Anish Pradhan

Ph.D. Candidate (ECE)
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Contact Information

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Research Interests

Wireless communications; Reconfigurable intelligent surfaces; Optimization; Phased Antenna Array; Beam management; Probability; THz; AR/VR; 4G LTE/LTE-A; 5G NR; 6G; Machine learning.

Education

Virginia Tech, Blacksburg, Virginia. **Aug. 2019 - Present**
MS (obtained) and Direct Ph.D. in Electrical Engineering (GPA 3.87/4.0)
- Expected graduation: May 2025
- Advisor: Prof. Harpreet S. Dhillon

National Institute of Technology, Durgapur, India. **2014 - 2018**
B. Tech. in Electronics and Communication Engineering (GPA 9.6/10.0, Class Rank: 1/95)
- Advisor: Dr. Sanjay Dhar Roy
- Final Year Project Topic: Reliable IoT Communication in LTE Environment through D2D Link

Work Experience

NXP Semiconductors, San Jose, California.
Wireless System Engineering Intern

- **Beam Management in mmWave Systems (802.11ad)** **May 2024 - Aug. 2024**
  * Designed a reference codebook with 3D sector beams and compared different codebooks in terms of reach, coverage, sensitivity and robustness.
  * Integrated beam-training protocol to the mmwave WiFi simulator.
  * Collaborated with the RF team to perform throughput tests on the mmwave testbed.

Virginia Tech, Blacksburg, Virginia.
Graduate Research Assistant

- **Reconfigurable Intelligent Surface-aided (RIS) Systems** **Aug. 2019 - Present**
  Funded by National Science Foundation (NSF)
  * Developed a framework optimizing RIS-assisted THz communication for maximum throughput, incorporating a THz channel model that considers scattering and noise in re-radiated signals.
  * Developed a novel probabilistic optimization technique for discrete RIS optimization and maximized SINR, overhead-aware rate and energy efficiency (EE) as case studies.
  * Currently working on optimizing real-world RISs to enable coexistence with minimal information.
- **Open Radio Access Network (ORAN)** **Jan. 2024 - Present**
  Funded by National Telecommunications and Information Administration (NTIA)
  * Investigating various statistical methods to interpret the data from the ORAN testbed.
  * Establishing workflows to obtain service-specific KPIs such as video streaming.
- **Channel Modeling** **Aug. 2019 - Aug. 2022**
  * Developed an LoS THz channel model considering radiation trapping effects.
  * Developed a geometry-based stochastic channel model (GSCM) with dual visibility regions that can capture more complicated GSCMs and used stochastic geometry to derive propagation characteristics.

Indraprastha Indian Institute of Technology Delhi (IIIT-D), India. **May 2018 - Oct. 2018**
Research Intern

- **MIMO Communication in Presence of Non-ideal Amplifiers**
  * Simulated MU-MIMO OFDM systems with non-ideal power amplifiers and phase noise.
  * Studied basics of USRP Rio and LTE application framework.

Relevant Publications

Journals

[J6] **A. Pradhan**, I. Alamzadeh, M. F. Imani, and H. S. Dhillon, "RIS-Aided Coexistence in Wireless Networks Using Angular Information," *Scientific Reports*, vol. 14, no. 1, p. 30659, 2024

[J5] **A. Pradhan** and H. S. Dhillon, "A probabilistic reformulation technique for discrete ris optimization in wireless systems," *IEEE Trans. on Wireless Commun.*, 2024

[J4] **A. Pradhan**, J. K. Devineni, A. F. Molisch, and H. S. Dhillon, "Novel los $\beta - \gamma$ thz channel unifying molecular re-radiation manifestations," *IEEE Trans. on Vehicular Technology*, 2024

[J3] **A. Pradhan**, M. A. Abd-Elmagid, H. S. Dhillon, and A. F. Molisch, "Robust optimization of ris in terahertz under extreme molecular re-radiation manifestations," *IEEE Trans. on Wireless Commun.*, 2024

[J2] P. Aggarwal, **A. Pradhan**, and V. A. Bohara, "A downlink multiuser mimo–ofdm system with nonideal oscillators and amplifiers: Characterization and performance analysis," *IEEE Systems Journal*, vol. 15, no. 1, pp. 715–726, 2020

[J1] S. Basu, **A. Pradhan**, and S. Dhar Roy, "Radial sub-band allocation with downlink interference mitigation in macro–femto environment," *Wireless Personal Commun.*, vol. 106, pp. 955–969, 2019

Conference Proceedings

[C5] **A. Pradhan**, M. F. Imani, and H. S. Dhillon, "A beamshaping framework for physically consistent reconfigurable intelligent surfaces," accepted in ICC 2025

[C4] **A. Pradhan** and H. S. Dhillon, "Novel probabilistic reformulation technique for unconstrained discrete ris optimization," in *IEEE PIMRC*, 2023

[C3] **A. Pradhan**, H. S. Dhillon, F. Tufvesson, and A. F. Molisch, "Stochastic geometry analysis of a new gscm with dual visibility regions," in *IEEE PIMRC*, 2023

[C2] **A. Pradhan**, J. K. Devineni, H. S. Dhillon, and A. F. Molisch, "Intelligent surface optimization in terahertz under two manifestations of molecular re-radiation," in *Proc., IEEE GLOBECOM*, 2021

[C1] **A. Pradhan**, S. Basu, S. Sarkar, S. Mitra, and S. D. Roy, "Implementation of relay hopper model for reliable communication of iot devices in lte environment through d2d link," in *Proc., IEEE COMSNETS*, 2018

Skills

- Communication Protocols: Wi-Fi (IEEE 802.11ad/ay), 4G, 5G.
- Algorithms: Transmitter/Receiver structures for MIMO and OFDM/single carrier wireless systems; gradient descent, backpropagation, artificial neural networks, and estimation theory.
- Programming Languages/Tools: MATLAB,LaTeX, Python, C++.

Other Positions of Responsibility

Member of the Student Leadership Committee of Wireless@VT, ECE.

Reviewer of IEEE Transactions on Wireless Communications, Vehicular Technology Magazine, IEEE Transactions on Vehicular Technology, and IEEE Transactions on Green Communications and Networking.

Teaching Experience

- **Graduate teaching assistant (GTA)** for Stochastic signals and systems (Fall 2021, 2022), signals and systems (Spring 2020), and electronics (Fall 2019).

Awards

- VT ECE Bill and LaRue Blackwell Graduate Research Award (2024)

References

Available upon request.