RIKI MUHAMMAD

R&D Electrical & Instrumentation Engineer • Deep-Tech & Full-Stack AI/SaaS Architect

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PROFESSIONAL SUMMARY

Currently working full-time as an **R&D Electrical & Instrumentation Engineer** at **Institut Teknologi Bandung (ITB)**, focusing on the research and development of a portable **Surface Plasmon Resonance (SPR) medical diagnostic prototype for Tuberculosis (TB) detection**. Alongside my research at ITB, I am the Founder & Architect of **RIKODE.COM** — an Indonesian technology studio building innovative digital ecosystems such as **SENTIX** (Multi-Agent AI Stock Analytics), **diundang.me** (Premium Digital Wedding Invitation SaaS), and **AJAR** (AI Edu-Platform). Bridging physics and digital intelligence. As a Physics graduate from Institut Teknologi Sumatera, I specialize in designing precision instruments, optoelectronics, and microfluidic control. My core passion lies in integrating hardware (IoT/Sensors/3D Printing) with *Machine Learning* algorithms to solve real-world experimental challenges, strengthened by an extensive research track record at **BRIN** and **UGM**.

PROFESSIONAL & RESEARCH EXPERIENCE

Institut Teknologi Bandung (ITB) **August 2025 – Present**

Instrumentation / Electrical R&D Engineer (Full-Time) *Bandung, West Java, Indonesia*

- **Medical Prototype Prototyping::** Designing and constructing functional SPR portable diagnostic medical prototypes translated from advanced laboratory research into deployable devices.
- **Analytical Software Engineering::** Developing custom software applications and signal processing algorithms for real-time measurement analysis and diagnostic reporting.
- **Performance Testing & Standardization::** Conducting rigorous calibration, performance evaluation, and accompanying the formal device standardization testing process.
- **System Maintenance::** Performing proactive electrical and opto-electronic diagnostics and maintenance on deployed prototype products.

National Research and Innovation Agency (BRIN) **February 2024 – July 2024**

Scientific Researcher Intern (Internship) *Bandung, West Java, Indonesia*

- **Dual Syringe Pump Prototyping::** Conducted applied research and fabricated a complete dual syringe pump system engineered for sub-microliter fluid flow control in microfluidic applications.
- **Control Interface Development::** Designed and programmed a responsive software interface application to operate, calibrate, and monitor fluid dynamics across the pump system.
- **Microfluidic Chip Design & Fabrication::** Created and iteratively refined 3 distinct microfluidic channel architectures tailored for *Lab-on-a-Chip* experimentation, fabricating high-fidelity prototypes via SLA/FDM 3D printing.

Sumatera Institute of Technology (ITERA) **September 2022 – May 2025**

Laboratory & Teaching Assistant (Teaching Assistant) *South Lampung, Lampung, Indonesia*

- **Practicum Mentorship::** Guided weekly fundamental physics practicums, explaining theoretical instrumentation principles and precision data collection techniques.
- **Academic Assessment::** Rigorously evaluated practicum reports, error propagation analyses, and experimental methodologies.

Universitas Gadjah Mada (UGM) **June 2023 – August 2023**

Research Intern (Research Internship) *Yogyakarta, Indonesia*

- **Experimental Data Analytics::** Mastered quantitative data processing methodologies to analyze thermal response profiles and magnetic susceptibility of synthesized nanoparticles.
- **Collaborative Research::** Engaged in interdisciplinary scientific discourse with leading physicists and researchers across diverse experimental domains.

SELECTED ENGINEERING PROJECTS & TECH VENTURES

RIKODE.COM — Flagship Technology & Digital Studio **2026**

- Founder & Chief Architect • Indonesian tech studio building SENTIX AI, diundang.me SaaS, & AJAR Edu-Platform.

Rapid 3D Microfluidic Lab-on-a-Chip Design & Prototyping **2024**

- Precision CAD modeling of Lab-on-a-Chip microchannels for low-cost diagnostic testing & interactive STL Viewer.
- **Micro-Scale Channel Dimensions::** Channel widths ranging from 200–500 µm calibrated for optimal passive fluid mixing and droplet generation.
- **Optical Transparency::** Fabricated using stereolithography (SLA) clear resin to facilitate real-time colorimetric sensing and microscopic optical inspection.

IoT & Machine Learning Multispectral Honey Classifier **2024**

- Optical multispectral classification system engineered with Python machine learning algorithms for honey verification.
- **Optical Data Acquisition::** Multispectral sensors capture detailed spectral reflectance responses across UV, visible, and near-infrared (NIR) wavelengths.
- **Data Processing Pipeline::** Automated feature extraction, spectral baseline normalization, and noise filtering handled via **Pandas** and **NumPy**.

Dual Syringe Pump Control Interface & Linear Regression Calibration **2024**

- High-precision dual microliter syringe pump engineered with Python linear regression calibration models.
- **Precision Actuation::** High-torque stepper motors coupled with lead screws providing sub-micron linear positioning resolution.
- **Embedded Controller::** Arduino/ESP32 firmware converting targeted volumetric flow rates into precise micro-stepping pulse frequencies.

PEER-REVIEWED SCIENTIFIC PUBLICATIONS

• **Muhammad, R.**, Isroni, Wisesa, T. P., & Syahputra, T. S.. "**Development of a Portable Low-Cost Multispectral Sensor Integrated with IoT and Machine Learning for Classifying Honey Types**." *Journal of Energy, Material, and Instrumentation Technology (JEMIT)*, Vol. 6, No. 3, pp. 143–153 (2025). DOI: https://doi.org/10.23960/jemit.343] (https://doi.org/10.23960/jemit.343

• Hertanto, T. L. O., Kurniawan, E. D., Oktaviana, A. T., Jessiena, C. C., Toba, J. P., & **Muhammad, R.**. "**Rapid and Low-Cost Microfluidic Devices Fabricated Using a 3D Printer**." *2024 International Conference on Radar, Antenna, Microwave, Electronics, and Telecommunications (ICRAMET)*, 27 December 2024 • Pages: 216–221. DOI: https://doi.org/10.1109/ICRAMET62801.2024.10809304](https://doi.org/10.1109/ICRAMET62801.2024.10809304

EDUCATION

Sumatera Institute of Technology (ITERA) **September 2021 – June 2025**

Bachelor of Science in Physics — Specializing in Physics Instrumentation, Electronics & Microfluidics. *South Lampung, Lampung, Indonesia*

- **Instrumentation & Real-Time Data Acquisition::** Designing fluid control circuitry, calibrating multispectral sensors, and integrating microcontrollers (ESP32/Arduino) for high-accuracy physical parameter monitoring.
- **Microfluidics Design & Rapid Prototyping::** Advanced thesis research on *Lab-on-a-Chip* (LoC) systems and high-precision dual syringe pump development using CAD modeling and high-resolution 3D printing (SLA/FDM).
- **Computational Physics & Applied ML::** Utilizing mathematical modeling and Machine Learning algorithms (*Support Vector Machine, Random Forest, Artificial Neural Network*) with Python to process, analyze, and optimize laboratory experimental data.

TECHNICAL COMPETENCIES & INSTRUMENTATION

INSTRUMENTATION & MICROFLUIDICS	Surface Plasmon Resonance (SPR) • Lab-on-a-Chip Microchannel Design • Precision Dual Syringe Pump Systems • Optical Sensors & Photodiodes • Stepper Motor Control & PWM Processing
CAD DESIGN & 3D FABRICATION	Autodesk Fusion 360 & FreeCAD • Formlabs SLA & Anycubic FDM • CHITUBOX & Cura Slicing Optimization • Rapid Prototyping & Enclosure Design • Microfluidic Chip Fabrication
EMBEDDED SYSTEMS & IOT	Microcontrollers (ESP32, Arduino Uno/Nano) • IoT Protocols (MQTT, Wi-Fi, HTTP, BLE) • ADC Signal Conditioning & Calibration • Circuit Prototyping & Electronics
PYTHON, AI & DATA SCIENCE	Python (NumPy, Pandas, Scikit-Learn) • TensorFlow & PyTorch Machine Learning • Linear Regression & Flow Calibration Modeling • Multi-Agent AI Architecture (SENTIX) • Scientific Data Visualization (Matplotlib)

WEB SAAS & CLOUD ECOSYSTEM	Full-Stack Web & SaaS Architecture • Next.js, Node.js & Vercel Deployment • Cloudflare DNS, CDN & Workers • Hugo SSG & Tailwind CSS Styling • Git / GitHub Version Control
R&D & SCIENTIFIC METHODOLOGY	Prototype Performance Testing & Standards • Scientific Writing (IEEE, LaTeX, Peer-Review) • Statistical Data Analysis & Validation • R&D Project Architecture