Ritesh Kumar

Ph.D. Candidate, Communication & Signal Processing
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Research Interests
Communication-efficient inference, distributed mean estimation, quantization, federated learning, statistical signal processing for 6G systems, RIS-NOMA.

Education

- **Ph.D.**, Communication & Signal Processing, IIT Hyderabad 2020–present
  CPI: 9.0/10
  Thesis: *Distributed Mean Estimation under Limited Communication*
  Advisor: Dr. Shashank Vatedka
- **M.Tech**, Electrical Engineering, IIT Patna 2018–2020
  CPI: 8.31/10
- **B.Tech**, Electronics & Communication Engineering, PTU Punjab 2013–2017
  Percentage: 76.77%

Publications

- **R. Kumar** and S. Vatedka, "Mean Estimation Scale–Location families Under Communication Constraints," *in preparation.*
- **R. Kumar** and S. Vatedka, "One-Bit Distributed Mean Estimation with Unknown Variance," *under review at TMLR*, 2025.
- N. Suresh Babu*, **R. Kumar***, and S. Vatedka, "Unbiased Quantization of the L_1 Ball for Distributed Mean Estimation," *AISTATS*, 2025.
- S. Srivastava, **R. Kumar**, et al., "RIS-Assisted Hybrid NOMA-OMA System with Imperfect SIC and Phase Compensation," *IEEE VTC*, 2025.
- **R. Kumar** and S. Vatedka, "Communication-Constrained Distributed Mean Estimation of Log-Concave Distributions," *NCC*, 2023. [**Best Paper Award**]
- **R. Kumar** et al., "Healthcare Data Encryption Using Cellular Automata for IoT Networks," *Wireless Personal Communications*, Springer, 2022.
- **R. Kumar**, et al.," A Cellular Automata-based Healthcare Data Encryption Technique for IoT Networks ", INDICON, 2019. [**Best Paper Award**]

Selected Research Contributions

- **Quantization and Inference**: Developed unbiased quantizers for distributed mean estimation; analyzed minimax risk for log-concave distributions, enabling efficient inference under communication constraints.
- **Federated Learning**: Implemented EDEN and DRIVE with efficient quantizers in PyTorch/Flower; incorporated bit-flip error handling, achieving robustness in lossy networks.
- **RIS-NOMA**: Designed optimized RIS-NOMA user clustering & power allocation strategies using DNNs under imperfect CSI; VTC 2025 paper extends state-of-the-art frameworks.

Technical Skills
Python, C, PyTorch, MATLAB, NumPy, SciPy, Flower, Git,

Teaching Experience

- Teaching Assistant, IIT Hyderabad:

  - Linear Algebra, Information Theory
  - Convex Optimization, Topics in Data Storage and Communication
  - Wireless Communication, Statistical Learning Theory
- Teaching Assistant, IIT Patna:
  - Digital Circuits and Design

Honors & Awards

- JENESYS Japan-India Exchange Program (Science, Technology): 2023
- Best Paper Award, NCC 2023
- First Prize, IEEE INDICON MV Chauhan Contest, 2019

Professional Activities

- Volunteer, IEEE ITSoc Summer School, IIT Hyderabad, 2024
- Participant, Reinforcement Learning Workshop, IISc Bangalore, 2025