Rudrapatna Vallabh Ramakanth

Student at Indian Institute of Technology Madras

Email: vallabh.developer@gmail.com | **Webpage:** 2vrk1504.github.io

Research Interests

Wireless Communication Systems and Circuits, Information Theory, Estimation Theory, Signal Processing and Statistics.

Education

Program	Institution	Performance	Period
MTech and BTech (with Honours) *Electrical Engineering*	Indian Institute of Technology Madras, Chennai	CGPA – 9.41	2017 – 2022
Senior Secondary Education (Till Grade XII) *CBSE Board*	Sri Kumaran Children's Home, Bangalore	98.2%	2015 – 2017

Relevant Coursework

Digital and Wireless Communication Systems, Information Theory, Error Control Coding, Stochastic Processes and Concentration Inequalities, Estimation Theory, Stochastic Control, Convex Optimization, Linear Dynamical Control Systems, Analog and Digital IC Design, RF IC Design, Phase Locked Loops, Microprocessor Theory.

Professional and Industry Experience

1. Wireless Systems Intern at Qualcomm, Hyderabad, India — June 2021 – August 2021
   - Developed methods for CFO tracking and designing trackers meeting transient specifications of tracker in the context of 5G.
   Guide: Mr. Manav Garg, Mr. Ravinder Kumar
2. Digital Engineering Intern at Texas Instruments, Bangalore, India — May 2020 – July 2020
   - Developed an automatic and efficient way to compute latencies and report the bandwidth of large transactions on RADAR SoCs over buses.
   Guide: Mr. Desmond Fernandes
3. Summer Intern at Tejas Networks, Bangalore, India — May 2019 – July 2019
   - Researched redundancies of OFDM in the context of 4G/LTE and formulated methods to improve data compression.
   - Developed a web-based tool for profit-margin analysis of products and line items.
   Guide: Mr. Vinod Kumar

Research Project and Thesis

Title: Blind Estimation of Communication Link Parameters and Signal Separation of Co-Frequency Signals in Wireless Communication. — September 2020 – Present
Guide: Prof. Devendra Jalihal and Prof. RK Ganti

Abstract: The aim of the project involves blind estimation of link parameters like symbol rate, roll off factor, FEC scheme, and modulation scheme (namely BPSK, QPSK, 8PSK and 16QAM) used between two wireless modems communicating on the shared center frequency and then separating both streams using the estimated parameters. For successful symbol separation, we develop novel algorithms for estimating impairments like CFO and timing offsets of both the carriers together.

Note: This is a sponsored project.

Teaching Apprenticeship Experience

1. Basic Electrical Engineering (EE1100) — August 2021 – Present
   - My primary role was to help undergraduate students with any doubts or problems, provide solutions to the tutorials, and handle any course logistics.
   Guide: Prof. Enakshi Bhattacharya

Scholarship/Fellowship

- Samsung–IITM Pravartak Fellowship for Dual Degree Project — March 2021 – July 2021

Projects

1. Presentation on the Theoretical Motivation behind Polar Codes (in 5G) — March – July 2021
   Guide: Prof. Abhishek Sinha
   - Paper presentation on the theoretical working of capacity-achieving polar codes using Martingale random processes techniques and probability concentration inequalities.
2. Phase-Locked Loop System and Circuit Design — September – December 2020
   Guide: Prof. Saurabh Saxena
   - Designed a complete PLL for 2.56GHz clock generation at transistor level. Simulated and optimized performance of PLL for key metrics like spur rejection, power supply rejection, phase noise with nominal loop gain and phase margin.
3. Mixer and LNA Design — February – June 2020
   Guide: Prof. S Aniruddhan
   - Designed Mixer and LNA at transistor level for 2.4GHz RF. Simulated and optimized performance of modules for key metrics like active power gain, noise figure and linearity.
4. Compressed Sensing Techniques for Denoising Audio Signals — February – June 2020
   Guide: Prof. Rachel K
   - Applied Compressed Sensing (CS) Techniques to get a sparse approximation of an audio signal in the frequency domain for denoising by posing it as an L1 convex optimization problem.
5. Convergence of EM Algorithm for Gaussian Mixtures with Unbalanced Mixing — February – June 2020
   Guide: Prof. Sheetal Kalyani
   - Researched faster algorithm (DAEM) for GMMs with unbalanced mixing coefficients. Applied method to approximate non-Gaussian (α-stable) noise models and use method for wireless channel estimation.

Scholastic Achievements

- Qualified JEE Advanced (All India Rank 3632) and JEE Main (All India Rank 1445) — June 2017
- Ranked 3rd in Karnataka state in COMED-K examination — May 2017
- Ranked 1st (among Bangalore Sahodaya Schools) in All India Secondary School Exam — May 2017
- Kishore Vaigyanik Protashan Yojana Scholar (All India Rank 963) — January 2017

Co-curricular Achievements and Honours

1. National Runners Up – Flipkart GRiD 2.0 — August 2020
   Built an end-to-end system for digitisation of invoices using digital image processing and OCR.
2. Gold and Bronze Medal – Inter IIT Tech Meet 2019, IIT Roorkee — December 2019
   - Part of the contingent representing IIT Madras in two events.
   - First event was Ashoka Tech for Social Change – my team presented a technology for aggregation of local scrap collectors, for which we won the bronze medal.
   - Second event was a hackathon – my team designed a system for effective crowdsourcing of user information/complaints about public spaces, for which we won the gold medal.
3. Placed 3rd in Tata Makerthon Challenge - Techfest, IIT Bombay — December 2018
   Built an autonomous real-time system with a 3-axis object tracking gimbal system to search the surroundings for an object in an image provided by a smartphone. Implemented using Raspberry Pi, Arduino and a USB-webcam.

Positions of Responsibility

1. Head of Web and Mobile Operations, Saarang 2020 — April 2019 – January 2020
   - Handled the Web and Mobile Operations of Saarang 2020, IITM's annual cultural fest, which receives a footfall of about 60,000 and web traffic of about 1000 hits per day.
   - Trained and managed a team of 10 coordinators to develop the website and mobile application.
2. Coordinator of Web and Mobile Operations, Saarang 2019 — April 2018 – January 2019
   - Was part of a team which developed the website and mobile application for Saarang 2019.

Technical Skills

- C/C++
- Verilog (HDL) & SystemVerilog
- ARM Assembly
- Java & Android Frameworks
- Python and libraries
- LTSpice & other circuit simulators
- MATLAB
- GNU Radio