. It shall increase efficiency by mitigating the synchronization, reliability, latency and criticality of data delivery, and support for multicast.
Network Design	The aim of this research is to find new or enhance network architecture and infrastructure that fulfill next generation of network requirement. The designs shall improve the architecture or infrastructure requirements according to recent needs. Network design is a category of systems design that deals with data transport mechanisms. As with other systems' design disciplines, network design follows an analysis stage, where requirements are generated, and precedes implementation, where the system (or relevant system component) is constructed.
Network Security	The aim of this research is to find new or enhance methods, protocols or techniques to secure communication medium. The methods shall protect traffic for all layers or specific layer involves in the corresponding network architecture. Our concentration is on a broad term that covers a multitude of technologies, devices and processes. It is more on rules and configurations designed to protect the integrity, confidentiality and accessibility of computer networks and data using both software and hardware technologies.
Intelligence Networking	The aim of this research is to find new or enhance methods, protocol or techniques that embed on artificial intelligence (AI) to improve network performance. The methods shall improve the traffic, data or packet delivery of the corresponding network.
Network Quality of Service (QoS)	The aim of this research is to find new or enhance process flow or framework that enhance the QoS parameters. Achieving the required Quality of Service (QoS) by managing the delay, delay variation (jitter), bandwidth, and packet loss parameters on a network becomes the secret to a successful end-to-end (e2e) answer.
Network Simulation	The aim of this research is to develop new or enhance network algorithm and simulate it using latest network simulator and emulator. The algorithm must be able to accurately resemble the network model and nodes behavior of the corresponding network. We used a software program to models the behavior of a network by calculating the interaction between the different network entities (routers, switches, nodes, access points, links etc.).

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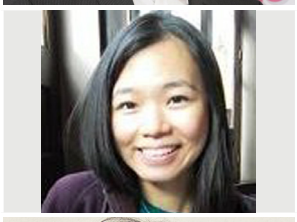

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1-2 November 2018

Cyber Resilience Workshop (CRW2018)
Imperial Hotel, Kuching Sarawak

13-25 November 2018

Cyber Resilience Conference (CRC2018)
Faculty of Information Science and Technology
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