ABU HUZAIFAH BIDIN

Graduate Researcher | Industrial AI Specialist

Email: maercaestro@gmail.com
Mobile: +60 17-675 7773
Portfolio: ahead-huzaifah.com
Location: Melaka, Malaysia

RESEARCH INTERESTS

Primary Focus: Continuous-Time Deep Learning, Causal Representation Learning, and Verifiable Physics-Constrained Control.
Keywords: Liquid Neural Networks (LNNs), Neural ODEs, Energy-Based Models (EBMs), Inherent Causality in AI, Safety-Critical Industrial Automation.

EDUCATION

Universiti Teknologi PETRONAS **Perak, Malaysia**

M.Sc. in Information Technology (Research Mode) *Ongoing*

- **Thesis:** "Energy-Based Liquid Neural Network: Utilizing Inherent Causality of Liquid Neural Network for Physics-Constrained Multi-Objective Environment"
- **Research Focus:** Investigating the inherent causality of Liquid Neural Networks (LNNs) via Energy-Based Models (EBMs). Developing physics-constrained, verifiable controllers for safety-critical multi-objective industrial environments.
- **Achievement:** Invited to submit manuscript to a Q1 Journal within 6 months of enrollment.

B.Eng. in Chemical Engineering *2012*

- Specialization in Process Control and System Dynamics.

PUBLICATIONS & PRESENTATIONS

[1] N. Abdullah, **A. Bidin**, M. B. Omar, H. Zaid, R. Ibrahim, and K. Bingi, "Lube Based Oil Unit Anomaly Limit Prediction using Decision Tree Classification Model," in *2024 IEEE International Conference on Automatic Control and Intelligent Systems (I2CACIS)*, June 2024, pp. 107-111. DOI: 10.1109/I2CACIS61270.2024.10649879

[2] **A. H. Bidin** and N. A. Osman, "AI-Enhanced Excess Oxygen Control in Industrial Furnaces via Liquid Neural Networks and Physics-Based Thermodynamic Modelling," in *Proceedings of ICON-AI 2025* (Paper ID 49).

[3] **A. H. Bidin**, *AI untuk Pemula* (Educational Book), Self-Published, 2025.

[4] **A. H. Bidin**, "Exploring Liquid Neural Network Approach for Furnace Excess O2 Control," *Runner-up, UTP Research Poster Competition 2025.*

[5] **A. H. Bidin**, *Azrahel si Penjejak Kubur* (Science Fiction Novel), Published 2019.

RESEARCH EXPERIENCE

Industrial Research Projects (PETRONAS)

Lead Researcher: Furnace Commander (Feasibility Study) *2024 - 2025*

- Conducted **computational feasibility studies** for replacing traditional PID loops with Liquid Neural Networks (LNNs).
- **In-Silico Validation:** Simulated model performance against stochastic sensor noise in millisecond timeframes, demonstrating theoretical stability superior to standard RNN/LSTMs.

- **Methodology:** Utilized differential equation solvers (Torchdiffeq) to model continuous-time hidden states and validate the architecture against thermodynamic constraints.

Deployed Machine Learning Projects (Plant Operations)

Base Oil Unit Thermal Predictor

- **Problem:** Reactor temperature lag caused quality give-away in Base Oil production.
- **Solution:** Developed an **XGBoost** regression model to predict future temperature states based on feed characteristics.
- **Impact:** Enabled proactive operator adjustments rather than reactive corrections.

Hydrotreater Energy Optimization Model

- **Solution:** Built a multivariate Linear Regression model to optimize Steam-to-Oil ratios in the Product Stripper.
- **Impact:** Reduced steam consumption by identifying the precise thermodynamic minimum required for product spec compliance.

Citizen Analytics: Sensor Anomaly Detection

- **Tech Stack:** Python (Keras/TensorFlow), LSTM Autoencoders.
- **Outcome:** Successfully trained an unsupervised model to reconstruct normal sensor patterns and flag deviations (reconstruction error) as potential plant anomaly/deviation. **(Top 10 Finalist in Citizen Analytics Hackathon)**.

Architect: MEGAT Neuro-symbolic Assistant *2022 - 2023*

- Designed a **Retrieval-Augmented Generation (RAG)** system bridging unstructured engineering manuals with structured SCADA data.
- **Recognition:** Awarded **2nd Place** at PETRONAS RMT Innovation Week and **2nd Place** at the Citizen Analytics x Microsoft Ideathon.
- Solved the "Hallucination" problem in industrial LLMs by enforcing a vector-search constraint against verified operational databases.

PROFESSIONAL EXPERIENCE

PETRONAS (Petroliam Nasional Berhad) **13+ Years**

Senior Supply & Optimization Engineer *2024 - Present*

- Applying **Linear Programming (Spiral Plan)** to model complex refinery networks. This work provides the "Ground Truth" data for validating AI optimization models.

Senior Process Engineer (Resident) *2023 - 2024*

- Led Design Feasibility Studies at Chevron Lummus Global (USA). Validated thermodynamic simulations for Hydroprocessing units, ensuring rigorous physical compliance for future AI integration.

Process Governance Executive *2016 - 2019*

- **Gold Award Winner (ICQCC Tokyo):** Led the digitalization of safety protocols, establishing the data governance framework required for modern AI safety layers.

TEACHING, OUTREACH & MEDIA

Academic Lectures & Training

- **Invited Trainer (MBA Program):** Selected to conduct the "AI & Automation Management Professional Certificate" for MBA students (2025).
- **Guest Speaker (UTP IChemE):** Invited by the Institute of Chemical Engineers (UTP Chapter) to lecture on the intersection of Chemical Engineering and Industrial AI.
- **Guest Lecturer (University of Malaya):** Invited by the Academy of Islamic Studies Student Association (PMAPI) to discuss the ethical implications and societal impact of Artificial Intelligence.

Public Engagement & Media

- **Featured Expert (RTM TV1):** Interviewed on Malaysia's national broadcaster to discuss advancements in AI technology and its industrial applications.
- **Speaker/Exhibitor (AI-Gen Fest 2025):** Showcased AI research innovations at the Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA) AI Festival.
- **1st Place Winner:** PETRONAS Innovation Garage Hackathon (2025) - "Aliran Tunai" (Vision LLM Application)

TECHNICAL PROFICIENCY

Research Tools	Python (PyTorch, SciPy, NumPy), LaTeX, Overleaf, MATLAB, Aspen HYSYS (Simulation Data Generation).
Architectures	Physics-Informed Neural Networks (PINNs), Liquid Neural Networks (LNNs), Transformers, LSTM.
Data & Cloud	SQL, Vector Databases (Embeddings), Docker, Azure ML, Git/GitHub.