

Roshan Ayyalasomayajula

Education

- 2019-
Ongoing **Doctor of Philosophy (Ph.D.)**, *University of California San Diego, Jacobs School of Engineering*,
PI: Prof. Dinesh Bharadia. Co-advised by Prof. Deepak Vasisht.
Major: Signal and Image Processing.
- Passed Candidacy Exam on March 13th, 2020 chaired by Dinesh Bharadia and with committee members: Deepak Vasisht, Peter Gerstoft, Nuno Vasconcelos, Xinyu Zhang, and Alex Snoeren.
- May 2019 **Masters (M.S.)**, *University of California San Diego, Jacobs School of Engineering*,
PI: Prof. Dinesh Bharadia..
Major: Electrical and Computer Engineering, **GPA: 3.86 (out of 4)**
- Graduate Research Assistant with Prof. Dinesh Bharadia.
 - **Selected Courses:** Statistical Learning, Linear Algebra, Neural Network/Pattern Recognition, Convex Optimization, Principles of Wireless Networks, Multi-User Communication Systems, Filter banks and Wavelets
- May 2016 **Bachelors of Technology (B.Tech.)**, *Indian Institute of Technology (IIT Roorkee)*, India.
Major: Electronics and Communication Engineering, **GPA: 9.17 (out of 10)**
- Departmental Rank 2
 - **Selected Courses:** Advanced Digital Communications, Artificial Neural Networks and Applications, Digital Signal Processing, Signals and Systems, Operation Research, Microwave Techniques, Principles of Digital Communication, Engineering Electro-magnetics, Advanced Optimization Techniques

Research

- 2018-
Ongoing **WILD: Wireless Indoor Localization Datasets**, *Supervisor: Prof. Dinesh Bharadia and Prof. Deepak Vasisht.*
- Developed an automated bot that can collect real-time maps and WiFi data across the WiFi anchors in the system.
 - Developing a simulation framework to generate more RF data for simulated indoor scenarios to further augment the existing WiFi data.
 - Used and expanding the real-world data in DLoc, and simulated data for future understanding of indoor RF characteristics
- 2019-2021 **ULoc: UWB based accurate 3D Indoor Localization**, *Supervisor: Prof. Dinesh Bharadia.*
- Developed a UWB based, infrastructure driven, and cm-accurate 3D localization
 - Augmented the existing UWB chipsets to extract 3D direction of arrival of the transmitter in realtime with low-power.
- 2018-2019 **DLoc: Achieving context assisted Indoor WiFi localization**, *Supervisor: Prof. Dinesh Bharadia and Prof. Deepak Vasisht.*
- Developed a novel deep learning architecture (DeepLoc) to overcome the problems of multipath resolution, random phase offsets and bandwidth dependant resolution in WiFi based indoor localization.
 - Developed an autonomous SLAM based platform to assist DeepLoc by collecting context labelled data.
- 2018-2019 **LocAP: Efficient Reverse Localization of WiFi access points in an Indoor environment**, *Supervisor: Prof. Dinesh Bharadia.*
- Developed a novel algorithm to accurately locate (up to few centimeters) the WiFi access point and identify its antenna geometry (up to few millimeters).
 - RevLoc facilitates CSI based WiFi indoor localization by providing accurate knowledge of the position and geometry of WiFi access points.
- 2017-2018 **BLoc: Bluetooth Low Energy Localization**, *Supervisor: Prof. Dinesh Bharadia and Prof. Deepak Vasisht.*
- Developed the first CSI based indoor localization algorithm using Bluetooth Low Energy (BLE).
 - Achieved a median error of 76 cm in real world deployment of 5m×6m.

Conference Publications

- ICASSP 2021 Yifan Wu, **Roshan Ayyalasomayajula**, MichaelBianco, Dinesh Bharadia, Peter Gerstoft. Blind Sound Source Localization based on Deep Learning. In proceedings of the 46th edition of The international Conference on Acoustics, Speech, & Signal Processing (ICASSP'21).IEEE, Toronto, Canada
- NSDI 2020 **Roshan Ayyalasomayajula**, Srivatsan Rajagopalan, Aditya Arun, Shreya Ganesaraman, Aravind Seetharman, Chenfeng Wu and Dinesh Bharadia. LocAP: Accurate Localization of Existing WiFi Infrastructure . In proceedings of 17th USENIX Symposium on Networked Systems Design and Implementation(NSDI'20).USENIX, Santa Clara, CA, USA
- Mobicom 2020 **Roshan Ayyalasomayajula**, Aditya Arun, Chenfeng Wu, Sanatan SharmaAbhishek Sethi, Deepak Vasisht, and Dinesh Bharadia. Deep learning based wireless localization for indoor navigation. In Proceedings of the 26th Annual International Conference on Mobile Computing and Networking.ACM, London, UK.
- CONEXT 2018 **Roshan Ayyalasomayajula**, Deepak Vasisht, and Dinesh Bharadia. BLoc: CSI-based Accurate Localization for BLE Tags . In Proceedings of International Conference on emerging Networking EXperiments and Technologies (CoNEXT'18).ACM, New York, NY, USA.
- CVIP 2017 **Roshan Ayyalasomayajula** and Pankajakshan, V., 2017. Differentiating Photographic and PRCG Images Using Tampering Localization Features. In Proceedings of International Conference on Computer Vision and Image Processing (pp. 429-438). Springer, Singapore.

Journal Publications

- JASA Vol.150 Issue 5 Yifan Wu, **Roshan Ayyalasomayajula**, MichaelBianco, Dinesh Bharadia, Peter Gerstoft. Sound source localization based on multi-task learning and image translation network. In The Journal of the Acoustical Society of America 150, 3374 (2021); doi: 10.1121/10.0007133
- IMWUT Vol.5 Issue 3 Minghui Zhao, Tyler Chang, Aditya Arun, **Roshan Ayyalasomayajula**, Chi Zhang, Dinesh Bharadia. ULoc: Low-Power, Scalable and cm-Accurate UWB-Tag Localization and Tracking for Indoor Applications. In Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies 5.3 (2021): 1-31.

Patents

Ayyalasomayajula SR, Bharadia D, Vasisht D, Katabi D, inventors. Location determination of wireless communications devices. United States patent application US 16/731,738. 2020 Jul 2.

Posters & Demos

- NSDI 2020 **Roshan Ayyalasomayajula**, Srivatsan Rajagopalan, Aditya Arun, Shreya Ganesaraman, Aravind Seetharman, Chenfeng Wu and Dinesh Bharadia. LocAP: Accurate Localization of Existing WiFi Infrastructure . In proceedings of 17th USENIX Symposium on Networked Systems Design and Implementation(NSDI'20).USENIX, Santa Clara, CA, USA

Professional Experience

April–July 2021 **Microsoft Research**, *Remote Intern*.

- Topic: **Soil Parameter Estimation** | Mentors: Bodhi Priyantha
- Developed a simple signal strength based soil parameter estimation model
 - Tested the system on various soil samples

March–June 2020 **Nokia Bell Labs**, *Remote Intern*.

- Topic: **Passive WiFi Sensing** | Mentors: Enrico Rantala, Swetha Muniraju
- Worked towards developing a passive WiFi based activity sensor for home applications
 - Developed a basic framework to analyze the data using deep learning tools
 - verified the failure cases of this system in real-world setups

Technical Skills

- Programming C/C++ (beginner), Python (intermediate), MATLAB (intermediate), Shell (beginner)
- Packages PyTorch (intermediate), TensorFlow (beginner), CVX (intermediate)
- Software Git, L^AT_EX, LTspice, Cadence Virtuoso, Verilog-VHDL

Selected Projects

- 2020-
Ongoing **PhoneSLAM: Mapping and navigating in an indoor environment with an off the shelf Smartphone**,
Supervisor: Prof. Dinesh Bharadia.
- Utilizing on-board hardware of smartphones to not only map the physical indoor environment, but also the WiFi map to assist indoor navigation.
- Jan–Mar
2018 **Question Answering Using Memory Networks**, *Course Project with Prof. Gary Cottrell.*
- Performed End-to-End learning for question answering tasks by the use of Memory networks.
 - Used Facebook's MemN2N architecture as a reference and added some novel contributions to achieve the objective, like LSTM for sentence representation in embedding space.
- 2015–2016 **Countering Anti-JPEG Forensics**, *B.Tech. Thesis, IIT Roorkee | Mentor: Prof. Vinod Pankajakshan.*
- Identified a feature set (Subtractive Adjacency Matrices) extracted from the spatial and frequency domain adjacent pixel dependencies to identify various kinds of Anti-JPEG operation.

Mentoring/Teaching Experience

- Winter 2020 **Teaching Assistant**, *UCSD, ECE 257B - Principles of Wireless Networks or Modern Wireless Communications.*
Helped the professor schedule the classes, design and grade assignments and examinations.
- Summer
2018, 2019,
and 2020 **PhD Mentor, SRIP**, *UCSD ECE Department.*
Guided a Masters student and four undergraduate students in their research towards summer internship at UCSD in the Summer Research Internship Programme (SRIP)

Awards and Honours

- Achieved 2nd highest GPA: 2016 Final year ECE, IIT Roorkee.
- Awarded Shri Raghuraj Behari Mathur Cash Prize for obtaining Highest Cumulative GPA in B.Tech. Civil Engg. I year(Male Student), 2012.
- Secured All India Rank 2672 (amongst 0.5 million students) in IIT- Joint Entrance Exam 2012.
- Secured All India Rank 37 (amongst 1.3 million students) in AIEEE (All India Engineering Entrance Examination) 2012.