

# Rajinthan Rameshkumar

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## About

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I'm an explorer driven by a passion for analog IC design, low-level system architecture, and the emerging field of integrated photonics. I enjoy solving complex problems and bridging the gap between traditional electronic engineering and modern optical sciences. My extensive hands-on experience spans PCB design, firmware development, and register-level programming. I'm deeply curious about how power-efficient electronics and real-time control systems can be utilized to optimize Photonic Integrated Circuits (PICs) and optoelectronic applications. I'm eager to collaborate with like-minded innovators in world-class research environments to bring advanced technologies to life. I also love mentoring young minds to spark their curiosity for innovation.

### Interests:

- Analog and mixed-signal ICs
- RF and high-frequency ICs
- FPGA-based prototyping
- Photonic Integrated Circuits (PICs)
- Power-efficient SoCs
- Edge Computing for IoT Devices
- Optoelectronics & Control
- IC layout optimization

## Education

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**University of Moratuwa, Sri Lanka** Cumulative GPA: **3.77/4.0** 2023 – 2027  
B.Sc.Engineering(Hons.) *Dean's list in semester: 1,2,4*

### Electronic and Telecommunication Engineering

Coursework: Analog and Digital Electronics, Signal Processing, Control Systems, Computer Architecture, Communication Systems, Embedded Systems Programming, Data Structures and Algorithms

**J/Hartley College, Jaffna, Sri Lanka** 2013 – 2022

- G.C.E. Advanced Level 2021 - Physical Science (Subjects: Combined Mathematics, Physics and Chemistry)  
**Z-score of 2.4978**, Island 158th (top 0.5%)
- G.C.E Ordinary Level 2018 - 9As (Including Commerce, ICT & Art)
- Served as a **Senior Prefect**, demonstrating leadership and responsibility

### Courses & Certifications

- Beginning C++ Programming - From Beginner to Beyond - Udemy
- Mastering Microcontroller and Embedded Driver Development - Udemy
- Introduction to FPGA Design for Embedded Systems - Coursera
- 100 Days of Code: The Complete Python Pro Bootcamp - Udemy

## Experience

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**StarLabs, National University of Singapore (NUS)** - Research Intern Dec 2025 – Present

- Developing a high-torque smart reaction wheel controller prototype (100mNms) for satellite Attitude Determination and Control Systems (ADCS).
- Implementing advanced Field-Oriented Control (FOC) algorithms and sensor interfacing to drive and optimize Alva BLDC motors.

**RoboticGen** (startup), Colombo SL - Robotic Team Member Apr 2025 – Present

- Designed a four-wheel drive system capable of reaching a maximum speed of 3 m/s for an open-source micromouse which is twice as fast as the previous version.
- Created the STM32F405 powered PCB for motor control and system management by reducing PCB size by over 40%.
- Currently working on control system algorithms (PID tuning, sensor integration) to optimize robot movement.

## Achievements - University

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**2nd Runner-Up | 20th International Microelectronics Olympiad in Armenia** - Secured 3rd place globally among participants from 20 countries, including the USA, UAE, Germany, and France, demonstrating advanced proficiency in microelectronics and EDA software on an international stage.

**Champion | IEEE Chips Challenge 2025** - National selection for the International Microelectronics Olympiad. Won by demonstrating strong knowledge in microelectronics and EDA software.

**Champions | UWU Robot Battle 2.0 – Death Race** - Battle Bot competition organized by the Department of Science & Technology at Uva Wellassa University. We designed and built a custom four-wheel-drive battle bot equipped with dual weapons and optimized for both terrain racing and combat performance.

**Champions | Dextron 2024** - Fast line-following robotic competition organized by the Division of Electrical, Electronic and Telecommunication Engineering Technology at ITUM. Built a mobile robot with differential drive powered by STM32F411, with advanced line and pattern detection using signal processing techniques.

**1st Runner-Up | Sri Lankan Robotics Challenge 2022/23** - Robotics competition organized by the Electronic Club of University of Moratuwa. Built a mobile robot capable of performing tasks such as box picking, color identification, and detecting arrow mark directions.

**2nd Runner-Up | IESL RoboGames 2023** - Robotics competition organized by the University of Moratuwa's CSE Department, IESL, and SLT-Mobitel. Designed and built a vision-based robot capable of detecting, picking, and placing colored balls into designated targets

**2nd Runner-Up | MicroMaze** - Micromouse competition organized by the IEEE Society of Robotics and Automation of IIT. Designed an ESP32 powered mobile robot capable of solving complex mazes by traversing and internally mapping the environment in real time.

## Achievements - School

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**Gold Medal | All-Island Math Quiz Competition 2016**

Represented the Northern Province team that won the gold medal at the national-level competition

**Gold Medal | All-Island Math Quiz Competition 2017**

Represented the Northern Province team that won the gold medal at the national-level competition

**Silver Medal | National Mathematics Olympiad Competition 2018**

Secured the Silver Medal at the national-level Mathematics Olympiad competition in Category III

**1st Runner-Up | All-Island School Robot Competition 2019**

Secured the Silver Medal in the Engineering Technology and Production Category at the island-wide school robot competition and exhibition organized by the Technology Education Branch of the Ministry of Education

**Best Hardware Application | Yarl Geek Challenge – Junior - 2019 (Season 8)**

Developed and demonstrated a smart hardware concept to monitor and control home appliances via the Internet

**Judges' Special Mention | Yarl Geek Challenge – Junior - 2020 (Season 9)**

Developed a working prototype of a smart wall plug for Sri Lankan households, enabling control and monitoring of appliances at an affordable cost

## Projects

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**Very Low Power NS-SAR ADC**

Jan 2026 – Present

Designing a Noise-Shaping Successive Approximation Register (NS-SAR) Analog-to-Digital Converter optimized for highly power-efficient operation. Developed as a final year academic project utilizing the SKY130 PDK and Cadence tools.

**2.4GHz Type-II Fractional-N PLL with VCO**

Aug 2025 – Present

Designing a 2.4GHz Type-II  $\Delta\Sigma$  Fractional-N Phase-Locked Loop (PLL) coupled with a Type-IV Cross-Coupled Differential LC Voltage-Controlled Oscillator (VCO) for WiFi/Bluetooth applications. Developed using the IHP SG13G2 PDK for the UNIC-CASS program by IEEE CASS. Includes Phase Frequency Detector (PFD) and charge pump design.

GitHub Repository: [github.com/SkillSurf/frac-n-pll-vco-smacd\\_2026](https://github.com/SkillSurf/frac-n-pll-vco-smacd_2026)

**Low-Power Three-Stage Operational Amplifier**

Nov 2025

Designed and submitted a highly efficient three-stage op-amp for TinyTapeout. Achieved a 2nA disable current, 4MHz unity-gain bandwidth, and 80dB open-loop gain. The schematic and layout were developed utilizing xschem, ngspice, and KLayout within the SKY130 PDK.

GitHub Repository: [github.com/rajinthanr/ttsky\\_opamp](https://github.com/rajinthanr/ttsky_opamp)

### **A Reconfigurable Gripper for Robotic Autonomous Depalletizing**

Jan 2025

Developed a robotic end-effector using pneumatic actuation, vacuum pumps, and an ARM-based microcontroller with register-level programming for precise real-time control. Created a rack and pinion driven fork integrated with time of flight (ToF) sensors for adaptive box handling in dynamic warehouse environments.

*GitHub Repository:* [github.com/rajinthanr/End\\_Effector](https://github.com/rajinthanr/End_Effector) [↗](#)

### **Open-Source Micromouse: High-Speed Maze Solving Robot**

Nov 2025

Leading the design and development of an open source Micromouse robot optimized for maze solving. Implementing PID based motion control with encoder feedback, and using the STM32F405 microcontroller for high speed, low latency navigation. Focused on open collaboration, modular firmware architecture, and performance benchmarking.

*GitHub Repository:* [github.com/rajinthanr/RGen\\_Mice](https://github.com/rajinthanr/RGen_Mice) [↗](#)

### **UART Module on DE0-Nano FPGA**

Apr 2025

Implemented a custom UART communication block on the DE0-Nano FPGA board using Verilog, configured for 9600 baud rate. Successfully established serial communication with another FPGA running an identical UART block. The project involved transmitter and receiver module design, simulation in ModelSim, and hardware testing via cross-board communication.

### **High-Speed Line Follower Robot**

Dec 2024

Designed and developed a two-wheeled robot optimized for high-speed line tracking using the STM32F411 microcontroller that achieved speeds exceeding 0.7 m/s with precise encoder-based speed and acceleration control. Implemented custom PID-based control and real-time sensor data filtering.

## **Skills**

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**Programming Languages:** C++, C, Python, MATLAB, Verilog,  $\LaTeX$

**Microcontrollers:** STM32, ARM Cortex series, ESP32

**Tools & IDEs:** Cadence, KLayout, xschem, Altium, Solidworks, Visual Studio Code, STM32CubeIDE, LTSpice, Quartus Prime

**Operating Systems:** Linux, Shell scripting

**Professional Skills:** Leadership, Project Management

## **Clubs and Organizations**

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**IEEE Circuits and Systems (CAS) Society Student Chapter - Webmaster (Dec 2025 – Present).** Managing digital presence and technical communications for the University of Moratuwa chapter, promoting events and resources related to analog and digital IC design.

**E-Club (Electronic Club)** - Active member contributing to both technical and social initiatives within the department. Served as the club's photographer/videographer, covering events such as the Career Fair, Annual General Meeting (AGM), and various departmental activities.

**Yarl IT Hub** - Volunteer and coordinator in a tech community aiming to transform Northern Sri Lanka into an innovation hub. Led the planning and coordination of a school-level robotic line-following competition, growing participation from 25 teams in the first year to 50+ in the second year.

**Mora Hiking Club** - Exploring nature and endurance through university-organized hikes

## **References**

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### **Prof. Rohan Munasinghe**

*Professor, University of Moratuwa*

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B.Sc. Eng. (Moratuwa), M.Sc.(Saga), Ph.D. (Saga), CEng., MIE(SL), SMIEEE

### **Dr. Thayaparan Subramaniam**

*Senior Lecturer, University of Moratuwa*

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B.Sc.Eng (Peradeniya), Ph.D (HKU)

### **Dr. Ranga Rodrigo**

*Senior Lecturer, University of Moratuwa*

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B.Sc. Eng. Hons. (Moratuwa), M.E.Sc. (Western, Canada), Ph.D. (Western, Canada)