Research Titles for Semester 2 2025/2026 – MCS(AC)

Email Address	Supervisor Name	Research Area	Research Title	Brief Description
firdaussahran@um.edu.my	Firdaus Sahran	Next Generation Networking; Quantum Networking; AI Networking	Quantum Machine Learning for Integrated Networks; Autonomous Networking with XAI and LLMs	Applying QML algorithms for the global optimization of networks; Combining Explainable AI and Large Language Models for automated root cause analysis and self-healing in network architectures
tutut@um.edu.my	Tutut Herawan	Soft computing	(1) Soft set theory for conflict analysis in warfare; (2) Soft set theory for conflict analysis in geopolitics; (3) Soft set theory for conflict analysis in defense and maritime	1. Soft Set Theory for Conflict Analysis in Warfare Molodtsov introduced Soft Set Theory in 1999 as a mathematical framework to model uncertainty without the limitations of probability-based or fuzzy-based systems. In modern warfare, uncertainty is multidimensional—arising from incomplete intelligence, misinformation, rapidly shifting alliances, cyber operations, and autonomous weapon systems. In contemporary conflicts such as the Russia-Ukraine War and the Israel-Hamas War, battlefield decision-making involves ambiguous parameters: Reliability of intelligence sources Troop morale and readiness Civilian displacement patterns Cyberattack attribution

				Drone swarm unpredictability Soft set theory allows analysts to define parameterized decision environments, where each parameter (e.g., logistics strength, air superiority, terrain control) maps to sets of possible outcomes. Unlike rigid binary models (win/lose), soft sets accommodate dynamic overlaps and partial dominance. In modern hybrid warfare—where kinetic, cyber, informational, and economic operations overlap—soft set modeling helps: Evaluate strategic vulnerability under uncertain intelligence Optimize multi-criteria battlefield decisions Model adaptive adversarial behavior Simulate escalation thresholds Thus, soft set theory offers a structured mathematical tool for analyzing warfare scenarios where classical deterministic models fail due to complexity and incomplete information.
tutut@um.edu.my	Tutut Herawan	Soft computing	(1) Soft set theory for conflict analysis in warfare; (2) Soft set	2. Soft Set Theory for Conflict Analysis in Geopolitics

			theory for conflict analysis in geopolitics; (3) Soft set theory for conflict analysis in defense and maritime	Geopolitical conflict today is no longer purely military—it includes sanctions, proxy wars, trade wars, cyber warfare, and energy leverage. Events such as tensions in the South China Sea and competition between United States and China illustrate multi-layered strategic uncertainty. Soft set theory is particularly powerful in geopolitical modeling because: Actors have shifting priorities Alliances are conditional rather than absolute Strategic interests evolve over time For example, a geopolitical soft set model might include parameters such as: Energy dependency Military capability Trade interdependence Public opinion Sanction exposure Technological sovereignty Each country can be represented as a soft set over these parameters, allowing analysts to:

				Identify potential alliance clusters Detect instability regions Evaluate sanction effectiveness Model risk of escalation In current sanction regimes related to the Russia-Ukraine conflict, soft set modeling helps analyze how economic, political, and military pressures interact under uncertain global responses. Unlike game theory that often assumes rational payoff maximization, soft sets better reflect ambiguity, incomplete data, and non-binary strategic preferences.
tutut@um.edu.my	Tutut Herawan	Soft computing	(1) Soft set theory for conflict analysis in warfare; (2) Soft set theory for conflict analysis in geopolitics; (3) Soft set theory for conflict analysis in defense and maritime	3. Soft Set Theory for Conflict Analysis in Defense and Maritime Maritime and defense conflicts are increasingly complex, especially in contested regions such as the Taiwan Strait and the South China Sea. Modern maritime security involves: Naval deterrence Grey-zone operations Coast guard militarization Maritime militia deployment

				Submarine invisibility Supply chain chokepoints In defense and maritime strategy, uncertainty arises from: Radar invisibility and stealth technology Satellite data ambiguity Autonomous naval systems Cyber vulnerabilities in defense networks Soft set theory enables: Threat classification under uncertain intelligence Multi-parameter naval risk assessment Defense resource allocation optimization Strategic deterrence modeling For example, in the context of the South China Sea dispute, a soft set model may include parameters such as: Naval deployment intensity Economic zone claims

				Diplomatic engagement level International arbitration influence Military modernization rate Each claimant state's strategic posture can be represented as a parameterized soft structure, allowing comparative conflict-risk assessment without requiring precise probability values. Concluding Perspective In today's war environment—characterized by hybrid warfare, cyber conflict, autonomous weapons, economic sanctions, and contested maritime spaces—uncertainty is structural rather than accidental. Soft set theory provides: Flexibility beyond probabilistic models Parameter-based strategic comparison Adaptability to evolving conflict conditions Suitability for incomplete and ambiguous data As global conflicts become increasingly multi-domain (land, sea, air, cyber, space), mathematical frameworks like soft set theory offer valuable decision-support mechanisms for policymakers, defense strategists, and

				geopolitical analysts seeking to manage escalation risks in an unstable international system.
nazlita@um.edu.my	Nornazlita Hussin	Augmented Reality (AR)	1. A Machine Learning-Based AR Navigation Framework for Real-Time Obstacle Detection for the Visually Impaired	This research addresses the navigation hazards faced by visually impaired individuals. You will develop a framework that uses machine learning to identify physical objects and overlay them as spatial audio cues in an AR environment, using a quantitative approach to measure navigation efficiency
nazlita@um.edu.my	Nornazlita Hussin	Augmented Reality (AR)	A Mixed Methods Evaluation of a Gamified AR Learning Framework for Improving Spatial Geometry Retention	Students often struggle with 3D visualization in mathematics. This study creates a pedagogical framework that projects 3D geometric proofs into physical space, using a mixed-methods approach to analyze both test scores and student engagement levels. You can analyze if this "hands-on" digital experience helps students visualize math better than 2D sketches through test scores and focus groups. You can suggest switching the context to any topic like Human Anatomy or Chemistry Molecule Bonding.
nazlita@um.edu.my	Nornazlita Hussin	Augmented Reality (AR)	A Quantitative Stimuli-Response Framework for Post-Stroke Cognitive Rehabilitation Using AR-Based Motor Tasks	High-cost clinical rehab is a barrier for many patients. This project proposes a home-based rehabilitation model using AR visual stimuli. You will quantitatively analyze patient motor-skill recovery data to validate the framework's effectiveness. Feel free to suggest any area that you are comfortable with.

nazlita@um.edu.my	Nornazlita Hussin	Augmented Reality (AR)	A Qualitative User-Perception Model for Sustainable Urban Planning Using Context-Aware AR Visualization	Public resistance to urban development often lack of visual clarity. This research develops a framework for visualization of green infrastructure, using qualitative interviews to model how visual transparency affects community acceptance.
nazlita@um.edu.my	Nornazlita Hussin	Virtual Reality (VR)	A Quantitative Model for Disaster Response Training in High-Fidelity VR Simulations	Emergency responders often lack realistic high-stress training. This study develops a framework that simulates life-threatening scenarios in VR, using quantitative biometric data to measure the trainee's stress resilience (or any other data).
nazlita@um.edu.my	Nornazlita Hussin	Virtual Reality (VR)	A Machine Learning-Adaptive VR Framework for Reducing Fear and Building Calmness via Real-Time Heart Monitoring	This is a modern take on "exposure therapy." For someone afraid of heights, you will build a VR environment that starts on a ground-floor balcony. An ML algorithm watches the user's live heart rate; as they become "calm" (less sensitive to the fear), the system automatically moves them to a higher floor. You are building the "intelligence" that ensures the therapy is never too scary but always challenging enough to help them recover. Feel free to change any phobia that interest you.
nazlita@um.edu.my	Nornazlita Hussin	Virtual Reality (VR)	A Mixed Methods Job-Skill Training Model for Neurodivergent Individuals in Sensory-Controlled VR Environments	For people with Autism, a noisy workplace can be overwhelming. You will create a Sensory-Adjustable VR Model where they can practice job tasks (like stocking a shelf) in a quiet, virtual store. As they get better, the framework slowly adds more "distractions" (people walking by, background music). You will measure their "confidence score" and "task accuracy" to see if VR prepares them for real-world employment.

nazlita@um.edu.my	Nornazlita Hussin	Virtual Reality (VR)	A Qualitative Narrative-Immersion Framework for Virtual Heritage Tourism in Reconstructed Historical Sites	Instead of just looking at ruins, a tourist puts on a VR headset and sees a historical building exactly as it looked 500 years ago, complete with virtual citizens walking around. You will develop a Narrative Framework with audio/visual history based on where the user walks and what they look at. This project focuses on User Presence. Using a Qualitative approach, you will conduct deep interviews to model how "Immersive Storytelling" affects a person's emotional connection to history compared to reading a plaque at a museum.
nazlita@um.edu.my	Nornazlita Hussin	Human-Computer Interaction (HCI)	A Mixed Methods Peer-Influence Model for Turning Online "Green" Engagement into Offline Environmental Action	Many people "Like" environmental posts but don't actually recycle. You will develop a Social-Influence Framework that uses proof (showing what your friends are doing) to encourage real-world action. Using Mixed Methods, you will track how online challenges lead to measurable changes in a community's recycling or energy-saving habits. It does not have to focus on recycling. You can change the scope.
nazlita@um.edu.my	Nornazlita Hussin	Human-Computer Interaction (HCI)	A Mixed Methods Instructional Design Framework for Transitioning Social Media Cooking Engagement into Home-Based Culinary Action	The research process focuses on the digital-to-physical behavioral transition of Malaysians who consume short-form cooking video content. You can use the viral videos of influencer Khairul Aming as a primary case study. The core problem addressed is the Passive Engagement Gap, where high digital metrics like likes, saves, and views among Malaysians do not translate into actual home-cooking activities, often due to a lack of structured guidance and the high activation energy required to

				begin. To solve this, you will develop an Instructional Design Framework that re-engineers video content into Micro-Learning Modules supported by social-influence triggers. Using a mixed methods approach, the study will measure the the percentage of Malaysians who actually cook the dish. A combination of quantitative app-tracking data and qualitative thematic analysis can be done. The final method involves testing this framework against traditional video formats to validate a model that effectively turns digital entertainment into a practical life skill.
noraniza@um.edu.my	Nor Aniza Abdullah	Medical Image Enhancement	Low-Dose CT Image RecontructionUsing Diffusion Model	This research focuses on reconstructing high-fidelity images from Low-Dose CT (LDCT) scans using diffusion models, by comparing model performance, identifying the best-performing model, proposing enhancements and implementing them.
misslaiha@um.edu.my	Miss Laiha Mat Kiah	Cyber Security	Blockchain-based access control framework	To investigate and design a blockchain-access control system in a chosen infrastructure/scenario/domain such as supply chain, healthcare or x.
misslaiha@um.edu.my	Miss Laiha Mat Kiah	Cyber security	Secure and lightweight communication for IoT devices	Investigate and develop a secure and lightweight solution for IoT devices in a real world scenario.
rjry@um.edu.my	Raja Jamilah Raja Yusof	Algorithm and LLM	Light Weight Algorithmic Approach in comparison to Large Language Model Approach for detecting textual inconsistencies	An exploratory study comparing traditional algorithmic (lightweight) approaches with large language model (LLM)-based methods for detecting textual inconsistencies. While LLMs may provide flexible semantic comparison capabilities, they often require significantly higher computational resources. Therefore,

				the study will examine whether lightweight algorithmic approaches can achieve sufficient accuracy while maintaining computational efficiency. Lightweight algorithmic approach are such as string matching, Rabin Karp, Automata, edit-distance-based comparison, or other optimized methods.
simying.ong@um.edu.my	ONG SIM YING	Information Security, Image and Signal Processing	Data Embedding using 2D Tree Generation	In this research, we will learn 2D tree generation algorithm, and use the tree properties to embed data while generating the trunks, leaves, etc. You will work together with the PhD student, and learn about image processing, and coding methods (MATLAB or Python) to complete this project. Besides, you will also learn to plan and conduct extensive experiments to measure the performance of the data embedding algorithm, including the tree qualities, data extraction accuracy, robustness, etc.