Akarsh Prabhakara

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Website · Google Scholar · GitHub · LinkedIn

Research Interests

Sensing Systems, Signal Processing, Machine Learning, Radio Frequency Embedded Systems

Education

Carnegie Mellon University *2018 - 2023*
Ph.D. in Electrical and Computer Engineering — GPA: 3.9/4.0
Advisors: Prof. Anthony Rowe and Prof. Swarun Kumar

National Institute of Technology Karnataka (NITK) *2014 - 2018*
B.Tech. in Electronics and Communication Engineering — GPA: 9.6/10.0

Professional Experiences

Carnegie Mellon University *Aug 2018 - May 2023*
Graduate Research Assistant at WiSE Lab and WiTech Lab
I am passionate about sensing systems. In my graduate research, I work on wireless sensing - that is, how wireless signals can help in sensing everyday objects (like tires) better and also provide new design operating points for classical sensing problems such as depth imaging, localization and robot navigation. My focus is on **millimeter wave sensing** which offers a middle ground between low frequency radio waves and visible/infrared light, thereby bringing both pros and cons to different applications. My solutions tackle these challenges and tend to be end to end system implementations with new hardware and processing techniques. Read more about my work here.

Optum, Pittsburgh *May 2021 - Aug 2021*
Corporate Startup Lab Fellow with Danita Kiser
I helped answer questions about large scale wireless connectivity technologies and build an actionable plan to bridge the divide between urban and rural areas in accessing digital health solutions - a problem that is close to my heart.

Texas Instruments, Dallas *May 2019 - Aug 2019*
Research Intern at Kilby Labs
I tackled the problem of wireless channel congestion and interference in IEEE 802.15.4 networks deployed in large industrial Internet of Things scenarios by devising machine learning pipelines that can predict the channel congestion ahead of time.

Microsoft Research, Bangalore *Aug 2017 - Dec 2017*
Research Intern with Dr. Harsha Simhadri
I built a real-time wake word detection pipeline to detect keywords like "Hey Cortana!" on extremely tiny, resource constrained IoT devices.

University of Lübeck, Germany *May 2017 - July 2017*
Research Intern with Dr. Alfred Mertins
I developed machine learning techniques to solve an audio processing problem of room impulse response interpolation.

Indian Institute of Science, Bangalore *May 2016 - July 2016*
Research Intern with Dr. GV Anand
I worked on fundamental signal processing estimation algorithms to determine direction of arrival of underwater acoustic signals in challenging noisy environments.

Competitions

DARPA Subterranean Challenge
As part of the CMU team, I performed initial experimentation on wireless mesh networking for consistent communication among robots, access points and base station in mines and caves.

IEEE Signal Processing Cup 2017
We built a real-time beat tracking algorithm running on an embedded device reacting to a variety of music signals. Check out our trippy visualizations here!.

IEEE Signal Processing Cup 2016
We developed a solution to extract power signal leaking into recorded audio signals and identify the power grid where audio was recorded. We finished top 15 in the world!

Publications

A Hybrid mmWave and Camera System for Long-Range Depth Imaging.
A Prabhakara, D Zhang*, C Li, S Munir, A Sankaranarayanan, A Rowe, S Kumar.*
Under review

Millimetro: mmWave Retro-Reflective Tags for Accurate, Long Range Localization.
E Soltanaghaei, A Prabhakara*, A Balanuta*, M Anderson, J Rabaey, S Kumar, A Rowe.*
ACM MobiCom. 2021.

A Community-Driven Approach to Democratize Access to Satellite Ground Stations.
V Singh, A Prabhakara, D Zhang, O Yağan, S Kumar.
ACM MobiCom. 2021.
ACM GetMobile Research Highlight

TagFi: Locating an Ultra-Low Power Tag Using Existing WiFi Infrastructure.
E Soltanaghaei, A Dongare, A Prabhakara, S Kumar, A Rowe, K Whitehouse.
Ubicomp. 2021.

Osprey: A mmWave Approach to Tire Wear Sensing.
A Prabhakara, V Singh, S Kumar, A Rowe.
ACM MobiSys. 2020.
Best Paper Honorable Mention, Best Demo, ACM GetMobile Research Highlight
Press: Gizmodo, Hackster.io, TedX Innovation Expo and That's Cool News Podcast.

Underwater Acoustic Source Localization by Vector Sensor Array using Compressive Sampling.
PV Nagesha, GV Anand, S Gurugopinath, A Prabhakar.
MTS/IEEE Oceans. 2016.

Patents

Tire Sensing Systems and Methods.
A Prabhakara, V Singh, S Kumar, A Rowe, T Wei, H Dorfi
Patent Pending.

Awards

- ACM GetMobile Research Highlight for Quasar — 2022
- Corporate Startup Lab Fellowship — Summer 2021
- ACM GetMobile Research Highlight for Osprey — 2021
- CMU ECE Department Award for Exemplary Qualifying Exam Performance — Spring 2020
- Best Paper Honorable Mention, ACM MobiSys — 2020
- Best Demo, ACM MobiSys — 2020
- Carnegie Institute of Technology Dean's Fellowship — 2018-2019
- DAAD WISE Fellowship — 2017
- Indian Academy of Sciences' Summer Research Fellowship — 2016
- Best Outgoing Student Award — 2014 and 2012

Skills

Hardware		Software	
• RF Circuits Simulation	Ansys HFSS	• Programming Languages	C · C++ · Python · Matlab
• PCB Design	Eagle	• Distributed and Parallel API	OpenMP · MPI
• Radios	mmWave radars (TI & Infineon) · Ettus USRP · IoT LoRa pHAT	• ML Frameworks	PyTorch · Tensorflow · Keras
• Cameras	FLIR · Optitrack · Intel T265	• Miscellaneous	ROS · PCL · MQTT · Docker · Cartographer
• Lidars	Ouster · Velodyne		