

# Rishi Nandha Vanchinathan

<https://rishinandha.github.io/> | rishinandhav@smail.iitm.ac.in

## 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 27 Sep 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

## CONFERENCE 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

- 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, synthesis, place-and-route and testing
- Designing a network to mimic an antenna's spiral Z-smith profile; projected wideband isolation of 42 dB

### 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. Bhawar 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. Bhawar 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 Automation of a VLSI Delta-Sigma ADC in CMOS 180nm

Nov - Dec 2025

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

IIT Madras

- Synthesis, Place-and-Route and Static Time Analysis of a Decimator for an 20-bit ADC sampling at 1 Msps

- Design of a Noise Transfer Function for an single-bit quantizer with a continuous-time delta-sigma loop
- 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

---

- 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 Advanced 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  
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

---

- 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