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

CONFERENCE PRESENTATIONS & CHIP TAPE-OUTS

[1] *"Wide-band Full-Duplex Transceiver at 7 GHz in CMOS 65nm"* – submitted for pre-tapeout foundry validation (Dec. 2024 - ongoing)

[2] *"Multi-channel TeraHertz P2P Link"*, demonstrated at *Indian Mobile Congress (IMC) 2024*, New Delhi, India, Oct. 2024.

RESEARCH EXPERIENCE

Wide-Band Same-Channel Full-Duplex Transceiver Chip at 7GHz Dec 2024 - Ongoing

Supervisor: Prof. Sankaran Aniruddhan ICS Group, IIT Madras

· Demonstrating single-antenna full-duplex at 7 GHz with 300 MHz (single-sided) bandwidth by extending the approach of Kumar et al. (TCAS-I, Oct-2018), originally reported at 2.4 GHz with 10 MHz bandwidth.

· Responsible for complete design flow including schematic, layout in CMOS 65GP, electromagnetics simulation, control-logic PnR and board-design for testing and characterization

· Pre-silicon isolation of -48 dB over a 300 MHz bandwidth observed; Design under pre-tapeout validation

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 RF clock boards designer for supporting 5G/6G research activities in the lab

· Designed multi-PLL clock trees for data protocols such as JESD204B in the lab's 5G-NR RRH

· Designed and assembled an RF board to provide reference clocks for TeraHertz Systems; supplied clocks at 100s of MHz for the lab's demonstration of a 270 GHz P2P Wireless Link at Indian Mobile Congress 2024.

TECHNICAL PROJECTS

Quantization-aware Neural Network for Inference with Passive RRAM Synaptic Array Aug - Oct 2024

EE6347 Course Instructor: Prof. Bhaswar Chakrabarti IIT Madras

· Extended the course project on using passive RRAM arrays for inference of a neural network, by replacing the post-training quantization with training a quantization-aware neural network using sigmoid weights

· Observed improved hardware-software consistency by benchmarking against Li et al. (2018)

8-Bit Carry-Save Multiplier With Pipelining in CMOS 22nm Sep - Nov 2023

EE5311 Course Instructor: Prof. Janakiraman Viraraghavan IIT Madras

· Designed custom transistor-level layout for a multiplier operating at 2.8 GHz with 0.32 ns critical delay

· Implemented pipelining using C2MOS D flip-flops, improving maximum frequency by 67%

Fully Differential OpAmp with Common-Mode Feedback in CMOS 130nm Feb - Apr 2024

EE5320 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 Chatbot 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
EE6347 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
- Delivered supplementary lectures on spiking neurons such as Leaky-Integrate-Fire (LiF)

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 IIT-JEE Advance 2021.

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

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 & VOLUNTEERING

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 inflow.

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

- Assisted the Head of Department with curriculum restructuring; Represented undergrads at town halls
- Assisted the Dean of Students of IIT Madras on measures & initiatives for women's safety in campus

Mobile Application for Animal Distress Call Response Aug 2024 - Present

- Collaborating with members from Animal Welfare Board of India and Blue Cross of India for developing a full-stack application for decentralizing animal distress call response