Gaurav Duggal

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EDUCATION

Virginia Tech, USA, Department of Electrical and Computer engineering **2021 – Present**
Ph.D. in Electrical Engineering

Indraprastha Institute of Information Technology Delhi, Delhi, India   **2017 – 2019**
Masters (M.Tech.) in Communications and Signal Processing   (GPA : 9.04/10.0)

Birla Institute of Technology and Science, Hyderabad, India   **2009 – 2013** Bachelors
(B.E.) in Electrical and Electronics Engineering   (GPA : 7.07/10.0)

PROFESSIONAL EXPERIENCE

Engineer, *Qualcomm*, India (RF software team)   **Jul 2019 – Aug 2021**
- Worked on the algorithm and firmware for managing the RF front end of Qualcomm Modems.
- Coordinated with the Systems team to Debug Customer issues related to the RF front end of Qualcomm Modems.
- Responsible for board bringup across 3 different target modem projects

Research Intern, *Hertzwell*, Singapore   **Dec 2018 – Feb 2019**
- Responsible for the simulation of the complete MIMO Automotive radar scenario including waveform design, ground clutter modelling, automotive target modelling, receiver modelling and signal processing for point cloud generation.

Member of Technical Staff, *Tonbo Imaging*, India   **May 2015 – Jun 2016**
- Worked as an embedded software engineer to develop firmware for a thermal imaging camera system used by Defence Forces across the globe.

Embedded Electronics Engineer, *Ducere Technologies*, India   **May 2015 – Jun 2016**
- Made working prototypes of Wearable technology based design ideas using basic physics and electronics.

Research Intern, *Cranfield University, United Kingdom*   **May 2012 – Jul 2012**
- Designed an Inertial Navigation System (INS) for an Unmanned Ground Vehicle using an accelerometer, magnetometer and gyroscope mems based sensors.
- The INS data was fused with GPS data using a Kalman Filter and the system was tested in a real world scenario

SELECTED PUBLICATIONS

[3] N. Pandey, G. Duggal, en S. S. Ram, "Database Of Simulated Inverse Synthetic Aperture Radar Images For Short Range Automotive Radar", in 2020 IEEE International Radar Conference (**RADAR**), 2020, bll 238–243. [Paper]

[2] G. Duggal, S. Vishwakarma, K. V. Mishra, en S. S. Ram, "Doppler-resilient 802.11 ad-based ultrashort range automotive joint radar-communications system", IEEE Transactions on Aerospace and Electronic Systems, vol 56, no 5, bll 4035–4048, 2020. [Paper]

[1] G. Duggal, S. S. Ram, en K. V. Mishra, "Micro-Doppler and micro-range detection via Doppler-resilient 802.11 ad-based vehicle-to-pedestrian radar", in 2019 IEEE Radar Conference (**RadarConf**), 2019, bll 1–6. [Paper]

GRADUATE COURSEWORK

Software Defined Radios, Stochastic Signals and Systems, Probability and Random Processes, Statistical Signal Processing (Detection), Radar Systems, Reinforcement Learning, Data Structures and Algorithms, Principles of Global Positioning Systems, Massive MIMO and OFDM Technologies for 5G Networks.

TEACHING	**Teaching Assistantship**
	▪ TA for the Grad course - Radar Systems (ECE 5675) with Prof. Mike J. Ruohoniemi (Fall 2021) at Virginia tech
	▪ Wearable Applications, Research, Devices, Interactions (DES 513) with Prof. Aman Parnami (Monsoon 2018)(Aug-Dec) at IIIT Delhi
	▪ Probability And Statistics (MTH 201) with Prof. Sanjit Kaul (Winter 2018)(Jan-May) at IIIT Delhi

PROJECTS

ADS-B Receiver and Antenna Design to Track Aircraft, Dr. SS Ram, Assoc Prof, IIITD

- Designed and Constructed a portable Automatic Dependent Surveillance-Broadcast (ADS-B) radio receiver using a Software Defined Radio and an embedded computer to track commercial aircraft
- Implemented a Matched Filter in the preamble detection stage of the ADSB receiver code.
- Implemented 1 bit error correction for the adsb packet.
- Constructed a phased array antenna based on a paper in the Antennas and Propagation journal, for the system to improve aircraft tracking up to the horizon (400km).

Wide Band Spectrum Monitoring using a Narrow band Receiver, Dr. Bohara, Assoc Prof, IIITD

- Estimating the channel occupancy probability distribution by scanning a wideband channel using a narrowband software defined radio.
- The data collected was put into a histogram and the paraemeters of the probability were estimated by minimising the Kullback-Leiber Diveregence between a parameterized probability distribution and the histogram.

Reinforcement Learning Agent for the Atari game Catch, Dr. Sanjit Kaul, Assoc Prof, IIITD

- Implemented Policy Gradient based methods (2018 research papers) and compared it with Deep-Q learning to learn the optimal policy for Atari game Catch. [Code]

Micro Doppler Radar using HB100 and RCWL-0516, Independent project

- Implemented a Doppler radar by amplifying the received baseband signals using an opamp based active amplifier circuit with adjustable gain.
- Sampled the amplified signal using an Arduino ADC and used Serial to send this data to the computer.
- The digitally sampled signals were processed using an STFT algorithm with a hamming window in Python code. We can see micro Doppler features of the target ceiling fan - blades in the spectrogram output [Code], [Video]

AWARDS

- Secured a scholarship amounting to 960 UK pounds per month for 3 months for a research internship at **Cranfield University**, United Kingdom. **2012**
- **All India Engineering Entrance Exam** - Top 0.4 percent among 1.2 million candidates. **2009**
- **IIT Joint Entrance Exam** - Top 1 percent among 0.5 million candidates. **2009**
- Won an Individual Silver medal (among 77 teams from 11 countries) at the 4th International Young Mathematician's Convention (**IYMC**). **2008**
- **National Cyber Olympiad** - All India Rank 13 **2007**

SKILLS

Languages : C, C++, Python, Matlab
Version Management : Git Perforce