

Rudrapatna Vallabh Ramakanth

Graduate Student Researcher at LIDS, MIT

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Research Interests

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

Education

| Program | Institution | Performance | Period |
|---|--|-------------|-------------|
| Doctoral Student | Massachusetts Institute of Technology | | 2022 – |
| MTech and BTech (with Honours) <i>Electrical Engineering</i> | Indian Institute of Technology Madras, Chennai | CGPA – 9.52 | 2017 – 2022 |
| Senior Secondary Education (Grade XII) <i>CBSE Board</i> | 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

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| 1. Interim Engineering Intern (Wireless Systems) at Qualcomm, Hyderabad, India <i>- Developed methods for CFO tracking and designing trackers meeting transient specifications of tracker in the context of 5G.</i> | June 2021 – August 2021 Guide: Mr. Manav Garg, Mr. Ravinder Kumar |
| 2. Digital Engineering Intern at Texas Instruments, Bangalore, India <i>- Developed an automatic and efficient way to compute latencies and report the bandwidth of large transactions on RADAR SoCs over buses.</i> | May 2020 – July 2020 Guide: Mr. Desmond Fernandes |
| 3. Summer Intern at Tejas Networks, Bangalore, India <i>- Researched redundancies of OFDM in the context of 4G/LTE and formulated methods to improve data compression.</i> <i>- Developed a web-based tool for profit-margin analysis of products and line items.</i> | May 2019 – July 2019 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 – May 2022
Guide: Prof. Devendra Jalihal and Prof. RK Ganti

Abstract: Project involved blind estimation of link parameters like symbol rate, roll off factor, FEC scheme, and modulation scheme 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.

Teaching Apprenticeship Experience

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| 1. Analog Systems and Lab (EE2019) | January 2022 – May 2022 Guide: Prof. S Aniruddhan |
| 2. Basic Electrical Engineering (EE1100) | August 2021 – December 2021 Guide: Prof. Enakshi Bhattacharya |

Scholarship/Fellowship

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| ▪ Samsung-IITM Pravartak Fellowship for Dual Degree Project | March 2021 – July 2021 |
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Projects

- 1. Presentation on the Theoretical Motivation behind Polar Codes (in 5G)** March – July 2021
- Paper presentation on the theoretical working of capacity-achieving polar codes using Martingale random processes techniques and probability concentration inequalities.
Guide: Prof. Abhishek Sinha
- 2. Phase-Locked Loop System and Circuit Design** September – December 2020
- 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.
Guide: Prof. Saurabh Saxena
- 3. Mixer and LNA Design** February – June 2020
- 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.
Guide: Prof. S Aniruddhan
- 4. Compressed Sensing Techniques for Denoising Audio Signals** February – June 2020
- 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.
Guide: Prof. Rachel K
- 5. Convergence of EM Algorithm for Gaussian Mixtures with Unbalanced Mixing** February – June 2020
- 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.
Guide: Prof. Sheetal Kalyani

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

