Amartya Basu

MS Research scholar, Dept. of CSE, IIT Madras

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Research Interests

My research interest lies in the broad spectrum of wireless based sensing and radio tomography, centered towards design and implementation of intelligent mobile devices that performs real-time interaction with the physical world.

Education

2022-2024   ■ **MS Research in Computer Science and Engineering** , IIT Madras, Chennai, India.
Thesis title: *Mapping pervasive environments using radio tomography and neural radiance field.*
Advisor: *Dr. Ayon Chakraborty.*

2016-2020   ■ **B.Tech in Computer Science and Engineering,** Government College of Engineering and Leather Technology, Kolkata, India.

Experience

2022-2024   ■ **Research Assistant**, Sensing and Networked Systems Engineering (SENSE) Lab, IIT Madras.

2020-2021   ■ **Assistant System Engineer**, Layer 7 team, Tata Consultancy Services, Kolkata.

2019   ■ **Web development intern**, ITC Infotech, Kolkata.

Awards and Achievements

Travel grant award   IITB CSE Research Symposium 2023,
ACM SIGMETRICS/PERFORMANCE 2022.

GATE CS 2020   Secured 98.58 percentile out of $\approx$ 1 lakh candidates.

Skills

Networks	Wireless communication, IoT, 3GPP.
Systems	Computer organization and architecture, operating systems, digital logic.
AI/ML	Statistical machine learning, CNN, RNN, encoder-decoder, transformers, NeRF.
Frameworks	Pytorch, tensorflow, scikit, Sionna.
Languages	C, C++, Java, Python, shell script.
Web Dev	Html, css, javaScript.

Publications

TMC 24   **Amartya Basu**, Ayon Chakraborty, Kush Jajal "Ubiquitous Indoor Mapping using Mobile Radio Tomography" *IEEE Transactions on Mobile Computing, 2024. In review.*

Patents and Inventions

■ With IIT Madras, Chennai, India

1. **A system and method for mapping indoor spaces in real-time**, Amartya Basu and Ayon Chakraborty. Submitted, Indian Patent 202441040240 .

Research projects

MS Thesis ▪ **Mapping pervasive environments using radio tomography and neural radiance field.**
My thesis focuses on design and implementation of prototypes for real-time indoor mapping and UAV based radio environment map (REM) estimation in adversely affected regions. The initial section of the thesis addresses the challenges of indoor mapping using radio tomographic technique. The later section utilizes neural radiance field (NeRF) architecture along with 3D radio tomography to address the existing challenges of REM estimation.

AICCTP project ▪ **Indoor and outdoor people counting using Channel State Information (CSI).**
The project involved utilization of channel state information (CSI) along with machine learning models to count the number of people inside an indoor and outdoor environment. The project addresses the current challenges of occupancy monitoring in places where a camera based infrastructure cannot be deployed.

Course projects

Smart sensing for internet of things — Developed a piezo-electric chip based step counter to monitor user's activity. ▶

Developed an android application to display different physical activities in real-time.

Wireless communication and networks — Developed a simulator to show the optimal building height required for maximum network coverage at different transmission frequencies. 🐙

Worked on the NS-3 simulator to study different wireless path-loss models.

An introduction to deep learning — Implemented a feed forward neural network from scratch along with optimizers like stochastic gradient descent, momentum gradient descent, nesterov accelerated gradient descent, RmsProp, adam, nadam.

Implemented convolution neural network (CNN) using tensorflow for multi-class classification task over 10 classes on Nature12K dataset. Applied transfer learning over different pre-trained CNN models (i.e RESTNET, InceptionNET, GoogleNet) for comparison of results.

Implemented the transliteration encoder-decoder model using recurrent neural network (RNN). Google Dakshina dataset was used for training the model. Used the wandb.ai tool for tuning hyper-parameters.

Pattern recognition and machine learning — Developed a spam-ham email classifier from scratch that classifies spam/ham emails with an accuracy over 85%.

Teaching Assistantships

Jan-May, 2024 **Advanced data structures and algorithm** *(Graduate level).*
Instructor : *Dr. C Pandu Rangan.*

Jul-Nov, 2022 **Foundation for computer system design** *(Undergraduate level).*
Instructor : *Dr. Ayon Chakraborty.*

Services

Reviewer — IEEE Transactions on Mobile Computing, 2024.

IEEE ICDCN 2024 — Volunteer for the IEEE ICDCN 2024 conference held at IIT Madras, Chennai, India.

CSE Bits, 2023 – — Organizer of CSE Bits monthly event in the department of CSE, IIT Madras.

GATE CS NPTEL, 2022 — Worked as the subject matter expert for GATE CS NPTEL . ▶
Subjects : Operating system, computer networks, computer organization and architecture.