Adway Girish

First-Year Ph.D. Student
School of Computer and Communication Sciences, EPFL ↗

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✉ Email | 🌐 Website | 🎓 Google Scholar

Research Interests

I am interested in **information and coding theory** and **applied probability**, particularly with **communication systems**. My current research problems are (1) maximal error exponents of multiple access channels, and (2) pure exploration over bit-constrained channels.

Education

EPFL (*The Swiss Federal Institue of Technology in Lausanne*)	*Lausanne, Switzerland*
Ph.D. in Computer and Communication Sciences	Sep. 2022 - Present
Receiving EDIC fellowship for the first year; Semester project advisor: Prof. Emre Telatar	
Indian Institute of Technology Bombay (*IITB*)	*Mumbai, India*
B.Tech. in Electrical Engineering	Jul. 2018 – May 2022
With Honors in Electrical Engineering and Minor in Mathematics; CGPA: *9.60/10*	

Publications

Conference papers:

- 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)*, 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)*, 2022 ↗

Academic Achievements

- Awarded an **Institute Academic Prize** for being the second-best academic performer in the EE department   *[2020-21]*
- Received an **Undergraduate Research Award** (URA01) from IITB in recognition of a developmental effort in research for work done in Radar Signal Processing   *[2020]*
- Secured **AP grades** (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.]*
- Awarded the **Urvish Medh Memorial Prize** for being the highest-ranked student in the EE department, IITB   *[2018]*
- Achieved **All-India Ranks** of **43** in **JEE(Advanced)** and **55** in **JEE(Main)**   *[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 IISc and 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]*

Older Research Projects and Internships

Micro-Doppler Estimation in Radar Signal Processing	*Research Project*
Prof. Vikram Gadre, EE Dept., IITB	Apr. 2020 – Apr. 2022

- Provided a theoretical analysis for the detection of micro-Doppler parameters using Inverse Radon Transform
- Derived an expression for the number of frequency terms to be eliminated, and conditions for successful estimation
- Extended a Finite Rate of Innovation framework to estimate mD parameters using Variational Mode Decomposition

Memoryless Broadcast Channels With Feedback

R&D Project

Prof. Sibi Raj Pillai, EE Dept., IITB — Jul. 2021 – Jan. 2022

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

Spatially Coupled LDPC Codes Over Fading Channels

B.Tech. Project

Prof. Kumar Appaiah, EE Dept., IITB — Jul. 2021 – Nov. 2021

- Performed literature review to understand why spatial coupling improves performance over conventional LDPC codes
- Studied 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

Evaluation of Baseband Behavioural Models for Power Amplifiers

Summer Internship

Texas Instruments (India), Bangalore, India — May 2021 – Jul. 2021

- 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 presently in use
- Devised a 'peeling' algorithm to make the model implementable on an FPGA, hence ready for use in a real product

Teaching and Talks

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 across Maharashtra
- Talked about recent generalizations such as Fractional Fourier Transforms to deal with non-stationary signals

Other Technical Projects

Compression of Graphical Data

Spring 2022

EE736: Introduction to Stochastic Optimization | Prof. Vivek Borkar, EE Dept., IITB

- Conducted a survey of recent works in the compression of various classes of marked graphs
- Studied the framework to analyze such graphs, efficient compression algorithms, and their optimality proofs

Communication-Constrained Multi-Armed Bandits

Spring 2022

IE617: Online Learning and Bandits Course Project | Prof. Manjesh Hanawal, IEOR Dept., IITB

- Studied schemes where agents can efficiently communicate with a central server to complete a learning task
- Partner's proposal was awarded the Qualcomm Innovation Fellowship India 2022 ↗

Compressed Sensing With Prior Information

Spring 2022

CS754: Advanced Image Processing Course Project | Prof. Ajit Rajwade, CS Dept., IITB

- Studied and implemented modified versions of LASSO, OMP, and Basis Pursuit, making use of prior information on the sparsity of the input

- Observed a slight improvement in the recovery rate when using different weightages for the prior distribution

Lightweight Stream Ciphers for IoT Applications
EE706: Communication Networks Course Project | Prof. Gaurav Kasbekar, EE Dept., IITB

Spring 2022

- Reviewed lightweight cryptographic techniques for secure communication in resource-constrained IoT devices
- Studied stream ciphers and chaotic cryptography in detail and proposed a scheme combining the two

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

Fall 2020

- Surveyed various watermarking techniques and identified echo data hiding and phase coding as effective and feasible
- Implemented these on MATLAB and obtained virtually error-free recovery of embedded text messages without any (audibly) perceptible degradation in quality of the original audio files

Mentoring and Responsibility

Institute Student Mentor
for incoming undergraduates at IIT Bombay

Jun. 2021 – May 2022

- 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 faced, in particular ensuring that they had the resources to attend online classes from home

Summer of Science Mentor for Signal Processing, Coding Theory
Math and Physics Club, IIT Bombay

Summers 2020, 2022 resp.

- Guided four students on self-paced reading projects by helping them create an action plan, suggesting reference materials, clearing their doubts, having discussions on recent work in these topics, and reviewing their reports
- Curated mini-projects to provide hands-on signal processing experience - image compression using Haar wavelets, dual-tone multi-frequency generator and decoder, and identification of instruments from music samples

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

Jul. 2018 – May 2019

- 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

- **Communication and Signal Processing:** Information Theory and Coding, Error Correcting Codes, Communication Networks, Wireless and Mobile Communication, Advanced Image Processing, Digital Communications, Digital Signal Processing, Signals and Systems
- **Probability and Statistics:** Stochastic Optimization, Online 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, Network Theory, Quantum Physics and Its Applications, Power Systems, Microprocessors, CMOS Analog Design, Digital Systems, Electronic Devices, Electricity and Magnetism

Extracurriculars

- 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]*