Shilajeet Banerjee

Location:Bengaluru, India
Samsung Semiconductor India R&D Center
Modem Software, Wireless Communication Engineer

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Education

Degree/Certificate	Institute/Board	CGPA/Percentage	Year
MS.	Indian Institute of Technology, Madras	8.5	2020-2023
B.Tech	University School of Information, Communication & Technology (USIC&T), Delhi	8.23	2016-2020
Senior Secondary	A.S.N Senior Secondary School (CBSE), Delhi	90.2%	2015
Secondary	A.S.N Senior Secondary School (CBSE), Delhi	10.00	2013

Professional Experience

- **Samsung Semiconductor India Research** — *Bengaluru, Karnataka*
  Senior Engineer — August 2023 - Present
  –Currently involved in the design and optimization of 5G and 4G modem communication processors. My work focuses on commercial issue handling and code improvement.

- **Office of Industrial Consultancy & Sponsored Research** — *IIT Madras,Chennai*
  Project Associate — March 2023 - July 2023
  –Contributed to Next Generation Wireless Research and Standardization on 5G and Beyond. Completed system-level code to model Narrowband Non-Terrestrial Networks.

- **Bharat Electronics Limited** — *BEL Ghaziabad,UP*
  Summer Intern — June 2019 - Aug 2019
  –Worked in Satellite Communication Systems Lab, PCB fabrication unit and RADAR Strategic Business Unit(SBU).

- **National Academy of Broadcasting & Multimedia** — *Delhi*
  Summer Intern — June 2018 - Aug 2018
  –Studied Television and Radio broadcast system.

Graduation

- **Indian Institute of Technology, Madras** — *Chennai*
  MS Research in Signal Processing and Communication — Sep. 2020 - June. 2023
  –**Supervisor:** Dr. K Giridhar & Dr.Abhishek Sinha
  –**Topic:** Model NR-NTN channel, Age of Information, Wireless Network Simulation
  –**CGPA:** 8.5

- **University School of Information, Communication & Technology** — *Delhi*
  B.Tech in Electronics and Communication — Aug.2016 - Aug.2020
  –**Thesis:** Bit Error Rate analysis of an OFDM system.
  –**CGPA:** 8.23

Publications

- **On Provisioning Link Margin for High Bit Rate Q/V Band LEO Communication for Autonomous Vehicles**
  – *S. Banerjee, S. Desai, KM. Yelamarty, A Harivignesh, ML. Narayana, K. Giridhar*
  – *Published in 2023 IEEE 98th Vehicular Technology Conference (VTC2023-Fall), Hong Kong*

- **Frequency Projection: A Review and its application in channel modeling**
  – *C. Ramanathan, S. Y. Desai, S. Banerjee and K. Giridhar,*
  – *Published in 2023 IEEE National Conference on Communications (NCC), IIT Guwahati, India*

Scholastic Achievements

- GATE-EC 2020 98.2 percentile.
- Cleared JEE Advanced 2016 All India Rank 14,680 amongst 2 lakh candidates.
- Awarded Certificate of Merit by CBSE for excelling Secondary School Examination, 2013.
- Cleared Architecture Aptitude Test conducted by IIT Guwahati in 2016.
- Awarded NPTEL Elite certificate.

Projects

Course Projects

1. **BER performance of BPSK in AWGN**: Simulated the theoretical BER performance of BPSK modulation in an AWGN channel. After the generation of the SRRC pulse, its frequency response and applied pulse shaping to random bits. Finally, calculated interference at various sampling instants to generate the eye diagram.
2. **BER and SER performance of QPSK**: Added AWGN to QPSK samples and passed through a matched filter. The BER and SER values were computed at the detector output and compared with the theoretical results.
3. **Estimating and Generating Wireless Channel**: Modeled Rayleigh Fading channel and plotted the BER, SER v/s SNR values at the receiver. Also observed the BER performance in fading channel as a function of antenna diversity.
4. **OFDM simulation**: Simulated the OFDM system for 4,16,64-QAM constellations in the presence of an AWGN channel. The variation of BER with SNR compared with theoretical results.
5. **Regret Optimal Online Network Catching**: Design sub-optimal policies that will maximize the number of file fetches via Content Distribution Network(CDN) containing multiple caches. Compare the performance of the LeadCache policy (in terms of the number of file fetches) with other existing policies like LRU, LFU, and FIFO. Also studied the performance of the LeadCache policy under Randomized Rounding against the proposed Pipage Rounding.
6. Project presentation as part of course project of **EE6112 Random Processes** in Spring 2021. Discussed how PAC Bayesian bounds can be used to estimate error in image datasets. Plotted theoretical guarantees were given by different meta-learning-based algorithms.
7. Implemented Naïve Bayes classifier and compared its performance with sklearn's Naïve Bayes. Also, polynomial curve fitting on a dataset was observed, and how regularization can be used to avoid overfitting was observed and done as part of **EE5180 Machine Learning** course project.

Research Projects

1. **Satellite Communication Time Series Generation**: A collaborative of Rayleigh, lognormal, and semi-Markov model-based channel modeling between satellite and user-equipment and time Series generation of time-correlated channel coefficients using Jakes spectrum for satellite communication systems.
2. **Statistical Channel Modeling**: Comparative analysis of First Order statistics and second order statistics (Average Fade Duration, Level Crossing rate) of 5G satellite channel model and generic TDL channel model in accordance with the 3GPP standards.
3. **5G/NR NTN Channel Model**: Previously part of IIT Madras team working alongside TCS Research on modeling channel for Land Mobile Satellite(LMS) system in Q/V band, Crest Factor Reduction(CFR) for high bandwidth NTN waveforms and designing novel algorithms for PAPR reduction. Also, I designed a MATLAB-based GUI that will cater to Link Budget calculation for the LMS system.
4. **Age of Information for an Energy harvesting source**: Implemented the Best Effort Uniform(BU) update policy wherein a source sends packets to a receiver depending upon its energy availability. Also designed a threshold-based policy that performs close to the optimal.
5. **Optimization of Age of Information in Adversarial Environments**: Implemented Cellular Max Age(CMA) and Multi Cell Max Weight(MMW) data scheduling policies in a $5G$ mmWave cellular wireless system and also simulated the greedy Max Age CSIT policy for users in a single-cell regime. I extended the policy implementation to multiple cells with random UE movement.
6. **Age of packets in FCFS, LCFS service disciplines**: Implemented variation of latency in packet delivery with server utilization for $M/M/1$, $M/D/1$, and $D/M/1$ queueing systems.$D/M/1$ queueing systems. Extended the simulation results for LCFS queues.

Skills

Programming Languages	MATLAB®	Python	C++	C
OS	Linux	Windows	M.S Office	Mac
Technical tools	Matplotlib	Numpy	Scipy	Pandas
	Omnet++	Scikit-learn	Arduino	LaTeX

Relevant Courses

- Wireless & Cellular Communication
- Advanced Topics in Communications (5G)*
- Digital Signal Processing
- Information Theory
- Analog and Digital Electronics & Circuits
- Probability Theory
- Linear Algebra
- Machine Learning
- Generative AI, from GANs to CLIP, with Python and Pytorch

Teaching Experience

- Applied Programming Lab(Python)
- Probability Foundations
- Microporcessor Theory & Lab

Extra Curricular Activities & Interests

Technical

- Finalist at **eYantra 2017** conducted by IIT Bombay, **Track**: Transporter Bot, **Theme**: Agriculture. Developed computer game on Blender using Python in which the bot loads fruit crates on vehicle which is then transported to market. Constructed the bot using Firebird V ATMEGA 2560 microcontroller and programmed it using Atmel Studio 6.0. Also remotely controlled the bot using wireless communication via Zigbee.
- Worked in **NPTEL GATE portal** as a content creator and reviewer.
- Core member **Techspace**, the Electronics club of USICT wherein I organised Roborace event as part of college technical fest. *2017-2019*

Hobbies	Football	Cricket	Chess
Languages	English	Hindi	Bengali