Rishi Nandha Vanchinathan

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EDUCATION

Indian Institute of Technology, Madras (IIT Madras) May 2026 (expected)
Integrated Masters (B.Tech + M.Tech) in Electrical Engineering
CGPA: 8.93/10 (As of 27 Sep 2025)
Thesis: CMOS RF Front-End for Wide-band Same-Channel Full-Duplex
Courses: Devices for AI and Neuromorphic Computing, Digital IC Design, Analog IC Design, RF IC Design
Tools: · Circuit Design: Cadence Virtuoso, EMX, Genus, Innovus
· System Design: Cadence Allegro, OrCAD, Ansys HFSS · Deep Learning: PyTorch, HuggingFace, LangChain

TAPEOUTS & CONFERENCE PROCEEDINGS

Full-Duplex Transceiver Tape-out in CMOS 65GP Scheduled for Dec 2025
Layout validation in-progress. Tape-out scheduled for Dec 2025

Indian Mobile Congress 2024 - "Multi-channel Sub-THz System" Oct 2024
5G Testbed lab group poster; designed and assembled the GPS clock distribution PCB used

AWARDS, HONOURS & FUNDING

Research supported by Ministry of Electronics & IT (MeitY), India Fall 2025
Master's Thesis tapeout, supervised by Prof. Sankaran Aniruddhan (PI).

Lab Group supported by Department of Telecommunications (DoT), India Fall 2024
Undergraduate research at the IITM 5G Testbed, under the indigenous 5G program.

Institute Day Certificate of Merit, IIT Madras Apr 2022
Awarded for securing All India Rank 332 in IITJEE Advance 2021.

Gold Medal, Online Physics Olympiad (OPhO) Jun 2021
For placing 6th globally among international participants

RESEARCH EXPERIENCE

Wide-Band Same-Channel Full-Duplex Transceiver at 7GHz Dec 2024 - Ongoing
Supervisor: Prof. Sankaran Aniruddhan ICS Group, IIT Madras

- Demonstrating single-antenna full-duplex at 7 GHz with 400 MHz bandwidth by extending the approach of Kumar et al. (TCAS-I, Oct-2018), originally reported at 2.4 GHz with 20 MHz bandwidth.
- Responsible for complete design flow including schematic design, layout in CMOS 65GP, electromagnetics simulation, control-logic P&R and board-design for testing and characterization
- Pre-silicon simulations show a TX isolation of -48 dB; Tapeout submission scheduled for 1st Dec 2025

High Speed Clock Distribution Boards for 5G-NR & 6G Research May 2023 – Nov 2024
Supervisor: Prof. Radha Krishna Ganti 5G Testbed, IIT Madras

- Contributed as the primary clock designer for supporting ongoing 6G research activities in the lab
- Designed the multi-PLL clock tree for data protocols such as JESD204B in the lab's 5G-NR RRH
- Designed and tested an RF PCB to provide GPS-synchronized reference clocks; thus enabling the lab's demonstration of a novel intelligent reflecting surface at Indian Mobile Congress 2024.

TECHNICAL PROJECTS

Soft-Binary Neural Network for Inference with Passive RRAM Crossbars Aug - Oct 2024
Course Instructor: Prof. Bhaswar Chakrabarti. (Write-up) IIT Madras

- Extended the course project on simulating passive RRAM crossbars, by training a 2-layer neural network with sigmoid weights, thus replacing the post-training quantization approach.
- Achieved a pre-silicon quantization-induced error below 2% (reduced from 15%).

8-Bit Carry-Save Multiplier With Pipelining in CMOS 22nm Sep - Nov 2023
Course Instructor: Prof. Janakiraman Viraraghavan IIT Madras

- Desinged Custom transistor-level layout for a multiplier operating at 2.8 GHz with 0.32 ns critical delay
- Implemented pipelining using C2MOS D-flipflops, improving maximum frequency by 67%

Fully Differential OpAmp with Common-Mode Feedback in CMOS 130nm Feb - Apr 2024
Course Instructor: Prof. Nagendra Krishnapura IIT Madras

- Designed a 2-stage Miller op-amp in 130nm CMOS with a phase margin of 72 degrees
- Designed a common-mode feedback with 14 MHz bandwidth and 80 degrees phase margin

Retrieval Augmented Chat-bot Assistant with a Locally Hosted LLM Nov - Dec 2024
AI Club, Centre For Innovation (Student-Run Innovation Centre, IIT Madras) IIT Madras

- Built a QA assistant that retrieves context through semantic search with BERT embeddings
- Implemented a pipeline that applies zero-shot classification, retrieves from a knowledge base of physics textbooks, and generates answers with a FLAN-T5 model

TEACHING EXPERIENCE

Teaching Assistant: Devices for AI & Neuromorphic Computing Aug - Nov 2025
Course Instructor: Prof. Bhaswar Chakrabarti IIT Madras

- Conducted tutorials on compact modeling and simulation of FeFET, RRAM, and FeCAP devices
- Taught simulation and programming of 1-bit & 2-bit 1T-1R, 1T-1C, and 1S-1R synaptic arrays
- Enriched learning experience by supplementing experimental HfO_x RRAM data from the lab.

INDUSTRY EXPERIENCE

Software Engineering Internship May - Jul 2025
Microsoft [Windows + Devices] Hyderabad, India

- Developed an MCP server enabling Agentic AI workflows to interface with legacy software components.
- Contributed to the open-source MCP TypeScript SDK, focusing on automation of engineering tasks

Open-Source Contribution to IBM Qiskit Feb - Apr 2025
Supervisor: Dhinakaran Vinayagamurthy, IBM Research Remote

- Contributed a quantum dataset for benchmarking variational fast-forwarding (Model introduced in 2020)
- Verified fast-forwarding of atomic Hamiltonians with a Jordan–Wigner mapping on NISQ devices

LEADERSHIP EXPERIENCE

Executive Head & Technical Lead Apr 2023 - Mar 2024
Sahaay - Social Innovation Club, IIT Madras

- Directed five student projects in animal welfare, assistive technology, and agricultural technology.
- Mentored two of the student teams on edge inference of neural networks such as YOLO and CNNs
- Conducted workshops for 54 freshmen on transfer learning, data augmentation, and model evaluation.
- Reorganized the club's practices, thereby broadening participation and increasing applications in-flow.

Department Committee Representative Jul 2021 - Present
Electrical Engineering Department, IIT Madras

- Assisted the Head of Department with curriculum restructuring; Represented undergrads at town halls

VOLUNTEERING & INTERESTS

- Assisted the Dean of Students of IIT Madras on measures & initiatives for women's safety in campus (2022)
- Collaborated with the Animal Welfare Board of India on a mobile app for distress call response (ongoing)
- Ultimate Frisbee player in IIT Madras institute team.
- Guitarist and composer; performed original works with the IIT Madras band, winning national intercollegiate competitions and opening for professional acts. Completed Trinity Grade 3 in Classical Piano.