Arin Weling

IIT Bombay | Stanford
paruwel@stanford.edu | Arin Weling | arinweling

EDUCATION

B.Tech. in Electrical Engineering — **IIT Bombay, India**
Honours in Electrical Engineering &
Minor in Artificial Intelligence & Data Science — *October 2022 - May 2026*

- **CPI: 9.59 / 10.00**
- **Department Rank: 10 / 114**

ACADEMIC ACHIEVEMENTS

- Awarded the **Undergraduate Research Award (URA) 01** for investigating thermal voltage drift mechanisms and the impact of X-ray exposure on the reliability of **3D NAND Flash Memory** devices
- Attained **an AP Grade** (Advanced Performer) for outstanding performance in the course **CH107(Physical Chemistry)**
- Achieved **All India Rank 3** in **Technothlon 2019** (IIT Guwahati), a national logic and problem-solving contest
- Attained **All India Rank 356** in **JEE Advanced 2022**, competing against 1,00,000+ candidates from across the country
- Attained **All India Rank 472** in **JEE Mains 2022**, duly competing against 10,00,000+ candidates from across the nation
- Secured a notable position by ranking within the **top 1%** in the Maharashtra (State) region for **IOQP Part 1 examination**

RESEARCH EXPERIENCE

Mars Rover Team, IIT B — **Student Technical Team**
Team Lead | Guide: Prof. P.J. Guruprasad — *December 2022 – March 2026*

- Successfully integrated a **Robotic Arm URDF model** with **RViz** and **Gazebo** to perform **Inverse Kinematics** simulations using **MoveIt2**
- Implemented a bidirectional long-range (**LoRa**) telemetry link to facilitate real-time command transmission at 433 MHz
- Integrated **CAN communication** and designed **custom PCBs** to increase the robustness of the electronic system
- Established efficient RPi–STM32 **UART communication**, enabling offloading of the **PID control loop** and quadrature encoder data retrieval to the STM32, significantly improving processing speed
- Coordinated a **50-member team** across software, electrical, and mechanical divisions to ensure smooth system integration
- Secured **2nd place** worldwide in the **Remote Edition of the European Rover Challenge, 2025**
- Placed **9th** globally in the Bio-Science Task at the **University Rover Challenge, 2024** held in Utah, USA
- Attained the **6th position** amongst 30 teams in the **International Rover Design Challenge, 2023**

3D NAND Flash Memory — **Research Project**
Research Assistant | Guide: Prof. Sandip Mondal, IIT Bombay — *June 2023 - June 2025*

- Designed a custom PCB to interface the **FTDI Mini Module** with **3D NAND Flash Memory**, facilitating precise byte programming and block erasure operations
- Characterized the detrimental effects of **medical-grade X-rays** on **3D NAND Flash watermarks** stored via **oxide degradation** and analyzed how radiation exposure disrupts the trapped charges used for physical-layer security
- Presented research findings on 3D NAND **watermark reliability** at the **2nd Annual SemiX Summit, IIT Bombay**
- Delivered an oral presentation titled **"Thermal-Induced Threshold Voltage Distribution Changes in 3D NAND Flash Cells: Experimental Characterization"** at the **Electronic Materials Conference, 2025**, **Durham, USA**

INDUSTRY EXPERIENCE

Smart Sentry AI — **Remote**
Intern | Guide: Prof. Amit Sethi — *August 2025 - January 2026*

- Engineered a custom **multi-agent architecture** for a **MongoDB** query chatbot that translates natural-language inputs into optimized database operations
- Integrated **Redis** for distributed state management and deployed the system on **Kubernetes**, enabling scalable performance
- Developing an **active-learning** pipeline for continuous model improvement, incorporating human feedback loops, data selection heuristics, and automated retraining cycles

Nvidia — **Bangalore, India**
Intern | HSIO Verification Team — *May 2025 – July 2025*

- Developed a **debug tool** integrating the **Cursor IDE** with Synopsys APIs to enable **AI-assisted hardware debugging**
- Implemented a **FastMCP** server with **stateless HTTP** design for analysis of **FSDB** waveforms and **RTL** designs
- Designed **debug flows** which helped in reducing the time required for manually debugging complex SoC designs by **30%**

KEY PROJECTS

S.N.A.S.H Morphobot — Course Project
Guide: Prof. Siddharth Tallur, IIT Bombay — *January 2025 - April 2025*

- Developed a simplified version of the **Morphobot** designed by researchers at **Caltech** utilizing **Ardupilot** to enable a seamless **transition** between **ground** and **drone** modes
- Engineered the **mechanical** and **electrical** design, optimizing the system and reducing the **transition time** to **5 seconds**
- Successfully tested the bot, demonstrating its performance with **3 minutes** of **flight time** and **15 minutes** of **drive time**
- Secured the **Course Best Project Award** and a Special Mention at **YUGM 2025** during an exhibition attended by the **Hon. Prime Minister of India**

Centralized Intelligence for Dynamic Swarm Navigation — Technical Competition
Inter IIT Tech Meet 13.0 — *November 2024 - December 2024*

- Secured **3rd place** in the **problem statement** and **2nd place overall** at the **Inter IIT tech meet 13.0**
- Engineered a custom **DBSCAN** clustering algorithm to facilitate low-latency detection of dynamic obstacles in real-time
- Implemented Conflict-Based Search (**CBS**) and Non-linear Model Predictive Control (**NMPC**) algorithms to generate collision-free **Multi-agent** paths while avoiding **dynamic obstacles**
- Simulated multi-bot **ROS2 Humble–Gazebo** setups with custom algorithms to optimize task priority and execution time

Falsification-Driven Robust Training — Course Project
Guide: Prof. Supratik Chakraborty, IIT Bombay — *August 2025 - November 2025*

- Architected a falsification-driven pipeline integrating **CARLA sim** and **VerifAI** to synthesize adversarial examples
- Leveraged **Alpha-CROWN (via AutoLiRPA)** to compute certified L2 robustness radii, overcoming the VRAM and latency bottlenecks that rendered standard Branch-and-Bound methods infeasible
- Expanded certified **L2 robustness radii** by **48%** via falsification-driven active learning, demonstrating superior sample efficiency compared to random sampling over **5 training cycles**

Foundations of Intelligent and Learning Agents — Course Project
Guide: Prof. Shivaram Kalyanakrishnan, IIT Bombay — *August 2025 - November 2025*

- Implemented and benchmarked **UCB**, **KL-UCB**, and **Thompson Sampling** for regret minimization, including a computationally optimized KL-UCB variant for stochastic environments
- Modeled a strategic card game as a **Markov Decision Process** and developed a solver using **Howard's Policy Iteration** and **Linear Programming** to derive optimal winning policies
- Engineered a **Microchess agent** using **Minimax search** with custom heuristics, optimizing depth and execution time

Control Systems Engineering Lab — Course Project
Guide: Prof. Debraj Chakraborty, IIT Bombay — *August 2024 - November 2024*

- Implemented a **Linear Quadratic Regulator (LQR)** control strategy to stabilize the dynamics of an **inverted pendulum**
- Built a **closed-loop noise cancellation system** with a **custom compensator**, achieving **20 dB attenuation** at **100 Hz**

Superscalar CPU Architecture — Course Project
Guide: Prof. Virendra Singh, IIT Bombay — *January 2025 - April 2025*

- Led a **team of 4** in the design and testing of a **superscalar**, **out-of-order CPU** in **VHDL** using **Quartus Prime**
- Designed a customized **user interface** using **Python** to significantly improve the ease of **debugging and implementation**
- Optimized VHDL design by removing non-synthesizable constructs and validated functionality on **MAX 10 FPGA** board

Covert Channels and Secure Cache Partitioning — Course Project
Guide: Prof. Biswabandan Panda, IIT Bombay — *January 2025 - April 2025*

- Implemented **Flush+Reload** and **Occupancy-based covert channels** in C to transmit images and audio across cores
- Designed custom protocols to establish shared memory using occupancy channels and verified end-to-end communication
- Developed **Dynamic Set Partitioning** in Low Level Cache (**LLC**) and evaluated the Instructions Per Cycle (**IPC**), Missed Predictions per Kilo Instructions (**MPKI**), **self-evictions** vs baseline on **SPEC** benchmarks

SKILLS

Languages	C, C++, C#, Python, Verilog HDL, VHDL, Dart, SQL, R, LaTeX
Software	Git, ROS, Gazebo, MATLAB, AutoDesk Fusion 360, Quartus, OpenCV, MoveIt, LTspice, Carla Sim
Machine Learning	PyTorch, Scikit-Learn, Pandas, Matplotlib, Plotly, VerifAI, AutoLiRPA

EXTRACURRICULARS

- Actively took part in the **Dahisar River March** and **Gorai Beach cleanups** to promote environmental sanitation
- Participated in a **STEM awareness drive**, introducing robotics and space technology concepts to underprivileged students
- Acted as a **mentor** for the **XLR8 competition**, offering guidance and support to **2 teams** throughout the competition
- Attained a **FIDE rating** of **1434** in **chess** through consistent dedication to skill development and strategic gameplay