M. ZAKI RAMDHAN

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SUMMARY

Mechanical Engineering undergraduate (GPA 3.87/4.00) specializing in process safety and reliability engineering for oil & gas systems, with demonstrated capability to build and deploy production-grade AI and data tools that solve real industrial problems. Hands-on experience in FMEA and consequence modelling (ALOHA) from internship at PT Pertamina Drilling Services Indonesia. Developed ML surrogate models achieving R^2 = 99.75% for real-time hazard zone prediction — extended into deployed applications: an AI-powered HSSE document analysis platform, an industrial predictive maintenance dashboard, and an AI automation system for field inspection reporting. Published researcher in Human Reliability Assessment (HEART & SLIM), second manuscript on energy systems risk under review.

EDUCATION

Universitas Pertamina — Bachelor of Mechanical Engineering *2022 – Present*

South Jakarta, Indonesia

- GPA: 3.87 / 4.00 | 139 SKS | Semester 8 | Recipient of SUN UP Scholarship
- Relevant Coursework: Fluid Mechanics, Thermodynamics, Turbomachinery, Probability & Statistics, Health Safety & Environment (K3), Maintenance Management

SELECTED PUBLICATIONS & RESEARCH

Comparative Analysis of HEART vs SLIM in Assessing Human Error Probability *Published 2025*

Project Leader | Motivtech Journal | doi.org/10.46574/motivection.v7i1.431 | Vol 7 No 1

- Computed Human Error Probability (HEP) for MCAS Boeing 737 Max operations using HEART (HEP = 0.164, Error Mode 5) and SLIM (HEP = 0.0049); demonstrated that a hybrid HRA approach yields more accurate risk mitigation strategies in complex safety-critical systems.

Promoting Evidence-Based Energy Transition: Statistical Analysis for Sustainability Policies in Indonesia *Accepted 2026*

Project Leader | SUSTINERE Journal | Submitted January 2026

- Applied ARIMA forecasting, Multiple Linear Regression, and Monte Carlo simulation (10,000 iterations) to evaluate feasibility of Indonesia's renewable energy targets. P(RE ≥ 23% by 2025) = 65.21%; P(RE ≥ 78% by 2060) = 0.00%.

PROJECTS

Hazard Zone Prediction for n-Hexane Tank Overfill Using ML Surrogate Models *2025 – Present*

Undergraduate Thesis | Universitas Pertamina

- Replaced computationally intensive ALOHA simulations with MLR and ANN surrogate models in Python for real-time LEL-based hazard zone radius prediction (Red/Orange/Yellow zones) from atmospheric dispersion scenarios.
- Generated 1,215 scenarios via full factorial design across 6 parameters: atmospheric stability class (Pasquill A–F), wind speed, air temperature, spill rate, effective spill duration, liquid thickness.
- ANN achieved R^2 = 99.75% (avg. across 3 zones) on test set — 12× lower MAE than MLR baseline for Red Zone (1.82 m vs 22.25 m). OOD robustness analysis identified critical boundary conditions for real-world QRA applications.
- Deployed interactive BI dashboard (Plotly Cloud): huggingface.co/spaces/MelioniDas31

AI-Powered HSSE Document Analysis Platform — Analisis.Aja *2025 – Present*

Independent Development | Next.js 15 + TypeScript + Claude API + Gemini

- Built a full-stack SaaS web application that converts raw HSSE/K3 documents (PDF, DOCX, Excel) into structured professional analysis reports via a 3-stage AI pipeline: document parsing (Marker), evidence extraction (Gemini Flash), report generation (Claude Sonnet).
- Implemented 5 Why Root Cause Analysis, Fishbone/Ishikawa Diagram (6M/HSSE/Office presets), and Generic RCA Report frameworks — with strict evidence-based traceability (no hallucination policy), targeting HSSE/K3 professionals in Indonesian O&G and industrial sectors.

Industrial Predictive Maintenance Dashboard *2025*

Independent Development | FastAPI + React + scikit-learn + XGBoost

- Developed a full-stack predictive maintenance system processing 876K+ sensor data points from 100 industrial machines over one year, implementing three ML models: XGBoost failure prediction, Isolation Forest anomaly detection, and RUL (Remaining Useful Life) estimation.
- Dashboard delivers composite machine health scores, cost-benefit analysis of proactive vs reactive maintenance strategies, and per-machine trend visualization — directly actionable for maintenance planning decisions.

AI-Automated Field Inspection Reporting — Pertamina MWT Context *2025*

Independent Development | Telegram Bot + Gemini 2.5 Flash + Whisper + Netlify Functions

- Built a serverless Telegram bot automating Management Walkthrough (MWT) inspection report digitization for oil & gas field operations — eliminating manual transcription for field operators.
- Accepts unstructured inputs (free text, photos, voice notes), transcribes audio via Whisper AI, extracts structured data using Gemini 2.5 Flash, and auto-populates Google Sheets with evidence uploaded to Google Drive.

HERO Helmets: Bio-Composite Safety Helmet Innovation *2025*

Team Leader | Funded by Kemdikbudristek (PKM-KC Scheme)

- Developed industrial safety helmet prototype from water hyacinth fiber biocomposites via vacuum infusion; optimized fiber-to-matrix ratio and verified compliance with SNI/ASTM standards through Impact Resistance and Tensile Strength testing.

Feasibility Study: Perovskite Halide as Fluorescent Taggant in Oil & Gas *2025*

Researcher | HAKI Granted — Surat Pencatatan Ciptaan No. 001135780, Kemenkumham RI

- Authored a feasibility study on Halide Perovskite as fluorescent chemical tracer for pipeline leak detection and flow tracing in O&G. Descriptive market analysis across 4 global sectors (2018–2033); Healthcare showed highest growth (~3.5× by 2033).

CNC Machine Failure Mode Classification — ML Capstone *Feb – Mar 2026*

Ruangguru Engineering Academy × Skill Academy | Certificate of Excellence · Score 95 / Grade A

- Built end-to-end ML pipeline on AI4I 2020 dataset (10,000 CNC records, 5 failure classes). Evaluated 4 algorithms (Decision Tree, Random Forest, XGBoost, ANN); XGBoost achieved best macro F1 on test set. Deployed Streamlit dashboard on HuggingFace Spaces.

PROFESSIONAL & ACADEMIC EXPERIENCE

PT Pertamina Drilling Services Indonesia (PDSI) *Aug – Sep 2025*

Mechanical Engineering Intern — Workshop & Maintenance Division

- Conducted Risk Assessment on the Blowout Preventer (BOP) system using FMEA methodology; calculated Risk Priority Number (RPN) for critical failure modes.
- Analyzed maintenance records and performed Non-Destructive Testing with hands-on exposure to drilling equipment workshop operations.

Laboratory Teaching Assistant — Universitas Pertamina *2023 – Present*

- Fluid Mechanics Lab (2025): instructed students on fluid flow characteristics, head loss in piping systems, and pump performance testing; enforced safety protocols during hydraulic experiments.
- Mechanics of Materials Lab (2023–2024): guided destructive testing procedures (Tensile, Torsion, Impact) using Universal Testing Machines (UTM) to analyze material properties.
- Basic Physics Lab (2023–Present): mentored 30+ students per semester; graded weekly technical reports with focus on data accuracy and methodology.

Calculus Teaching Assistant — Universitas Pertamina *2023 – 2024*

- Prepared teaching materials and practice problems; conducted tutorial sessions; evaluated student assignments and examination performance.

ORGANIZATIONAL EXPERIENCE

Himpunan Teknik Mesin (Mechanical Engineering Student Association) *2024 – 2025*

Head of Student Department

- Supervised and managed programs within the student affairs division: mentoring, public outreach, and entrepreneurship development. Coordinated multi-stakeholder program implementation and continuity.

ACHIEVEMENTS

- National Science Olympiad (OSN) 2024 — Gold Medal, Physics (Individual, Tier 1) | Yayasan Prestasi Maju (PRESMANESIA)
- National Science Week Olympiad 2023 — Silver Medal, Physics | Yayasan Berlian Hati Mulia
- National Science Week Olympiad 2023 — Bronze Medal, Mathematics | Yayasan Berlian Hati Mulia
- ON-MIPA 2023 — National Delegation, Universitas Pertamina, Physics | Kemdikbud

SKILLS

Safety & Risk	FMEA/RPN · HEART · SLIM · QRA · Consequence Modeling · ALOHA (CAMEO)
ML & AI	Python (scikit-learn, TensorFlow/Keras, XGBoost, pandas, numpy) · ARIMA · Monte Carlo
App Development (Vibe Code)	Next.js · FastAPI · Flask · React · Telegram Bot API · Netlify Functions
Data & Visualization	Plotly · Looker Studio · Matplotlib · Excel · Google Sheets API
Engineering Software	SolidWorks · AutoCAD · ANSYS · Carrier HAP · ALOHA (CAMEO)
Workflow & Integration	n8n · Supabase · Replicate API · Google Drive API

CERTIFICATIONS

- BNSP Data Analyst — Badan Nasional Sertifikasi Profesi via DQLab × UMN × Xeratic, Batch 22 (2026)
- AI Engineering Bootcamp — Ruangguru Engineering Academy × Skill Academy, Certificate of Excellence, Score 95 (2026)
- Persiapan Sertifikasi ML & AI — DQLab (2026)
- Persiapan Sertifikasi Excel — DQLab (2026)