Minal Suresh Patil

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Summary

Machine learning engineer with a PhD in Computer Science, specializing in safe and scalable AI systems. Experienced in deploying models to production and applying formal methods to ensure system correctness. Research interests lie at the intersection of AI, formal methods, and software engineering—particularly in ensuring provable reliability guarantees for AI-enabled systems. Proven track record of leading cross-functional teams and mentoring engineers.

Education

Umeå Universitet   Sep. 2020 – Sep. 2024
PhD, Computer Science   *Umeå, Sweden*

University College London   Sep. 2018 – Sep. 2019
MSc, Data Science   *London, UK*

R.V. College of Engineering   Sep. 2011 – Sep. 2015
B.E., Computer Science   *Bengaluru, India*

Experience

Scania CV AB   Sep. 2024 – present
Senior ML Engineer   *Södertälje, Sweden*

- Lead cross-functional teams of engineers and researchers within the `SAFe` framework to develop and deploy production-grade automotive software systems, emphasizing collaborative delivery and continuous integration.
- Design and deploy an LLM-based code generation toolchain that translates formal and natural language requirements into `ISO-26262` and `MISRA-C` compliant C code. Integrate software verification and static analysis tools to ensure functional and safety requirements, with scalable deployment on AWS—bridging AI with dependable software engineering.
- Lead technical mentorship sessions for junior engineers, conducting weekly 1:1 code reviews and architecture design workshops.

Propinquity Labs   June 2016 – Sep. 2019
Data Scientist   *Bengaluru, India*

- Developed machine learning models with scikit-learn and TensorFlow to analyze Landsat and Sentinel satellite imagery, improving land classification accuracy by 15%.
- Implemented deep learning architectures (U-Net, Mask R-CNN) using PyTorch for object detection in aerial imagery, reducing manual annotation time by 40% and integrating with QGIS for visualization.

- Developed a cloud-based pipeline using AWS S3, Lambda, and SageMaker to efficiently handle terabytes of imagery and vector data for model training and inference.

Sensus Labs   Sep. 2015 – June. 2016
Data Scientist   *Bengaluru, India*

- Developed deep learning models using TensorFlow and Keras to estimate user location from smartphone sensor data (accelerometer, gyroscope, magnetometer), improving accuracy by 25% and deploying with TensorFlow Lite for on-device inference.

- Implemented Extended Kalman Filters (EKFs) in C++ and Python to fuse data from inertial sensors, Wi-Fi fingerprinting, and Bluetooth Low Energy (BLE) beacons for seamless indoor navigation, integrated with Android SDKs.
- Optimized EKFs through parameter fine-tuning and covariance adaptation techniques, utilizing NumPy and SciPy for numerical computations, improving positioning accuracy by 30% and reducing latency by 20% on resource-constrained mobile devices.

INTERNSHIP

Scania CV AB
February 2024 – July 2024

PhD Research Intern
Södertälje, Sweden

- Led the development of a framework for generating secure `C` code, known as `spec2code`, designed to meet both formal and informal specifications using LLMs.
- Benchmarked state-of-the-art LLMs for generating secure `C` code against traditional synthesis tools, using a curated dataset of formal and informal specifications and Frama-`C` for deductive verification to ensure functional correctness.

Virgin Media
May 2019 – August 2019

MSc Research Intern
London, UK

- Developed a halo-forecasting model using data from over 100,000 customers, achieving 88.4% accuracy and increasing conversion rates by 15% through targeted up-selling strategies.
- Implemented a customer segmentation model using unsupervised learning and transaction data, optimizing marketing efforts and driving a 12% increase in customer engagement through targeted, personalized campaigns.

PUBLICATIONS

- **M.S. Patil**, Gustav Ung, Mattias Nyberg. **Towards Specification-Driven LLM-Based Generation of Embedded Automotive Software.** *In 2nd Artificial Intelligence International Symposium On Leveraging Applications of Formal Methods, Verification and Validation (AISoLA), 2024* 📄

- **M.S. Patil** and Kary Främling. **Enhancing Vulnerable Class Robustness in Adversarial Machine Learning.** *In IEEE World Congress on Computational Intelligence (IEEE-WCCI): International Joint Conference on Neural Networks (IJCNN), 2024* 📄

- **M.S. Patil** and Kary Främling. **Investigating Lipschitz Constants in Neural Ensemble Models to Improve Adversarial Robustness.** *In Proceedings of 7th International Conference on System Reliability and Safety (IEEE-ICSRS), 2023* 📄

- **M.S. Patil** and Kary Främling. **Improving Neural Network Verification Efficiency through Perturbation Refinement.** *In 32nd International Conference on Artificial Neural Networks (ICANN), 2023* 📄

- **M.S. Patil** and Kary Främling. **Do Intermediate Feature Coalitions Aid in the Explainability of Black-Box Models?.** *In 1st World Conference on eXplainable Artificial Intelligence (XAI), 2023* 📄

- **M.S. Patil. Explainability in Autonomous Pedagogically Structured Scenarios.** *In Workshop on Explainable Agency in Artificial Intelligence at 36th Association for the Advancement of Artificial Intelligence (AAAI), 2022* 📄

TECHNICAL SKILLS

Languages: C/C++, Python, OCaml, Rust
Technologies/Frameworks: PyTorch, AWS, JAX, Docker, Git
Verification Tools: Lean and Coq (proof assistants), Frama-C, Dafny