ANURAG PALLAPROLU

Ph.D. Candidate in Electrical and Computer Engineering

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EXPERIENCE

University of California Santa Barbara

Research Assistant, Electrical and Computer Engineering

Sep 2019 – Present Santa Barbara, California, USA

- Designed and deployed end-to-end wireless sensing systems on commodity 5 GHz WiFi and 77 GHz mmWave
- Built core signal-processing and ML components for RF pipelines, enabling robust target detection, real-time crowd size estimation, and static object imaging
- Developed automation pipelines for Ansys HFSS and REMCOM Wireless InSite to enable large-scale EM simulation sweeps and dataset generation
- Led extensive WiFi and mmWave experimental campaigns to validate imaging and crowd-sensing pipelines across 5+ real-world deployments
- Teaching Assistant for communication systems, circuits, probability theory; mentored 50+ students across discussion sections and labs (most scoring above 90%)

Qualcomm Technologies Inc.

VLSI CAD Engineer

Aug 2017 – Sep 2019 Bengaluru, Karnataka, India

- Developed and maintained backend CAD automation flows, including hierarchical extraction (Synopsys StarRC) and fill-DEF back-annotation (Calibre FDI) for advanced-node SoCs
- Designed optimization methods for post-route hold-fix ECO cycles to reduce buffer count and improve timing-closure efficiency
- Applied statistical ML methods (e.g., random forest regression) for die overdrive voltage margin characterization and project resource forecasting in advanced-node SoC designs
- Supported several high-volume SoC tapeouts through sign-off debug, flow automation, and cross-team engineering support

Prior Research & Industry Experience

- **STMicroelectronics Pvt. Ltd.**
  Intern, Standard Cells Team, Noida, India Jan 2017 - Jun 2017
- **Physical Research Laboratory (PRL)**
  Summer Research Fellow, Ahmedabad, India May 2016 - Jul 2016
- **Indian Institute of Science (IISc)**
  Junior Research Fellow, Bengaluru, India May 2015 - Jul 2015

SUMMARY

Systems-focused wireless engineer experienced in production-ready sensing and perception pipelines. Strong track record in prototyping embedded RF platforms, designing real-time signal-processing algorithms, and shipping scalable ML models for sensing tasks.

EDUCATION

Ph.D. in Electrical and Computer Engineering

UC Santa Barbara, California, USA

Expected June 2026, Advisor: Dr. Y. Mostofi

M.S. in Electrical and Computer Engineering

UC Santa Barbara, California, USA

December 2020 GPA: 3.97/4

B.E. (Hons.) Electrical Engineering and M.Sc. (Hons.) in Physics

Birla Institute of Technology & Science, Pilani, Rajasthan

July 2017 GPA: 8.14/10

SKILLS

- **Radar Signal Processing**
  FMCW Range–Doppler Analysis, micro-Doppler, SAR/MIMO Radar
- **Computational Electromagnetics**
  Finite Element Analysis, Ray Tracing, Batch EM simulation workflows
- **Machine Learning for Sensing**
  Temporal Convolutional Networks (TCNs), PyTorch, LightGBM, Optuna
- **Programming & Scripting**
  Python (NumPy/SciPy), C++, MATLAB, Verilog, TCL, OpenCV, Shell
- **Modeling RF Wave Propagation**
  Diffraction (GTD/UTD), occlusion modeling in mmWave channels
- **Designing Experimental RF Platforms**
  Prototyping on embedded WiFi and mmWave sensing systems

PUBLICATIONS & PATENTS

mmWave Sensing & Crowd Analytics

- Demonstrated that systematic undercounting caused by human occlusions in mmWave **crowd size estimation** is a useful indicator of occupancy. Achieved crowd size MAE of 1.53 persons over 22 field experiments in 4 areas
- Developed a **location-dependent visibility model** to handle non-uniform spatial layouts. Achieved MAE of 0.48 persons across 5 distinct crowd spatial distributions
- Reconstructed crowd flow topology from mmWave point clouds via compact **crowd flow field** representations. Achieved 0.45 m average closest-point error and 8.8° orientation MAE across 17 field experiments

Related Publications:

- ◇ **Crowd Analytics with a Single mmWave Radar**, ACM MobiCom 2024
- ◇ **Crowd Size Estimation for Non-Uniform Spatial Distributions with mmWave Radar**, Asilomar Conference on Signals, Systems, and Computers 2025
- ◇ **mmFlux: Crowd Flow Analytics with Commodity mmWave MIMO Radar**, npj Wireless Technology 2025

WiFi Imaging & Diffraction-Based RF Modeling

- Demonstrated that **edge diffraction** encodes richer geometric information than surface reflections, enabling imaging of extended objects with commodity WiFi transceivers — validated over 37 experiments in 3 environments (including through-wall)
- Experimentally characterized **Keller cones** at 5 GHz, demonstrating reliable edge-based imaging even for objects without visibly sharp edges
- Proposed **edge-lattice metasurfaces** for RF field programming and multi-point focusing. Achieved up to 4 simultaneous focal points with 10.9 dB peak focal gain using fully passive, low-cost elements, validated in 13 experiments across 3 indoor setups

Related Publications:

- ◇ **Embracing Diffraction: A Paradigm Shift in Wireless Sensing and Communication**, IEEE Journal of Selected Topics in Electromagnetics, Antennas and Propagation 2025
- ◇ **Exploiting Diffraction For Sensing With RF Signals And/Or For RF Field Programming**, US Patent Application No. 18/904,812, 2024
- ◇ **I Beg to Diffract: RF Field Programming With Edges**, ACM MobiCom 2023
- ◇ **Analysis of Keller Cones for RF Imaging**, IEEE RadarConf 2023
- ◇ **Wiffract: A New Foundation for RF Imaging via Edge Tracing**, ACM MobiCom 2022

AWARDS

- **Dissertation Fellowship**
  ECE Department, UCSB, 2025
- **Finalist, Student Paper Contest**
  Asilomar Conference on Signals, Systems, and Computers, 2025
- **2 x Outstanding Reviewer**
  ACM IMWUT, 2025
- **3 x Travel Grant Recipient**
  Academic Senate, UCSB (2025), National Science Foundation (2023), ACM SIGMOBILE (2022)
- **3 x Outstanding TA Award**
  ECE Dept., UCSB, 2019-2022
- **1st in New Venture Competition**
  Technology Management Program, UC Santa Barbara, 2020
- **10 x Qualstar Award**
  Qualcomm Inc., 2017-2019

TOOLS

Ansys HFSS (FEM/SBR+) | Git | REMCOM Wireless InSite | LevelDB / SQLite | Fusion 360

EDA Tools (Industry Experience)

Cadence Virtuoso / Genus / Innovus | Synopsys ICC II, StarRC | Calibre

COURSEWORK

Imaging Systems | Wireless Communications | Theoretical Machine Learning | Optimal Estimation & Filtering | Multirate Digital Signal Processing

PEER REVIEW SERVICE

- IEEE Internet of Things Journal (2025)
- ACM IMWUT (2025, 2 Cycles)
- IEEE GLOBECOM Workshops (2025)
- ACM MobiCom (2024)
- IEEE Signal Processing Letters (2023)
- IEEE Comm. Magazine (2022)