E. Kritheesh

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Education

Indian Institute of Technology Bombay   *Nov 2020 – May 2024*

- Bachelor of Technology with Honours in Electrical Engineering; **CPI: 8.84/10**
- Minor degree in Computer Science and Engineering

Publication

SPAM: Streamlined Prefetcher-Aware Multi-Threaded Cache Covert-Channel Attack

E. Kritheesh and Biswabandan Panda

Published in IEEE Computer Architecture Letters (**CAL**) 2025; DOI: 10.1109/LCA.2025.3529213

Work Experience

Jaguar Land Rover (JLR TBSI) | Graduate Charging Software   *July 2024 - Present*
Battery Management & Charging Master Controller

- Developed **AUTOSAR**-compliant in-vehicle **CAN-FD** and complex device drivers on **EB Tresos**
- Analysed Hardware Security Module (**HSM**) registers to determine the right initial flashing procedure
- Evaluated memory usage for storing certificates and keys during **TLS 1.3** handshake for **V2G** comm.

Charging/Discharging Wakeup Controller

- Gained a system-level understanding of wakeup triggers from various chargers (such as **CCS1**, **NACS**)
- Migrated to the **qualified** TASKING **linker** for integrating the wakeup & the master S/W (ASIL D)
- **Ongoing work:** Exploring the **secure flashing** process over CAN, focusing on the certificate chain validation, **signature** generation, and verification in the master controller **bootloader** S/W

Research Experience & Internship   *(Extended list)*

Agile and Stealthy Cache Covert Channel Attack   *Jan 2023 - May 2024*
Guide: Prof. Biswabandan Panda   Computer Science & Engineering, IIT Bombay

- Proposed a novel LLC attack leveraging **hardware prefetchers** by tuning memory accesses to selectively trigger or bypass them, after a literature review of the **Intel IP-stride** and **stream** prefetchers
- Advanced the bit rate of the state-of-the-art covert-channel by over **70%** in **multi-core** systems
- Enhanced **resilience** against defenses by investigating **mitigations** of flush-based channels
- Tested attacks rigorously by **injecting noise** using **stress-ng** workloads co-running on other threads

Validity Proofs for Bitcoin Header Chain Using Nova   *Jan 2024 - May 2024*
Guide: Prof. Saravanan Vijayakumaran   Electrical Engineering, IIT Bombay

- Designed **R1CS** circuits in **Rust** and **bellpepper** to validate Bitcoin block header consensus rules
- Incorporated **Nova** folding schemes to generate verifiable **zero-knowledge** SNARK proofs recursively
- Demonstrated **linear** proof generation time across 8000+ Bitcoin block headers, with **constant** proof size and verification time, making the proofs suitable for light nodes

Electric Vehicle Powertrain Internship   *May 2023 - July 2023*
Company: Jaguar Land Rover (JLR TBSI)   Bengaluru, India

- Studied Space Vector PWM implementations and developed an efficient **Simulink** model from scratch
- Clinched the **1st** position in a 36-hour **hackathon** on *Vehicle as a Tour Guide* by proposing a feature to reduce **range anxiety** in trips, researching **battery consumption** and **charging time** estimation

Technical Projects *(Extended list)*

Wide-Band Audio Acquisition | Electronic Design Lab *Jan 2023 - Apr 2023*
Guides: Prof. PC Pandey, Prof. VM Gadre *Electrical Engineering, IIT Bombay*

- Designed a compact 5cm×5cm **PCB** layout with μC mounting and optimized **pre-amplifier** circuit
- Engineered peak-valley detection in the **TIVA-C** board, configuring SPI for **automatic gain control**

16-bit RISC Processor in Quartus using VHDL *Nov 2022 - Dec 2022*
Guide: Prof. Virendra Singh *Computer Science & Engineering, IIT Bombay*

- Developed an efficient **29 state FSM** for an 8 register multicycle processor with a reduced instruction set, capable of performing **17 instructions** involving arithmetic, branch, and memory read/write
- Improved the design with a 6-stage **pipeline** and later extended it to a 2-way fetch **out-of-order superscalar** processor with **register renaming**, **ROB**, and a 2-bit **branch predictor**

8051 Micro-controller Programming | Microprocessors Lab *Jan 2022 - Apr 2022*
Guide: Prof. Saravanan Vijayakumaran *Electrical Engineering, IIT Bombay*

- Programmed in **Embedded C** to build applications such as a Morse code player and a temperature monitor by interfacing the **Atmel AT89C51** board with a speaker, **LCD**, and temperature sensor
- Used **UART** Module and **RealTerm** software for interfacing between a keyboard and micro-controller
- Coded in **assembly** language to implement a reaction timer using **Keil μVision** and **Flip** software

Autonomous Driving: Object Detection & Driver Behavior Analysis *Dec 2021 - Jan 2022*
Winter in Data Science (WiDS) *Analytics Club, IIT Bombay*

- Performed a comparative analysis of algorithms to give the best results by employing various **ML** architectures such as **SVM**, **Naive Bayes** classifier, and **ensemble learning** using **scikit-learn**
- Comprehended the **YOLO** implementation in detail after studying different **deep neural networks**

Academic Honours

- Achieved All-India Rank **816** in **IIT-JEE Advanced** out of over **160,000** candidates *(2020)*
- Secured **99.83 percentile** score in **IIT-JEE Main** amongst over **1.1 million** test-takers *(2020)*
- **Top 1%** out of 40,000+ students in the National Standard Examination in Chemistry **(NSEC)** *(2019)*
- Recipient of the National Talent Search Exam **(NTSE)** scholarship given to top **1000** students *(2018)*

Technical Skills

Languages	Embedded C, C++, Python, VHDL, Assembly, Java, Bash, LaTeX, Rust
Software	Quartus, Keil, GNU Radio, NgSpice, EB Tresos, dSPACE System Desk, Git, JFrog Artifactory, Fusion360, TI CCS, TASKING toolset, Lauterbach Trace32

Teaching & Mentorship Experience

- **Teaching Assistant** - Helped **40+** freshmen with their doubts in weekly two-hour lab sessions *(2023)*
  CS101: Computer Programming and Utilization | Instructor: Prof. Ajit Rajwade, IIT Bombay
- Mentored an **intern** at JLR for **8** weeks on **RTOS** and **scheduling** for embedded systems *(2025)*
- **Mentor** - *ML, Summer of Science, Maths & Physics Club*, and *CodeWars, Web & Coding Club* *(2022)*

Key Courses *(Extended list)*

- **Electrical & Computer Science:** Microprocessors, Embedded Systems, Communication networks, Advanced Comp. Architecture, An Intro. to Number Theory & Cryptography, Topics in Cryptology
- **Machine Learning & Probability:** Deep Learning: Theory and Practice, Image Processing, Intro. to Machine Learning, Markov Chains & Queueing Systems, Probability and Random Processes