Rishi Nandha V | EE21B111 | PR/22/EE/25/111

Skills

SOFTWARE | Cadence Virtuoso, Spectre, OrCAD & Allegro • Keysight ADS • ANSYS Electronics • Electric VLSI • LTSpice • Xilinx Vivaldo **LANGUAGES** | Python • C • C++ • MATLAB • Verilog
HARDWARE | ZCU102 FPGA • Tiva C Evaluation Board • Arduino • Raspberry Pi • Jetson Nano
OTHER SKILLS | Sound Synthesis • Digital Audio De-Noising • PCB Soldering • Deep Learning

Professional Experiences

R&D of a 7GHz CMOS 65nm Full Duplex Transceiver[5] | Cadence Virtuoso

May 2024 – Current | Research Project, Guide: Prof. Aniruddhan Sankaran

- Developing a **single-channel full-duplex transceiver** improvising Kumar et al. (TCAS1 2018) design
- Designed & simulated a 3-terminal capacitance bridge in TSMC 65nm process with **>50dB isolation**
- Researching on improving RX chain with **Balun Low Noise Amplifier & active mixer** architectures

Research Associate at 5G TestBed | APLLs, DPLLs[7], RF PCB, OrCAD & Allegro

May 2023 – Current | 5G Testbed, IIT Madras. Funded by GOI[8] Department of Telecommunications

- Designed an **IEEE1588 Compliant RF Clock Structure** to synchronize data interfaces & global clock
- Reviewed literature on modern **Advanced-5G & 6G RRHs** & encoding techniques in data interfaces
- Designed & **Tested a Multi-PLL Architecture** for SyncE, IEEE-1588, and JESD204B Synchronization
- Achieved **Return Loss of -26dB, Insertion Loss -0.1dB** & Delay-Tuning $\pm$6ps in the Fabricated PCB
- Integrating the design with a new RRH[6]; Attended the **National Communications Conference 2024**

Technical Projects

Design of a CMOS 120nm Analog Front End for 5GHz WLAN | Virtuoso

Feb - Apr 2024 | Course Project. Guide: Prof. Sankaran Aniruddhan

- Designed a **Cascoded Common-Source LNA** with In-Band S_{11} **< -30dB, NF < 1.9dB & Gain > 32dB**
- Designed an **Active Gilbert Cell Mixer** with In-Band **Gain > 18.1 dB, IIP3 = -4.1 dBm & NF < 6.1 dB**
- Designed a **Cross-Coupled VCO** with V_{pp} **> 2.8V, 1MHz phase noise < -123 dBc/Hz &** ΔK_{VCO} **< 3%**
- Designed a **Cascoded Power Amplifier** with P_{1dB} **> 11.4 dBm & AM-PM Deviation at** P_{1dB} **<** 3.4^o

Design of a Differential Miller OpAmp | LTSpice, Common Mode Feedback

Feb – Apr 2024 | Course Project. Guide: Prof. Nagendra Krishnapura

- Designed OpAmp of desired Load Capacity, Bandwidth & Phase Margin with **Current-Mode CMFBs**[12]
- Simulated design for Noise PSDs[13], Slew Rate, Swing Limits, & CMFB Gain Crossover & Phase Margin

Vacuum Tube Triode Guitar Pedal | Handmade Prototype, Class-A Amplifier

Nov 2023 – Jan 2024 | Self Project

- Designed **2-Stage Class-A Amplifier with 12AT7 Tube**; chose DC Points for Max Harmonic Distortion
- **Soldered circuit by hand**, Verified **Power-Integrity** & Tested the Pedal with a Guitar & Hi-Z Speakers
- **Rediscovered F.Langford(1934)**'s Solution to **In-Band DC-DC Converter Feedthrough** with LC Shunt

Layout & Simulation of a CMOS 22nm Carry Save Multiplier | Electric VLSI

Aug – Dec 2023 | Course Project. Guide: Janakiraman Viraraghavan

- Designed **Layout** of a 8-Bit CSM operating at **2.8 GHz Clock** & **0.32ns simulated Propagation Delay**
- Identified the **Critical Path Delay**, Simulated and Optimized the delay by **scaling the Standard Cells**
- Achieved a **67% increase in Max Frequency** & **21% deacrease in Delay** by **Pipelining** using Flipflops

KRLS[9] for Self Interference Cancellation in MIMO Antennas | PyTorch

Aug – Nov 2023 | Course Project. Based on C. Auer et al. 2021

- Implemented the Kernel Method proposed by C. Auer et al. for **Noise Cancellation in 5G Antennas**
- Compared how different sparsification methods respond to **sudden changes in the Noise Profile**
- Achieved **>30dB Isolation** in **32-Channel Array** by Ensemble Parallelization using PyTorch Tensors

Positions of Responsibilities

Executive Head & Software Lead | Sahaay - Social Innovation Club

Apr 2023 – Mar 2024 | Centre for Innovation, IIT Madras

- Executed **5 Socially Relevant Projects** impacting Animal Welfare, Agriculture Tech. & Assistive Tech.
- **Reformed club's PR**[11] to see a **growth** in member & application count of about **400% & 900%** resp.
- **Reformed the Club Structure** & formalized member recruitment & project management practices

Mentorship Experience

Deputy Coordinators Workshop | Sahaay - Social Innovation Club

- **Trained 54 Freshmen** in Product Design & Development, Deep Learning, Electronics & Fusion 360
- Conducted Sessions on **CNNs, Transfer Learning, Data Augmentation & Model Evaluation Metrics**
- Facilitated the Program to progress in a **Hackathon format** using our project AWS[10] as a Case Study

Education

IIT MADRAS

Dual Degree (B.Tech + M.Tech in Electrical Engineering)
CGPA: 8.72 / 10
2021 - 2026[#]

CLASS XII

CBSE, Mathematics & Computer Science
Score: 94.0 %
2021

CLASS X

Central Board of Secondary Education
Score: 90.8 %
2019

Scholastic Achievements

AIR[1] 332 in JEE Advanced 2021

Among 0.14 million candidates

Top 35 AIR[1] in CMI Entrance 2021

Thereby qualifying for Admission in Chennai Mathematical Institute (CMI), India

Secured Gold Tier in OPhO[2] 2021

By placing 6th among 800 Teams from Physics Communities around the Globe

Placed 7th in Physics Brawl 2021

Organized by FYKOS, Charles University, Prague

Coursework

GRADUATE

RF IC Design
Analog IC Design
Digital IC Design
Multirate Digital Signal Processing
Adaptive Signal Processing[$]

UNDERGRADUATE

Analog Systems Lab[$]
Digital Systems Lab
Fundamentals of Audio Engg.[@]

Interests

GUITARIST & MUSICIAN by hobby. Graduated **Trinity Grade 3** in Piano and **Grade 4** in Theory. Played with IIT Madras Band and **won 1st** in IIM-B's Unmaad, **3rd** in IIT-B's Mood Indigo, Sold-out a **live show** with our **Originals** & Opened shows for **Masala Coffee** & **Guitar Prasanna**
ULTIMATE FRISBEE Reserve in Insti[3] Team

Volunteering

STUDENT LEADER of Volunteer Group that aided Dean of Students & SLC[4] on Improving Safety Measures for Women On-Campus
REPRESENTATIVE of Students-View in the Academic Restructuring of the Elec. Engg. Curriculum for Batches 2023 Onwards
MENTOR for five Freshers as part of Saathi
ANIMAL WELFARE Enthusiast

#. Ongoing 1. All India Rank 2. Online Physics Olympiad @. Online $. Highest Grade in Class 3. Institute 4. Student Legislative Council 5. Radio Frequency Integrated Circuit 6. Remote Radio Head 7. Analog PLLs & Nested Digital PLLs 8. Government of India 9. Kernel Recursive Least Squares 10. Automatic Waste Segregator 11. Public Relations 12. Common Mode Feedbacks 13. Power Spectral Density