# Minal Suresh Patil

📞 +46 0738192248  ✉ minalsp@outlook.com  in www.linkedin.com/in/minalspatil  🔗 minalspatil.github.io

## Summary

Experienced ML engineer with PhD in Computer Science, specializing in formal methods and verification for AI systems. Proven track record of integrating LLMs with formal verification techniques to develop safety-critical, production-grade software with provable reliability guarantees. Accomplished at leading cross-functional teams in automotive and geospatial domains while mentoring engineers in building verifiable AI solutions.

## Education

**Umeå Universitet**                                                           Sep. 2020 – Sep. 2024
*Ph.D., 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 build and deploy production-grade automotive software systems, with a strong focus on collaboration and continuous delivery.
- Design and integrate an LLM-based code generation tool with formal verification workflows, deployed on AWS cloud infrastructure, ensuring full compliance with ISO-26262 and MISRA-C standards for safety-critical applications—bridging advanced 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 2$^{nd}$ 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 7$^{th}$ 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 32$^{nd}$ 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 1$^{st}$ 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 36$^{th}$ 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