

ARGHA SEN

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Website: <https://arghasen10.github.io/>

Github: <https://github.com/arghasen10/>

Google Scholar: <https://scholar.google.com/citations?user=QF2toEoAAAAJ&hl=en>

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RESEARCH EXPERIENCE

- Experience with **mmWave and acoustic FMCW signal processing** techniques. I have used mmWave and acoustic FMCW sensors for localization, tracking and activity recognition of humans under indoor environments.
- Hands-on experience in **hardware prototyping** including circuit design, circuit debugging, deployment. Developed prototype hardwares for Embedded Pollution Sensors mounted on a drone for air quality assesment.
- Experience conducting **human research studies**. Conducted real-time driver inattenviness study using COTS mmWave Radars by collecting doppler shifts in the mmWave data because of drivers attentive body movements, such as talking, yawning, nodding, etc.
- Experience with design of **UAVs**, control systems, RF communication devices. Developed drones using ArduCopter APM flight controller board and mounted air quality measurement sensors.
- Experience with **Computer Networks**, IoT devices, Distributed Sensor Networks. Worked on energy optimisation in 5G Cellular Networks, using network simulator ns-3.

EDUCATION

Indian Institute of Technology Kharagpur

Jan 2021 - present

Doctor of Philosophy

Department of Computer Science and Engineering

National Institute of Technology Durgapur

August 2016 - June 2020

Bachelor of Technology

CGPA: 8.97

Department of Electronics and Communication Engineering

Higher Secondary School

2016

Central Board Of Higher Secondary Education (CBHSE)

Aggregate Percentage: 95.4

Jawahar Navodaya Vidyalaya, Birbhum

Secondary School

2014

Central Board Of Secondary Education (CBSE)

Cum. GPA: 9.8

Jawahar Navodaya Vidyalaya, Birbhum

PATENTS

1. **Argha Sen, Anirban Das, Sandip Chakraborty** “**A system for in-vehicle passive monitoring of driver behaviors.**”. **India Patent Application: TEMP/E-1/18612/2024-KOL**, filed **2nd February 2024**.

PUBLICATIONS

1. **Argha Sen**, Amrta Chaurasia, Avijit Mandal, Sandip Chakraborty. “**Capturing Human Emotion Pervasively using COTS mmWave Radar**”. Accepted in **ACM COMPASS Posters 2024**.
2. Rajib Sarkar, **Argha Sen**, Sandip Chakraborty. “**Live In-car Traffic Monitoring using mmWave Sensing**”. Accepted in **ACM COMPASS Posters 2024**.
3. **Argha Sen**, Avijit Mandal, Prasenjit Karmakar, Anirban Das, Sandip Chakraborty “**Passive Monitoring of Dangerous Driving Behaviors Using mmWave Radar**”. *Pervasive and Mobile Computing Journal (PMC)*.
4. **Argha Sen**, Soham Chakraborty, Soham Tripathy, Sandip Chakraborty “**Poster: Dynamic Ego-Velocity estimation Using Moving mmWave Radar: A Phase-Based Approach**”. Accepted in **ACM MobiSys Posters 2024**
5. **Argha Sen**, Anirban Das, Swadhin Pradhan, Sandip Chakraborty “**Demo Abstract: MARS -An mmWave-based Multi-user Activity Tracking Solution**”. Accepted in **ACM/IEEE IPSN Demos 2024**
6. **Argha Sen**, Anirban Das, Swadhin Pradhan, Sandip Chakraborty “**Continuous Multi-user Activity Tracking via Room-Scale mmWave Sensing**”. Accepted in **ACM/IEEE IPSN 2024**.
7. **Argha Sen**, Avijit Mandal, Prasenjit Karmakar, Anirban Das, Sandip Chakraborty “**mmdrive: mmWave Sensing for Live Monitoring and On-Device Inference of Dangerous Driving**”. **IEEE Percom 2023**.
8. **Argha Sen**, Anirban Das, Prasenjit Karmakar, Sandip Chakraborty “**mmAssist: Passive Monitoring of Driver’s Attentiveness Using mmWave Sensors**”. **IEEE COMSNETS 2023**.
9. **Argha Sen**, Ayan Zunaid, Soumyajit Chatterjee, Basabdatta Palit, Sandip Chakraborty “**Revisiting Cellular Throughput Prediction: Learning *in-situ* for Multi-device and Multi-network Considerations for 5G**”. **EWSN 2023**
10. Basabdatta Palit, **Argha Sen**, Abhijit Mondal, Ayan Zunaid, Jay Jayatheerthan, Sandip Chakraborty “**Improving UE Energy Efficiency through Network-aware Video Streaming over 5G**”. **IEEE Transactions on Network and Service Management**
11. Praveen Kumar Sharma, Bidyut Dalal, Ananya Mondal, **Argha Sen**, Amartya Banerjee, Sandip Mondal, Tanmay De, Sujoy Saha “**Indoor Air Sensing: A Study in Cost, Energy, Reliability and Fidelity in Sensing**”. **Sensing and Imaging Journal, Springer 2023**
12. **Argha Sen**, Sashank Bonda, Jay Jayatheerthan, Sandip Chakraborty “**Implementation of mmWave-energy Module and Power Saving Schemes in ns-3**”. **WNS3 2022**.
13. **Argha Sen**, Sashank Bonda, Jay Jayatheerthan, Sandip Chakraborty “**An ns3-based Energy Module for 5G mmWave Base Stations**” **IEEE INFOCOM Posters 2022**
14. **Argha Sen**, Abhijit Mondal, Basabdatta Palit, Jay Jayatheerthan, Krishna Paul, Sandip Chakraborty “**An ns3-based Energy Module of 5G NR User Equipments for Millimeter Wave Networks**” **IEEE INFOCOM Posters 2021**
15. Praveen Kumar Sharma, Suraj Gupta, **Argha Sen**, Tanmoy De, Sujoy Saha “**Exploring Collision Avoidance during Communication Over Sound for Healthy Environment**” **SoCIeTY, ICDCN Workshops 2020**
16. **Argha Sen**, Monsij Biswal, Shreyan Datta “**Intelligent Traffic Routing Based on Real-time Congestion Analysis**” **IEEE INDICON 2019**

RESEARCH PROJECTS

- **Real-time Multi-User Localization, Tracking, and Activity Recognition using mmWave Abstract:** With the recent advancement in 5G technology which builds on top of mmWave-based communication, we observe a massive paradigm shift towards a new form of RF sensing where

millimeter-level range-resolution can be achieved in localizing a human subject or in determining their activities. In this project, we study the extent to which we can achieve high granularity mmWave sensing under diverse scenarios such as single or multi-user, macro, or micro-user activities. Finally, we implement a system to accurately localize and track multiple users inside a room and recognize their activities. The system is robust and monitors human activity opportunistically in real time under environment-independent scenarios.

GitHub: <https://github.com/arghasen10/mars>

· **mmWave Sensing for Live Monitoring and On-Device Inference of Dangerous Driving**

Abstract: In this work, we explore the feasibility of purely using mmWave radars to detect dangerous driving behaviors. We first study characteristics of dangerous driving and find some unique patterns of range-doppler caused by 9 typical dangerous driving actions. We then develop a Fused-CNN model to detect dangerous driving instances from regular driving and classify 9 different dangerous driving actions. Through extensive experiments with 5 volunteer drivers in real driving environments, we observe that our system can distinguish dangerous driving actions with an average accuracy of 97.2%. We also compare our approach with existing state-of-the-art baselines to establish its significance.

GitHub: <https://github.com/arghasen10/mmdrive>

WORK EXPERIENCE

Visiting Postgraduate Research Student, SMU, Singapore

Aug 2023 - Feb 2024

- High-Frequency Temporal Eye Movement Features For Robust Biometric Authentication Using Event Cameras
- HyGeNe: Efficient Video Compression Using Hybrid Artificial-Spiking Neural Networks

Teaching Assistant

Jan 2024 - Apr 2024

- NPTEL, Sub: Computer Networks & Internet Protocol

Teaching Assistant

Jan 2023 - Apr 2023

- NPTEL, Sub: Computer Networks & Internet Protocol

Junior Research Fellow (INTEL sponsored Project)

Oct 2020 - April 2023

- Traffic Engineering for Enabling Energy-aware Design in Next Generation Cellular Networks
- mmwave-energy module for ns-3 (Completed)

GitHub: <https://github.com/arghasen10/mmwave-energy>

Teaching Assistant

Jan 2022 - Apr 2022

- NPTEL, Sub: Computer Networks & Internet Protocol

Summer Research Intern

May 2019 - July 2019

Integrated Test Range, Chandipur, DRDO, Govt. of India

- 3D Tracking and Geo-Localization of a target using Unmanned Aerial Vehicles

Winter Research Intern

Nov 2018 - Jan 2019

Mobile Computing & Network Research Group MCNRG, NIT Durgapur

- AeT-Drone: Aerial Environment Sensing and Traffic Surveillance using sensor-enabled Drone/UAV

GitHub: <https://github.com/arghasen10/Image-Processing-in-UAV>

Video: <https://www.youtube.com/watch?v=t7wGiFjItSI>

Summer Intern

May 2018 - July 2018

Criotam Technologies PVT LTD, Bangalore

- Designed and developed three IoT prototypes for Sports Authority of India. (Starting Block, Force Plate, Timing Gates)
- Developed a Facial Recognition system as a LockOut-Tagout (LOTO) system for Industrial IoT.
Video: <https://www.youtube.com/channel/UCeuhgjsfn7CaBQ2TpSGfjUw>

ACHIEVEMENTS

- Recipient of ACM COMPASS Travel Grant for attending ACM COMPASS 2024
- Recipient of ACM MobiSys Student Travel Grant for attending ACM MobiSys 2024
- Recipient of ACM IARCS Travel Grant for attending IPSN 2024
- Recipient of COMSNETS LRN Travel Grant for attending IEEE PerCom 2023
- Recipient of ACM IARCS Travel Grant for attending IEEE PerCom 2023
- Recipient of IEEE INFOCOM Travel Grant for attending IEEE INFOCOM 2021
- Best Project Award at ITR Chandipur, DRDO Project title: 3D Tracking and geolocalization of the target using Unmanned Aerial Vehicles
- Participated in Festival of Innovation and Entrepreneurship (FINE) 2019 at NIF Gandhinagar, Gujarat from March 15 to 18, 2019.
- 1st Position in Techmela, The annual science exhibition organized in AAROHAN 2019. AeT-Drone: Aerial Environment Sensing and Traffic Monitoring with Drone(UAV) complete working prototype presented in Techmela.
- 1st Position in Onspot IoT Hackathon organized in AAROHAN 2019: The first position among 70 entries in IoT Hackathon. An intrusion detection system with a Raspberry Pi Zero working prototype is presented.
- IoT Hackathon Winner: 1st Position in Hackoverflow, IoT Hackathon organized in Aavishkar 2018, Techno-Management fest of NIT Durgapur by GNU LINUX USER'S GROUP and HackerEarth.
- District and School Topper in Higher Secondary Examination, CBHSE.
- Secured 15883 Rank in JEE Main 2016, out of 12,07,058 applicants all over India.

TECHNICAL SKILLS

Strongest Areas - Sensors, Signal Processing, Machine Learning, Embedded Systems, Internet Of Things, Computer networks, Unmanned Aerial Vehicles, Raspberry Pi, Arduino, UDOO Neo

Languages - Python, C, C++, UNIX Shell, JavaScript, Java, HTML, Android.

Tools and Frameworks - MmWave Studio, Matlab, Git, Android Studio, ns3, Mininet

Operating Systems - Linux: Ubuntu, Cent OS, Windows, Android

POSITION OF RESPONSIBILITY

Vice Captain of Team Robocon, NIT Durgapur - Sep 2018-Mar 2019

NIT Durgapur

Teaching Assistant; Computer Networks - Jan 2023-April 2023

IIT Kharagpur

Teaching Assistant; Advances in Operating Systems - July 2022-Nov 2022 IIT Kharagpur

Teaching Assistant; PDS - Jan 2021-July 2022 IIT Kharagpur

PERSONAL DETAILS

Date of Birth: 20th November, 1998

Gender: Male

Nationality: Indian

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REFERENCES

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Indian Institute of Technology Kharagpur , West Bengal, India.
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- # **Prof. Sujoy Saha** *Assistant Professor*
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