

# Rishi Nandha Vanchinathan

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## EDUCATION

### Indian Institute of Technology, Madras (IIT Madras)

Jun 2026 (expected)

Integrated Masters (B.Tech + M.Tech) in Electrical Engineering

CGPA: 8.93/10 (As of 23 Nov 2025)

**Thesis:** CMOS RF Front-End for Wide-band Same-Channel Full-Duplex at 7 GHz

**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

## POSTER PRESENTATIONS & CHIP TAPE-OUTS

- [1] "Wide-band Full-Duplex Transceiver at 7 GHz in CMOS 65nm" – expected MPW submission for tape-out in Early Feb 2026 (Dec. 2024 - ongoing)
- [2] "Multi-channel TeraHertz System", exhibited 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

- Extending electric balance duplex demonstrated by Kumar et al. (TCAS-I, Oct-2018) to wideband scenarios using a tunable network that balances antenna's spiral smith behaviour over a 600 MHz bandwidth
- Responsible for complete design flow including schematic, and layout. Tape-out scheduled for Feb 2026
- Innovation disclosure filed for designing highly linear tunable networks using LVT FETs without stacking

### 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 physical-layer data protocols in the group's 5G-NR and 5G+ RRHs
- 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.

## TEACHING EXPERIENCE

### Teaching Assistant: Devices for AI & Neuromorphic Computing

Aug - Nov 2025

EE6347 Course Instructor: Prof. Bhaswar Chakrabarti

IIT Madras

- Delivered supplementary lectures on designing and simulating silicon neurons such as the Adaptive Low-Power Integrate-and-Fire (Indiveri, 2003) and the Tau Cell Neuron (van Schaik et al., 2010).
- Conducted tutorials on compact modeling and simulation of FeFET, RRAM, and FeCAP devices
- Demonstrated simulation of synapses made of 1T-1R cells and DenRAM (Payvand et al., 2024) cells.

## 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

### Physical Design of a Digital Decimation Filter for a Delta-Sigma ADC in 180nm

Nov - Dec 2025

Inter IIT Contest 2025, Problem Statement promoted by ISRO (Indian Space Research Organisation)

IIT Madras

- Register Transfer Logic, Synthesis, Place-and-Route and Static Time Analysis of a decimation filter for a 20-bit ADC with 19 ENOBs over a 1 kHz bandwidth with simulated data from a 4-bit CIFF delta-sigma loop

- Awarded Gold Medal for best design in the contest with participation from all IITs across India

### **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 bot that retrieves context through semantic search with BERT embeddings
- Utilized a zero-shot classification of user task, KV token caching and generation with a local T5 LLM

## AWARDS, HONOURS & FUNDING

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### **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, supervised by Prof. Radha Krishna Ganti (PI).

### **Institute Day Certificate of Merit, IIT Madras**

Apr 2022

Awarded for securing All India Rank 332 in IIT-JEE Advanced 2021.

### **Gold Medal, Online Physics Olympiad (OPhO)**

Jun 2021

For placing 6th globally among international participants

## INDUSTRY EXPERIENCE

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### **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

Supervisors: Dr. Dhinakaran Vinayagamurthy (IBM), Prof. Chandrashekhar Lakshmi Narayanan (IITM)

- Contributed a quantum dataset for benchmarking Variational Fast-Forwarding (Model introduced in 2020)
- Exhibited fast-forwarding of molecular hamiltonians with a Jordan–Wigner mapping on NISQ run-times

## LEADERSHIP & VOLUNTEERING

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### **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 student teams on edge inference of neural networks such as YOLO and CNNs for assistive tech
- Conducted workshops for 54 freshmen on transfer learning, data augmentation, and model evaluation.

### **Department Committee Representative**

Nov 2021 - Jun 2025

Electrical Engineering Department, IIT Madras

- Assisted the Head of Department with curriculum rearrangement; 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