MUSTAFA A. AZZAWI

Applicant, Ph.D. in Computer Science | Wireless & IoT Systems · Edge AI · Healthcare Security

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RESEARCH INTERESTS

Secure, reliable and energy-efficient connected systems, from individual IoT devices up to the networks and learning pipelines above them: task-oriented (semantic) communication for wearable sensing; post-quantum security for resource-constrained devices; bio-inspired and learning-based routing in wireless body area networks; behavioral drift monitoring for edge-deployed machine learning; privacy-preserving and federated learning, including adversarial robustness and availability attacks; and lightweight authentication for healthcare IoT. Related work in medical image analysis (lesion segmentation).

EDUCATION

Master of Computer Science (Network Technology) 2015 – 2017

Universiti Kebangsaan Malaysia (The National University of Malaysia), Bangi, Malaysia

- **WES GPA 3.63 / 4.00** (UKM cumulative GPA 3.44 / 4.00). Full time, by coursework and research.
- **Thesis:** *Enhanced Lightweight and Robust Authentication Mechanism for Internet of Things (IoT) Environment*. Supervisors: Prof. Rosilah Hassan; Dr. Khairul Azmi Abu Bakar.
- Coursework: HPC Architectures and Technologies (A−), Network Modeling and Simulation (B+), Algorithms and Data Structures (B+), Research Methodology in IT (Pass).
- **Medium of instruction certified as entirely English** by the UKM Centre for Academic Management (ref. UKM.AKA.600-7/2/2).

Bachelor of Science in Computer Science 2010 – 2014

College of Computer Science & Mathematics, University of Tikrit, Tikrit, Iraq

- **WES GPA 3.05 / 4.00**. Ranked **9th of 62** in the graduating class (top 15%).
- Sustained upward trend across four years: yearly averages of 57.5, 59.8, 66.0 and 77.5 per cent, with A grades (WES) in six of seven final-year subjects, including Computer Communication & Networks (85%), Internet (85%), Operating Systems and the final-year research project.

RESEARCH IMPACT

Google Scholar, November 2026: 162 citations (129 since 2021), h-index 4, i10-index 2. The first-authored survey “A Review on Internet of Things (IoT) in Healthcare” has 135 citations from researchers in more than twenty countries.

ACCEPTED CONFERENCE PAPER

1. **Optimizing Monkeypox Lesion Segmentation via Kernel Density Estimation Techniques**. A. A. Abdulhussein, M. A. Azzawi, M. T. Abdulhadi, A. R. Khekan. *ICONS2026 — International Conferences in Computational Science and Engineering for Society*, 16–18 July 2026. **Accepted**; publication in the Springer conference proceedings pending. Contribution: method design, code and experiments.

MANUSCRIPTS UNDER REVIEW

1. **Strategic Dropout Against Secure Aggregation in Federated IoT: Attacks and Defense** (sole author). *IEEE Transactions on Dependable and Secure Computing*, under review. Shows how a silent adversary can stall federated training or erase chosen contributions without breaking the protocol's privacy guarantees and proposes a defense that relies only on participation metadata.
2. **The First-Witness Problem in Federated IoT Intrusion Detection** (second author and corresponding author, with A. A. Abdulhussein, H. M. Al-Juboori and M. F. Nasrudin). *IEEE Internet of Things Journal*, submitted 15 November 2026. Shows that poisoning-robust aggregation suppresses the honest update of the first site to see a new intrusion, proves that the resulting delay is inherent, measures it across eleven defenses on three IoT datasets, and introduces sentinel aggregation, which delivers the warning within one round at a bounded false-alarm cost.
3. **How Many Bytes Does an Arrhythmia Decision Need? Task-Oriented Compression of Wearable ECG** (sole author). *Biomedical Physics & Engineering Express* (IOP Publishing), submitted 12 November 2026. A **3,163-parameter** on-device encoder represents a ten-second window in roughly **four bytes per decision**, against about 256 bytes for a conventional transform coder, with matched-payload controls showing the training objective rather than the architecture drives the gain. Code: github.com/azzawi91/task-oriented-semantic-ecg

4. **How Many Labels Is a Drift Statistic Worth? Label-Budgeted Risk Tracking for Frozen Models on Edge Devices** (corresponding author and software lead, with A. A. Abdulhussein and M. F. Nasrudin). *Evolving Systems* (Springer), submitted 13 November 2026. A constant-memory filter tracks the error of a frozen edge model from a few labels per window, and a closed-form accounting states how many labels a drift statistic is worth. On sixteen real deployments, with two labels per window, the tracker's error is 37% below the raw label mean; its state occupies 816 bytes on a Cortex-M0+ microcontroller. Code: github.com/azzawi91/behavioral-drift-iot

MANUSCRIPTS IN PREPARATION

1. **SemPQ-IoT: Semantic Encoding, Post-Quantum Security and Lyapunov Scheduling for Wearable ECG** (lead author, with H. M. Al-Juboori, R. Hassan, M. F. Nasrudin and A. A. Abdulhussein). Wearable ECG over Bluetooth Low Energy: 8-byte-per-beat semantic encoding, an ML-KEM / ML-DSA handshake verified with ProVerif, and a scheduler that never drops below a minimum-security level. In co-author review; target IEEE IoTJ.
2. **PhysaRoute: Physarum-Inspired Routing for Healthcare Wireless Body Area Networks** (lead author, with A. A. Abdulhussein and R. Hassan). Complete and evaluated; venue selection in progress. Closed-form fixed points, a viability threshold and convergence and tracking bounds, evaluated in a discrete-event simulator (IEEE 802.15.6 CM3 channel, CSMA/CA MAC, nRF52840 energy model) against eight baseline protocols. Highest delivery ratio at every walking speed (99.57% at 1 m/s) at the lowest energy per delivered packet among relaying protocols, over 30 paired seeds with Holm-corrected tests. Code: github.com/azzawi91/PhysaRoute

All projects are released with open, one-command reproducible code at github.com/azzawi91.

PUBLISHED WORK

1. **An Adaptive Privacy Preserving Framework for Distributed Association Rule Mining in Healthcare Databases**. H. K. Kuba, M. A. Azzawi, S. M. Darwish, O. A. Hassen, A. A. Abdulhussein. Computers, Materials & Continua, vol. 74, no. 2, pp. 4119–4133, 2023. doi:10.32604/cmc.2023.033182 (SCIE-indexed).
2. **IoT and Wearable Technology in Patient Monitoring: Business Analytics Applications for Real-Time Health Management** M. Saeed, K. K. Roy, K. Y. Lama, M. A. Azzawi. The American Journal of Engineering and Technology, vol. 7, no. 8, pp. 226–246, 2025.
3. **Leveraging Artificial Intelligence for Strategic Decision-Making in Healthcare Organizations: A Business IT Perspective**. K. K. Roy, M. Saeed, M. B. Rahman, K. Y. Lama, M. A. Azzawi. The American Journal of Engineering and Technology, vol. 7, no. 8, pp. 74–93, 2025.
4. **A Novel Method of Preprocessing and Evaluating the KDD CUP 99 Data Set**. E. S. Abdulmajed, R. C. Muniyandi, M. A. Azzawi. Journal of Advanced Research in Dynamical and Control Systems, vol. 9, no. 10, 2017.
5. **Reliable and Secure Traffic Exchange Approach for Internet of Things (IoT) Devices**. M. A. Azzawi, R. Hassan, K. A. Abu Bakar. Proc. 3rd International Congress of Technology, Management and Social Sciences (ICTMS-17); Research Cell: An International Journal of Engineering Sciences, vol. 23, 2017.
6. **A Review on Internet of Things (IoT) in Healthcare**. M. A. Azzawi, R. Hassan, K. A. Abu Bakar. International Journal of Applied Engineering Research, vol. 11, no. 20, pp. 10216–10221, 2016. **(135 citations)**

THESIS

M. A. Azzawi. Enhanced Lightweight and Robust Authentication Mechanism for Internet of Things (IoT) Environment. Master's thesis, Universiti Kebangsaan Malaysia, 2017.

RESEARCH EXPERIENCE

Independent Researcher 2023 – Present

New York, NY — with advisors and collaborators at Universiti Kebangsaan Malaysia and South East Technological University, Ireland

- Sole, lead or corresponding author on six manuscripts spanning semantic communication for wearable biosignals, post-quantum security for constrained devices, bio-inspired WBAN routing, drift monitoring for edge models, and the security of federated learning in IoT (availability attacks on secure aggregation; intrusion detection under poisoning defences).
- Build end-to-end evaluation pipelines: discrete-event network simulators, inter-patient ECG benchmarks on MIT-BIH and the full PTB-XL set of 21,378 records, and statistical testing with bootstrap confidence intervals, Wilcoxon tests, Holm correction and Newey–West HAC standard errors.
- Release every project as open, one-command reproducible code; revise and rebuild pipelines in response to reviewer criticism, removing unsupported claims and reporting trade-offs explicitly.
- Co-developed a kernel-density-estimation method for monkeypox lesion segmentation (method design, code and experiments), accepted at ICONS2026.

- Authored two research proposals: fog computing with federated learning for healthcare IoT, and regularization-by-denoising X-ray super-resolution for breast-cancer imaging.

Graduate Researcher, Teaching Assistant and Research Associate 2015 – 2018
Faculty of Information Science & Technology, Universiti Kebangsaan Malaysia, Bangi

- Designed a lightweight, robust authentication mechanism for resource-constrained IoT devices (master's thesis) and a secure traffic-exchange approach presented at ICTMS-17.
- Wrote the IoT-in-healthcare survey that became the author's most-cited work; co-authored an intrusion-detection study on preprocessing and evaluating the KDD CUP 99 dataset.
- Supported undergraduate instruction as a teaching assistant, then continued as a research associate extending thesis results into publications.

PROFESSIONAL EXPERIENCE

Quality Engineering Lead — Salla (e-commerce platform) Apr 2023 – May 2026
Remote

- Led testing strategy across the software development life cycle, analyzed quality metrics to inform release decisions, and ran training and mentoring on testing practice.

Accenture — Google Trust & Safety Projects Sep 2017 – Apr 2023
Quality & Training Program Team Lead (2022–2023); Senior Quality Assurance Specialist / Shift Lead (2017–2022), Malaysia

- Produced and audited the labelled policy decisions used to train and evaluate Google's machine-learning content classifiers — the work that led directly to a research interest in how deployed models degrade.
- Led a quality team designing test data and procedures from product specifications in an Agile Scrum environment; built KPI dashboards; trained and onboarded analysts.

ACADEMIC SERVICE

Journal peer reviewer — four verified reviews, 2023–2025, recorded in ORCID via the Web of Science Researcher Profile:

- Qeios (ISSN 2632-3834) — two reviews, 2023 and 2024
- European Journal of Computer Sciences and Informatics (ISSN 3041-4849) — 2025
- Journal of Engineering Research and Reviews (ISSN 3041-4822) — 2025

HONOURS AND AWARDS

- Champion of H2 FY2022 (Q3 & Q4), Google products, Accenture, 2022 · Leadership Award, Trust & Safety vendor program, Accenture
- Champion of the Quarter, December 2018 – February 2019 · Key Player Award for quality of Google products, 2018 · Hang Tuah End-of-Year Award (subject-matter expert)
- Certificate of completion, Malay language programme, Universiti Kebangsaan Malaysia

CERTIFICATIONS AND TRAINING

- Advanced Research Methodology (quantitative, qualitative and mixed-methods design) · Accenture Certification for Quality Associates (ACQuA), 2021 · Certified Quality Auditor, Accenture, 2019
- Accenture technology courses: Artificial Intelligence; Security; 5G & Edge Computing; Cloud Computing; Data; Quantum Computing; Blockchain; Automation; Agile & DevOps; Enterprise Platforms; XR & Metaverse; Sustainability & Technology

TECHNICAL SKILLS

- **Languages & machine learning:** Python (PyTorch, scikit-learn, NumPy, SciPy, pandas), SQL, LaTeX
- **Methods:** Deep learning for biosignals, federated and edge learning, drift detection, statistical testing (bootstrap CIs, Wilcoxon, Holm correction, Newey–West HAC)
- **Networking & security:** IEEE 802.15.6 / BLE / 802.15.4, discrete-event network simulation, WBAN routing, IoT authentication, post-quantum cryptography (ML-KEM, ML-DSA), authenticated encryption, secure aggregation
- **Data & tools:** WFDB, MIT-BIH, PTB-XL, WESAD, Git, Tableau, Power BI, JIRA

LANGUAGES

Arabic (native) · English (full professional proficiency) · Malay (elementary)