

Ritesh Kumar

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Research Interests

Communication-efficient inference, quantization, distributed and federated learning, log-concave estimation, statistical signal processing, RIS-assisted NOMA systems.

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

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

Selected Research Contributions

- **Minimax Quantization and Estimation:** Developed unbiased quantization schemes for constrained distributed mean estimation; established minimax bounds for log-concave families and constructed practical quantizers achieving these rates.
- **Communication-Efficient Federated Learning:** Implemented EDEN and DRIVE frameworks with robust quantizers in PyTorch/Flower; incorporated bit-flip-aware decoding improving performance over lossy channels.
- **RIS-Assisted NOMA Design:** Proposed deep-learning-based clustering and power-allocation strategies under imperfect CSI; demonstrated gains in hybrid NOMA–OMA architectures (IEEE VTC 2025).

Technical Skills

Python, C, PyTorch, MATLAB, NumPy, SciPy, Federated Learning (Flower), Git

Teaching Experience

- **IIT Hyderabad**

Courses: Linear Algebra, Information Theory, Convex Optimization, Topics in Data Storage and Communication, Wireless Communication, Statistical Learning Theory

Responsibilities: Conducted tutorials, evaluated assignments/exams, and guided student projects.

- **IIT Patna**

Courses: Digital Circuits and Design

Responsibilities: Assisted with lab sessions, graded course assignments, and supported student learning.

Honors & Awards

- JENESYS Japan-India Science & Technology Program, 2023
- Best Paper Award, NCC 2023
- First Prize, IEEE INDICON MV Chauhan Student Paper Contest, 2019

Professional Activities

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

References

- **Dr. Shashank Vatedka**

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- **Dr. Aditya Siripuram**

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- **Dr. Lakshmi Natarajan**

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- **Dr. Abhinav Kumar**

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