


# ADWAY GIRISH

INCOMING PH.D. STUDENT

SCHOOL OF COMPUTER AND COMMUNICATION SCIENCES, EPFL 

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## EDUCATION

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**Indian Institute of Technology Bombay (IITB)**

Mumbai, India

Bachelor of Technology in Electrical Engineering (EE), **CGPA 9.60/10**

Jul. 2018 – May 2022

- **Honors** in Electrical Engineering and **Minor** in Mathematics

## PUBLICATIONS

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- S. Sharma, **A. G.**, D. Jeff, G. Sresth, S. Bhalerao, V. M. Gadre, C. H. Srinivas Rao, and P. Radhakrishna, “Micro-doppler parameter estimation using variational mode decomposition with finite rate of innovation,” in *2022 IEEE International Conference on Signal Processing and Communications (SPCOM)*, pp. 1–5, 2022
- S. Sharma, **A. G.**, N. P. Rakhashia, V. M. Gadre, S. Ul Haque, A. Ansari, R. B. Pachori, P. Radhakrishna, and P. Sahay, “Theoretical analysis of an inverse radon transform based multicomponent micro-doppler parameter estimation algorithm,” in *2022 National Conference on Communications (NCC)*, pp. 70–75, 2022

## ACADEMIC ACHIEVEMENTS

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- Recipient of an **Institute Academic Prize** for being the second-best academic performer in the EE department [2020-21]
- Extended a full-time offer by Texas Instruments (India) following an **excellent internship performance** [Summer 2021]
- Received an **Undergraduate Research Award** (URA01) from IITB in recognition of a developmental effort in research for work done in Radar Signal Processing [2020]
- Awarded an **AP grade** (given to the top 2% of students) in two courses at IITB - Digital Communications, and Data Analysis and Interpretation - for exceptional performance [Spring 2021, Fall 2019 resp.]
- Granted the **Urvish Medh Memorial Prize** for being the highest-ranked student in the EE department, IITB [2018]
- Secured **All-India Ranks** of **43** out of 155,158 participants in **JEE(Advanced)** and **55** out of 1,259,000 in **JEE(Main)**, standing first in the state of Karnataka in both [2018]
- Among the top 40 and 49 students chosen for the final camp to select **the team to represent India** at **International Olympiads** on Astronomy and Astrophysics and Chemistry (IOAA and IChO respectively) [2018]
- Selected for the **Kishore Vaigyanik Protsahan Yojana** fellowship (in Basic Sciences, initiated and funded by the Department of Science and Technology, Government of India) by securing an **All-India Rank** of **35** [2016]
- Awarded the prestigious **National Talent Search** scholarship (NTS) by the National Council of Educational Research and Training (NCERT), offered to around 1000 students all over India [2016]

## RESEARCH PROJECTS AND INTERNSHIPS

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**Memoryless Broadcast Channels With Feedback**

R&D Project

Guide: Prof. Sibi Raj Pillai, EE Dept., IITB 

Jul. 2021 – Present

The capacity of single-user memoryless channels cannot be increased by causal feedback. We study the possible capacity enlargement provided by noisy feedback for two-user Broadcast Channels (BC).

- Obtained the maximum feedback erasure probability that can provide any improvement in the binary erasure BC
- Currently looking to characterize capacity of the Gaussian BC with 1-bit quantized output (QBC) with feedback
- Studying linear feedback coding schemes to achieve capacity enlargement for the QBC

**Spatially Coupled LDPC Codes Over Fading Channels**

B.Tech. Project

Guide: Prof. Kumar Appaiah, EE Dept., IITB 

Jul. 2021 – Nov. 2021

Spatial coupling of LDPC codes has been shown to improve error performance, with high-complexity MAP thresholds under low-complexity BP decoding. We studied their performance over correlated, continuously-varying fading channels.

- Conducted literature review to understand why performance improves over conventional LDPC codes
- Analysed the best performance possible over fading channels using interleaving, subject to a latency-constraint
- Extended the application of low-complexity, reduced-latency windowed decoding to correlated fading channels without losing out significantly on performance

### Micro-Doppler Estimation in Radar Signal Processing

Research Project

Guide: Prof. Vikram Gadre, EE Dept., IITB 

Apr. 2020 – Apr. 2022

Radar signals are used in detecting position and motion parameters of objects. Rotating or vibrating parts produce sinusoidal variations in the frequency called the micro-Doppler (mD), in addition to shifts produced by translation.

- Studied the detection of mD parameters from Radar signals using Inverse Radon Transform and proposed an alternate algorithm to separate BD components using L-statistics
- Devised an algorithm to extract mD components by expressing the demodulated signal in terms of Bessel functions and filtering out appropriate elements
- Looking to generalize a finite-rate-of-innovation-based dual focusing approach to mD estimation

### Evaluation of Baseband Behavioural Models for Power Amplifiers

Summer Internship

Texas Instruments (India) Pvt. Ltd., Bangalore, India

May 2021 – Jul. 2021

Non-linearities in power amplifiers distort the signal and generate out-of-band components by causing the spectrum to spread. Removing them is essential to efficiently use the allocated bandwidth in wireless communication applications.

- Performed literature review of Volterra series and Memory Polynomial models and identified reasonable ones to pursue
- Implemented these models on MATLAB, obtaining considerable improvement over those currently in use
- Devised a ‘peeling’ algorithm to make the model implementable on an FPGA, hence ready for use in a real product

## TEACHING AND SEMINARS

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### Teaching Assistant

Fall 2021, Fall 2020, Spring 2020. Fall 2019 resp.

Calculus II, Calculus I, Electricity and Magnetism, Calculus

- Mentored batches of 45+ students by taking weekly tutorial sessions and periodic doubt-clearing sessions
- Responsible for grading exam papers and assignments, and invigilation during exams

### Applications of Fourier and Hilbert Transforms in Communication Systems

April 2021

MA5106: Introduction to Fourier Analysis Seminar | Prof. Sanjoy Pusti, Mathematics Dept., IITB

- Presented applications of the Fourier and Hilbert transforms in Signal Processing and Communication to 20+ graduate students in mathematics, being the only engineering student in the class
- Demonstrated the intuition behind the transforms and a few examples of modulation and demodulation with a series of simulations on GNU Radio

### Transform Domain Analysis in Electrical Engineering

October 2019

EE225: Network Theory Class Term Assignment | Prof. Vikram Gadre, EE Dept., IITB

- Presented the use of Transform Domain Analysis in Signal Processing to 100+ students and faculty from TEQIP-III (Technical Education Quality Improvement Programme, Govt. of India) colleges
- Talked about the recent generalizations of Fourier Transforms such as Fractional Fourier Transforms to deal with non-stationary signals

## OTHER PROJECTS

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### Bank Queue Simulator on Pt-51 Microcontroller

Mar. 2021 – Apr. 2021

EE337: Microprocessors Lab Project | Prof. Rajbabu Velmurugan, EE Dept., IITB

- Simulated the behaviour of a queue in a bank with four counters by distributing tokens to new customers as they arrive and allotting them to counters as they become free on a first-come-first-serve basis
- Interfaced a keyboard with the Pt-51 using UART to imitate the actions of the customers and tellers using keystrokes

- Displayed the token numbers being served at any moment on a  $16 \times 2$  LCD module, using Timer Interrupts to notify a counter becoming free and the token number allotted to it on the screen

#### Audio Watermarking

Sep. 2020 – Dec. 2020

EE338: Digital Signal Processing Application Assignment | Prof. Vikram Gadre, EE Dept., IITB

- Conducted literature survey of various watermarking techniques and identified echo data hiding and phase coding as effective and feasible methods to pursue
- Implemented these two schemes on MATLAB and obtained virtually error-free recovery of the embedded messages without any perceptible degradation in quality of the original audio files

## MENTORING AND RESPONSIBILITY

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#### Institute Student Mentor

Jun. 2021 – May 2022

for incoming undergraduates at IIT Bombay

- Mentored 12 first-year students, helping them have a comfortable transition and adaptation to college life
- Functioned as the single point of contact for any issues they may face, in particular ensuring that they have the resources to attend online classes from home

#### Summer of Science Mentor for Signal Processing

Summer 2019

Math and Physics Club, IIT Bombay

- Guided two students on a self-paced introduction to signal processing by helping them create an action plan, suggesting reference materials and reviewing their reports
- Curated mini-projects to provide hands-on experience - image compression using Haar wavelets, dual-tone multi-frequency generator and decoder, and identification of constituent instruments from simple music samples

#### Class Representative

Jul. 2018 – May 2019

for the first-year batch of B.Tech in Electrical Engineering at IIT Bombay (69 students)

- Created effective communication channels to ensure that all students were kept updated on relevant issues
- Mediated discussions between faculty and the class as a whole to allow for smooth proceedings of courses

## RELEVANT COURSEWORK

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- **Communication and Signal Processing:** Information Theory and Coding, Error Correcting Codes, Communication Networks, Wireless and Mobile Communication, Advanced Image Processing, Digital Communications, Communication Systems, Digital Signal Processing, Signals and Systems
- **Probability and Statistics:** Stochastic Optimization, Online Machine Learning and Bandit Algorithms, Probability and Random Processes (Advanced and Basic), Estimation and Identification, Data Analysis and Interpretation
- **Mathematics:** Finite Fields and their Applications, Introduction to Fourier Analysis, Basic Algebra, Complex Analysis, Real Analysis, Differential Equations (Partial and Ordinary), Linear Algebra, Calculus
- **Miscellaneous:** Control Systems, Power Systems, Microprocessors, CMOS Analog Design, Digital Systems, Electronic Devices, Network Theory, Electricity and Magnetism, Quantum Physics and Its Applications

## TECHNICAL SKILLS

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- **Languages:** Python, C++, Javascript, MATLAB, VHDL, HTML,  $\text{\LaTeX}$ , Markdown, Spice, Embedded C
- **Software:** Keil, GNU Radio, Xcircuit, Qt, Quartus, Eagle, AutoCAD, SolidWorks

## EXTRACURRICULARS

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- Completed an intermediate course in **Table Tennis** under the **National Sports Organization** at IIT Bombay [2018-19]
- Conferred the title of **Best All-Rounder** on graduation from Ryan International School, Bangalore [2016]
- Elected to the **Student Council** at Ryan International School as the **Deputy Education Minister** [2014-15]
- Completed 12 credits in practical examinations and 7 credits in theoretical examinations for **Electronic keyboard** from the **Trinity College of Music London**, a result of 6 years of musical training [2007-13]