Chirag C. Shetty

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I am an Electrical Engineer with special interests in telecommunication systems, signal processing, electronic design and hardware development, information theory and bio-inspired computing.

Education

Indian Institute of Technology Bombay (IITB) **Mumbai**
Master & Bachelor of Technology, Electrical Engineering , 9.24/10 *2012–2017*
Specialization: Communication & Signal Processing

Research

Publications

- **Chirag Shetty**, Kamal Singh, Sibi Raj B Pillai; Bounds on capacity of decentralized multiple access channels in MIMO systems; *In Preparation 2018*
- **C. Shetty**, S. Nitchith, R. Rawat, S. Nandakumar, P. Shah, S. Kulkarni, B. Rajendran "Live demonstration: Spiking neural circuit based navigation inspired by c. elegans thermotaxis" IEEE International Symposium on Circuits and Systems (ISCAS) 2015, May 2015

Major Projects

Signal Processing for GPS/IRNSS Receiver **Master's Thesis, EE, IITB**
Guides: Prof.M.P.Desai, Prof.Sibiraj Pillai, Prof.Shalabh Gupta *2016–2017*

Designed and implemented analog and signal processing front-end of receiver for the Indian Regional Navigation System (IRNSS), which became fully operational in April 2016. [details]

- **Signal Processing:** Implemented GPS-inspired acquisition, tracking and pseudo-range computation software blocks. Studied key engineering parameters and their inter-dependencies involved in the design, as a first step towards subsequent development of an ASIC
- **Hardware:** We built a setup to capture and record raw S-band (2.49 GHz) IRNSS signals (SNR $\approx$ 130 dBm). Demonstrated end-to-end working of the receiver by computing pseudo-ranges of all active IRNSS satellites (led a team of 3 undergraduates as their teaching assistant)

Bounds on Capacity of Decentralized MIMO MAC **Information Theory, EE, IITB**
Guide: Prof. Sibiraj Pillai *2017–Present*

Proposed close upper and lower bounds for ergodic sum capacity of MIMO multiple access channel with distributed channel state information with each transmitter aware only of its own fading matrix and coherent receiver.

○ **Real-time biologically inspired Neural Networks**   **Neuromorphic Computing, EE, IITB**
Guide: Prof. Bipin Rajendran   *2014–2015*

Designed a biomimetic real-time spiking neural network based autonomous navigation robot inspired by the thermotaxis in the nematode *C.Elegans*. The natural behavior of the organism was recreated using multiple independent microcontrollers acting as neurons and their interactions. The spike outputs of the microcontrollers was wirelessly displayed. The setup had key features of any biological computing system, namely the computation was asynchronous, temporal, analog (though implemented digitally) and task-optimized. [paper, video]

Research Workshop & Training

○ **Computational Approaches to Memory & Plasticity (CAMP)**
National Center for Biological Sciences, Bangalore   *2016*

Completed an intensive summer school on theory and simulation of learning and memory in the brain. The school trained participants in basics of neuroscience across all levels from molecular to cellular and networks. Four short-term group projects had to be done as part of the school.

○ **Brain, Computation & Learning Workshop (BCL)**
Indian Institute of Science, Bangalore   *2017*

Professional Experience

○ **Texas Instruments**   **Bangalore**
Analog Design Engineer, High Speed Data Converters Team   *March 2018 - Present*
Part of the team building high-speed data converters for mobile basestations
 - Developed core system-level architecture of a novel low power ADC
 - Designing key high-speed custom-made blocks for the same

○ **Taiwan Semiconductor Manufacturing Company (TSMC)**   **Hsinchu, Taiwan**
Engineer, Physical Design Flow   *September 2017 - January 2018*
Part of the team responsible for bench-marking and quality-check of physical design APR flows

○ **Deutsche Bank**   **Summer Internship, Mumbai**
Financial Analyst, Emerging Markets   *May 2015 - July 2015*
 - Conceptualized and built a predictor for a key financial index, and demonstrated the model by correctly predicting the direction of market-surprise for June 2015 release
 - Offered Pre-Placement Offer based on the performance during the internship

○ **Skills**: C/C++, Python, Matlab, VHDL, Assembly, HTML/CSS, Eagle, Spice, Innovus/ICC2(familiar), Cadence (analog design)

Awards & Distinctions

○ **President Dr. Shankar Dayal Sharma Gold Medal**, awarded at IITB Convocation 2017, to only one among all graduating students for overall academic excellence and general proficiency.

○ **Undergraduate Research Award** (URA03) for significant research work in the Masters Thesis

- **Institute Organizational Roll of Honor** '17, given to at-most two recipients, for providing exceptional leadership to the student community
- **Department of EE Graduating Technical Color** '17, for technical contributions to the dept.
- **All India Rank 61** in IIT-JEE '12 among 5 lakh aspirants
- **All India Rank 17** in AIEEE '12 among 10 lakh students
- Awarded Certificate of Merit in Regional Mathematics Olympiad by HBCSE '10

Academics

Selected Courses and Skills

- Signal Processing (SP) and Communication: Wavelets, Analytical SP, Adaptive SP, DSP system design, Digital image processing, Wireless & Mobile Communication
- Electronics: Sensors in Instrumentation, VLSI design, Biosensors, Electronic Design Lab
- Mathematics & Computer Science: Information Theory, Markov Chains & Queuing, Estimation & Identification, Optimization, Matrix Computation, Discrete Structures, Computer Networks

Teaching

- Teaching Assistant, Introductory Course on Probability 2016
- Teaching (Lab) Assistant, Electronic Design Lab 2017. In this role I led a team of three undergraduates to build the IRNSS analog front-end.

Leadership & Extra-Curricular Activities

- Overall Coordinator, Students' Technical Activities Body, IIT Bombay   [2015-16]
- Student Head, Tinkerers' Lab (alumni-funded makespace) IIT Bombay   [2015-16]
- Institute Student Mentor, Department Academic Mentor   [2014-16]
- Quarterfinalist, National Debate Tournaments at ILS, Pune & NLS, Bangalore   [2013-15]
- Hobby Robotics
  - Engineering Excellence Award, Robowars, Techfest   [2012]
  - Pratham - Student Satellite Project Team   [2013]
  - Institute Electronics Club   [2014]
- Cycling