

RESEARCH	I am a wireless and cyber-physical systems researcher that builds <b>compact wireless systems with high quality sensing capabilities</b> . I achieve this by developing new hardware, leveraging machine learning and novel signal processing, and balancing system constraints on communication and sensing computation. I build end-to-end systems with transformative implications spanning cyber-physical systems, wireless communication and robotics.
INTERESTS	<i>Research:</i> Cyber-Physical-Systems, Radio Frequency Sensing Systems, Next Gen Wireless Systems <i>Application Themes:</i> Automotive, Robotics, Critical Infrastructure Monitoring <i>Core:</i> Wireless Systems, Signal Processing, Embedded Systems, Computer Networks
EDUCATION	<b>Carnegie Mellon University</b> <span style="float: right;">2018 - 2024</span> Ph.D. in Electrical and Computer Engineering — GPA: 3.9/4.0 <i>Advisors:</i> Prof. Anthony Rowe and Prof. Swarun Kumar <i>Committee Members:</i> Prof. Aswin Sankaranarayanan (CMU) and Prof. Mani Srivastava (UCLA) <b>National Institute of Technology Karnataka</b> <span style="float: right;">2014 - 2018</span> B.Tech. in Electronics and Communication Engineering — GPA: 9.6/10.0
PROFESSIONAL EXPERIENCES	<b>Zendar, Berkeley</b> <span style="float: right;">May 2022 - Aug 2022</span> Research Intern with Dr. Darsh Ranjan <b>Optum, Pittsburgh</b> <span style="float: right;">May 2021 - Aug 2021</span> Corporate Startup Lab Fellow with Danita Kiser <b>Texas Instruments, Dallas</b> <span style="float: right;">May 2019 - Aug 2019</span> Research Intern at Kilby Labs with Xiaolin Lu <b>Microsoft Research, Bangalore</b> <span style="float: right;">Aug 2017 - Dec 2017</span> Research Intern with Dr. Harsha Simhadri <b>University of Lübeck, Germany</b> <span style="float: right;">May 2017 - July 2017</span> Research Intern with Dr. Alfred Mertins <b>Indian Institute of Science, Bangalore</b> <span style="float: right;">May 2016 - July 2016</span> Research Intern with Dr. GV Anand
AWARDS	<ul style="list-style-type: none"><li>• Best Presentation Runner Up, Ph.D. Forum ACM/IEEE IPSN <span style="float: right;">2023</span></li><li>• Best Demo Runner Up, ACM/IEEE IPSN <span style="float: right;">2023</span></li><li>• Top 5 Best Demos, ACM MobiCom <span style="float: right;">2023</span></li><li>• Trailblazer Alumni - Kumarans Educational Council <span style="float: right;">2022</span></li><li>• ACM GetMobile Research Highlight for Quasar <span style="float: right;">2022</span></li><li>• Corporate Startup Lab Fellowship <span style="float: right;">2021</span></li><li>• ACM GetMobile Research Highlight for Osprey <span style="float: right;">2021</span></li><li>• CMU ECE Department Award for Exemplary Qualifying Exam Performance <span style="float: right;">2020</span></li><li>• Best Paper Honorable Mention, ACM MobiSys <span style="float: right;">2020</span></li><li>• Best Demo, ACM MobiSys <span style="float: right;">2020</span></li><li>• Carnegie Institute of Technology Dean's Fellowship <span style="float: right;">2018-2019</span></li><li>• DAAD WISE Fellowship <span style="float: right;">2017</span></li><li>• Indian Academy of Sciences' Summer Research Fellowship <span style="float: right;">2016</span></li><li>• Final Fifteen of the IEEE Signal Processing Cup <span style="float: right;">2016</span></li><li>• Best Outgoing Student Award <span style="float: right;">2014 and 2012</span></li></ul>

CONFERENCE  
PUBLICATIONS  
(PEER  
REVIEWED)

**Millimeter Wave Imaging from a Single Antenna.**

*A Prabhakara, Y Liu, A Rowe, A Sankaranarayanan, S Kumar.*  
In Preparation.

**Neural Radar Fields.**

*J Miller\*, T Huang\*, A Prabhakara, T Jin, T Laroia, Z Kolter, A Rowe.*  
In Submission.

**Multi-Bounce Scattering to Image beyond mmWave Field of View.**

*N Mehrotra, D Pandey, A Prabhakara, Y Liu, S Kumar, A Sabarwal*  
In Submission.

**Reprogramming Wireless Signal Distributions Using Soft Robots.**

*Y Liu, J Zhu, A Prabhakara, S Kumar.*  
In Submission.

**High Resolution Point Clouds from mmWave Radar.**

*A Prabhakara, T Jin, A Das, G Bhatt, L Kumari, E Soltanaghai, J Bilmes, S Kumar, A Rowe.*  
IEEE ICRA 2023.

**Platypus: Sub-mm  $\mu$ -Displacement Sensing with Passive mmWave Tags As Phase Carriers.**

*T King, J. He, C. Yao, A Prabhakara, M Alipour, S Kumar, A Rowe, E Soltanaghai.*  
ACM/IEEE IPSN 2023.

**Exploring mmWave Radar and Camera Fusion for High-Resolution and Long-Range Depth Imaging.**

*A Prabhakara\*, D Zhang\*, C Li, S Munir, A Sankaranarayanan, A Rowe, S Kumar.*  
IEEE/RSJ IROS 2022.

**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, 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 Prabhakara.*  
MTS/IEEE Oceans 2016.

SYMPOSIUMS  
(PEER  
REVIEWED)

**Zoom Out: Abstractions for Efficient Radar Algorithms on COTS architecture.**

*TM Low, Y Chi, J Hoe, S Kumar, A Prabhakara, L Shi, U Sridhar, N Tukanov, C Wang, Y Wu.*  
IEEE Phased Array Systems and Technology (PAST) 2022.

POSTERS,  
DEMOS,  
MAGAZINES  
(PEER  
REVIEWED)

**RadarHD: Demonstrating Lidar-like Point Clouds from mmWave Radar.**

*A Prabhakara, T Jin, A Das, G Bhatt, L Kumari, E Soltanaghai, J Bilmes, S Kumar, A Rowe.*  
ACM MobiCom Demo 2023.

Top 5 Best Demos

**Pushing the Limits of High Resolution Sensing with Single-Chip mmWave Radar.**

*A Prabhakara.*

ACM/IEEE IPSN Ph.D. Forum 2023.

Best Presentation Runner Up

**Demo Abstract: Platypus: Sub-mm  $\mu$ -Displacement Sensing with Passive mmWave Tags As Phase Carriers.**

*J. He, T King, C. Yao, A Prabhakara, M Alipour, S Kumar, A Rowe, E Soltanaghai..*

ACM/IEEE IPSN Demo 2023.

Best Demo Runner Up

**A Community-Driven Approach to Democratize Access to Satellite Ground Stations.**

*V Singh, A Prabhakara, D Zhang, O Yağan, S Kumar.*

ACM GetMobile Magazine Mar 2022.

**Long-range Accurate Ranging of Millimeter-wave Retro-reflective Tags in High Mobility.**

*TH King, E Soltanaghai, A Prabhakara, A Balanuta, S Kumar, A Rowe.*

ACM MobiCom Demo 2021.

**OSPREY: A mmWave Approach to Tire Wear Sensing.**

*A Prabhakara, V Singh, S Kumar, A Rowe.*

ACM GetMobile Magazine Dec 2020.

**Osprey Demo: A mmWave Approach to Tire Wear Sensing.**

*A Prabhakara, V Singh, S Kumar, A Rowe.*

ACM MobiSys Demo 2020.

Best Demo

PATENTS

**Methods, Systems And Low Power Retrodirective RF Tags for Localization.**

*E Soltanaghai, A Rowe, S Kumar, A Prabhakara, A Balanuta*

US 2022/0244374A1

**Tire Sensing Systems and Methods.**

*A Prabhakara, V Singh, S Kumar, A Rowe, T Wei, H Dorfi*

WO 2021/231381

RESEARCH  
TALKS

- ICRA 2023 2023  
*High resolution point clouds from mmWave radar*
- IPSN 2023 Ph.D. Forum 2023  
*Pushing the limits of high resolution sensing with single-chip mmWave radar*
- Microsoft Research India 2022  
*Pushing the limits of high resolution sensing with single-chip mmWave radar*
- IROS 2022 2022  
*Exploring mmWave radar and camera fusion for high-resolution and long-range depth imaging*
- DARPA/SRC CONIX Annual Review 2022  
*RF Sensing: CONIX and beyond ...*
- TedX CMU Innovation Expo 2021
- MobiSys 2020 2020  
*Osprey: A mmWave approach to tire wear sensing*
- DARPA/SRC CONIX Student Seminar 2020  
*Osprey: A mmWave approach to tire wear sensing*

PRESS ARTICLES	<ul style="list-style-type: none"> <li>• Pioneering Minds “Low Power, High Accuracy Tag That Can Improve Autonomous Driving”</li> <li>• That’s Cool News Podcast “Osprey: Utilizing mmWaves to Sense Vehicle Tire Wear and Tear — Akarsh Prabhakara”</li> <li>• Hackster.io “Researchers Develop System That Monitors Tire Wear in Real-Time”</li> <li>• Gizmodo “Researchers Find That Radar Can Be Used to Detect a Nail in a Tire Long Before It Goes Flat”</li> <li>• Weibold “Radar to monitor tire wear developed by American engineers”</li> <li>• Wonderful Engineering “This Radar Based Device Can Detect Tire Punctures Along With Wear And Tear”</li> <li>• Interesting Engineering “Radar Can Be Used to Detect Tire Wear and Tear, Nail Punctures”</li> <li>• Tyrepress.com “Measuring tyre wear with on-car radar”</li> </ul>
ENGINEERING TEAM COMPETITIONS	<p><b>DARPA Subterranean Challenge 2019</b> As part of the winning <a href="#">CMU team</a>, I performed initial experimentation on wireless mesh networking for consistent communication among robots, access points and base station in mines and caves.</p> <p><b>IEEE Signal Processing Cup 2017</b> 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 <a href="#">here!</a>.</p> <p><b>IEEE Signal Processing Cup 2016</b> We developed a solution to extract power signal leaking into recorded audio signals and geolocate the power grid where audio was recorded. We finished top 15 in the world!</p>
RESEARCH MENTORING	<ul style="list-style-type: none"> <li>• John Martins (CMU UG) <span style="float: right;">2023</span></li> <li>• Priyadarshini Kulkarni (CMU Masters) <span style="float: right;">2022</span></li> <li>• Tao Jin (CMU Masters → CMU Ph.D.) <span style="float: right;">2021-2022</span></li> <li>• Chao Li (CMU UG → MIT Ph.D.) <span style="float: right;">2021-2022</span></li> <li>• Thomas Horton King (CMU UG → Stanford Ph.D.) <span style="float: right;">2020-2021</span></li> </ul>
TEACHING	<ul style="list-style-type: none"> <li>• Graduate Teaching Assistant at CMU: Developed course material, gave lectures, and worked with students through assignments. <ul style="list-style-type: none"> <li>• Wireless Communication <span style="float: right;">Fall 2021</span></li> <li>• Computer Networks <span style="float: right;">Spring 2020</span></li> </ul> </li> <li>• Guest Lectures <ul style="list-style-type: none"> <li>• Intro to Computer Systems, CMU ECE <span style="float: right;">Spring 2023</span></li> <li>• Advanced Topics in Communication, UW EE <span style="float: right;">Spring 2023</span></li> </ul> </li> </ul>
PEER REVIEWING	<ul style="list-style-type: none"> <li>• 2024: IEEE ICRA</li> <li>• 2023: Transactions on Networking (ToN), Intelligent Vehicles (TIV), Sensor Networks (ToSN)</li> <li>• 2022: IMWUT, Transactions on Sensor Networks (ToSN)</li> <li>• 2021: Shadow Program Committee ACM Compass</li> </ul>
ORGANIZATION AND LEADERSHIP	<ul style="list-style-type: none"> <li>• Co-chair S3 workshop at ACM MobiCom <span style="float: right;">2023</span></li> <li>• Member of CMU ECE student council for faculty candidate interviews <span style="float: right;">2023</span></li> <li>• Treasurer of CMU ECE Graduate Student Organization <span style="float: right;">2019-2022</span></li> <li>• Joint-Secretary of IEEE Chapter at NITK <span style="float: right;">2017-2018</span></li> </ul>
SOCIETAL OUTREACH	<ul style="list-style-type: none"> <li>• Mentored 5 Masters and early Ph.D. students as part of CMU ECE’s Peer Mentor Program organized by the Diversity, Inclusion and Outreach Committee.</li> <li>• Worked with Optum Inc. about large scale wireless connectivity technologies and built an actionable plan to bridge the urban/rural divide in accessing digital health solutions.</li> <li>• Developer and Instructor at CMU ECE Outreach program. I developed lab sessions and organized hardware building for middle and high school students in the Pittsburgh region.</li> </ul>