Philip Modayil

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Summary

AI Engineer with 3+ years of experience developing and deploying AI/ML solutions to automate engineering workflows, improve predictive maintenance, and enhance quality control in the electrical and electronics industry. Skilled in applying machine learning, computer vision, and data analytics to accelerate PCB design reviews and enable early detection of networked water pump faults. Collaborated cross-functionally with R&D and engineering teams to drive innovation, efficiency, and data-driven decision-making.

Education

Technische Universität Dortmund — Germany

M.Sc. Automation and Robotics (GPA: 1.9)

Kerala Technological University — India

B.Tech. in Electrical and Electronics Engineering (GPA: 8.54/ 1.8)

Experience

DT/IPL, Technische Universität Dortmund — Dortmund, Germany

AI Engineer - Research & Development, Electronic Design — Oct 2024 – Present

Project: Transmission Line Modeling on Printed Circuit Boards (PCBs)

- Developed an explainable AI model to predict PCB transmission line behavior using a physics-informed machine learning approach.
- Employed Reinforcement Learning and Genetic Algorithm to reduce model training time by ~10x compared to traditional approaches.
- Re-engineered the genetic algorithm in C++, enabling design teams to explore multiple design options up to 90% faster.

Project: AI Assistant for Electronic Designers

- Built an AI assistant that reads and evaluates PCB design files, circuit images, and simulation outputs to support designers during prototype reviews, cutting their manual review time on prototypes by 25%.
- Fine-tuned a large language model to PCB design tasks so it can answer design review questions, check against regulatory rules, and highlight areas of improvement, increasing answer accuracy on internal benchmarks by 60%.
- Automated 40% of routine layout checks (rule violations, obvious visual issues) enabling senior engineers to spend less time on simple signal-integrity topics.

Project: Explainable AI for sleep apnea prediction

- Led a team to develop a clear, trustworthy AI model that predicts sleep apnea episodes from patient sensor data, boosting prediction reliability and transparency by 20% for better doctor trust and patient safety.
- Applied straightforward signal processing steps to clean and highlight key patterns in sensor readings, making the AI's decisions easier to understand and verify during medical reviews.
- Added human-guided reinforcement learning (RLHF) to refine the model based on expert feedback, ensuring more accurate apnea predictions that healthcare teams can rely on for timely interventions.

Wilo SE — Dortmund, Germany

Data Scientist (Part Time) — May 2022 – Sep 2024

Project: Smart Water Pump Monitoring & Maintenance

- Built and deployed live monitoring for sensor data from more than 100 pumps so that maintenance teams can see abnormal behavior early, while cutting signal processing time by 29%.

- Created a predictive maintenance model that warns about potential pump faults in advance, improving early fault detection by up to 25% and helping avoid unplanned downtime.
- Improved the reliability of the full data chain (from sensor to dashboard) by 10%, making maintenance planning more data-driven and reducing manual checks.

Project: Automated Data Curation

- Created scripts that pull data from SIM card services and display live dashboards, so teams can track smart sensor uptime and fix issues before they cause downtime.
- Set up automation using Power Automate to run pumps and oscilloscopes hands-free during experiments, collecting reliable data faster without manual intervention.

Publications

- "AI-based Hybrid Approach (RL/GA) for Calculating the Characteristic Parameters of a Single Surface Microstrip Transmission Line", DOI: 10.1109/APEMC62958.2025.11051725
- "Chip2System - LLM-gestütztes Co-Design", edaWorkshop25.

Skills & Languages

- **Programming**: Python, C, C++, GO
- **Machine Learning**: PyTorch, Scikit-Learn, HuggingFace transformers, stable-baselines3
- **Computer Vision & NLP**: OpenCV, LLM, RAG, FAISS, ollama, llama.cpp
- **High Performance**: Eigen3, CUDA, JAX
- **Data Science**: Numpy, Pandas, PySpark, Plotly, Matplotlib, SQL, Streamlit
- **Cloud**: Azure Databricks
- **Tools**: Matlab, ROS2, Git, Docker
- **Creative**: DaVinci resolve, Canva
- **Languages**: English (C2), German (A2), Hindi(A2), Malayalam (Native)

Projects

- **Police Report Insight (Young AI Leaders Dortmund)**: Built a system that reads police documents with an AI model and turns them into clear dashboards, helping non-technical staff quickly spot trends and risks.
- **ragyphi (Personal)**: Created a library that lets users ask questions over their documents (text, tables, images) and get direct answers instead of manually searching through files.
- **Hazard Inspection (BMW Inno Challenge 2024)**: Developed software that scans drone images for safety risks on industrial sites using vision transformers, so safety teams can focus on the most critical areas first.
- **Online Job Scheduling (Semester Project)**: Trained an AI model that learns how to schedule jobs when resources are limited, demonstrating how reinforcement learning can improve planning decisions.