V. Arvind Rameshwar

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EDUCATION

Indian Institute of Science — Bengaluru, India
PhD in Electrical Communication Engineering; GPA: 9.4/10 — *Aug. 2018 – 10 Nov. 2023*

Birla Institute of Technology and Science, Pilani - Hyderabad Campus — Hyderabad, India
B.E. (Hons.) in Electronics and Communication; GPA: 9.93/10 — *Aug. 2014 – Jul. 2018*

Padma Seshadri Bala Bhavan Senior Secondary School — Chennai, India
High School; CBSE Class XII: 97.6% — *2012 – 2014*

EXPERIENCE

Research Fellow, Indian Urban Data Exchange — Bengaluru, India
Supervisor: Dr. Anshoo Tandon (Differential Privacy Research Team) — *Nov. 2023 – present*

- **Differential Privacy for IoT Data**: Working on the design of algorithms for user-level/item-level differential privacy (DP) in the release of statistics from real-world traffic data recorded by smart city sensors. In particular, introduced a novel metric for measuring the "worst-case" estimation error incurred by *any* dataset and devised algorithms for the private release of sample mean, variance, and cumulative distribution functions (CDFs). Also devised a novel procedure that reduces the privacy loss under composition of mechanisms across grids in a city, while maintaining a fixed worst-case error. Co-authored research papers presented at top IEEE conferences and workshops, and submitted to journals.

Research Associate, Indian Institute of Science — Bengaluru, India
Advisor: Prof. Navin Kashyap — *Jul. 2023 – Nov. 2023*

- **Weight Enumerators of Reed-Muller Codes**: Worked on the design of sampling-based approximation algorithms for computing the weight distribution and the weight spectrum of Reed-Muller codes. Obtained good estimates of weight enumerators for $RM(11, 5)$ and the hitherto-unknown, exact weight spectrum of $RM(10, 4)$, contributing to the state-of-the-art. Work accepted to the National Conference on Communications, 2024 and the 2024 IEEE International Symposium on Information Theory (ISIT 2024).

Graduate Teaching Assistant, IIIT Hyderabad — Hyderabad, India
Faculty: Dr. Lalitha Vadlamani, Dr. Praful Mankar — *Jan. 2021 – Jul. 2022*

- **PMRF Teaching Obligations**: Conducted tutorial sessions, designed homework assignments and examinations for the following courses: "**Introduction to Coding Theory**" (Jan. 2021–Mar. 2021), "**Probability and Random Processes**" (May 2021–Jul. 2021), "**Signal Detection and Estimation Theory**" (Aug. 2021–Dec. 2021), "**Information and Communication**" (Mar. 2022–Jul. 2022)

Research Intern, Indian Institute of Science — Bengaluru, India
Advisor: Prof. Navin Kashyap — *Jan. 2018 – June 2018*

- **Secure Regenerating Codes**: Final-year undergraduate thesis. In collaboration with Prof. Kashyap, came up with an explicit code construction for achieving secrecy capacity at the Minimum Storage Regeneration (MSR) point, for all values of system parameters. Work nominated for a Best Paper Award at the National Conference on Communications, 2019.

Summer Research Intern, IIIT Hyderabad — Hyderabad, India
Advisor: Dr. V. Lalitha — *May 2017 – July 2017*

- **Maximally Recoverable Codes for Product Topologies**: Studied literature on Maximally Recoverable Codes, and worked on the sufficiency of the *regularity* condition, for restricted cases, for a grid-like erasure pattern to be recoverable.

Summer Research Intern, Chennai Mathematical Institute — Chennai, India
Advisor: Dr. Prajakta Nimbhorkar — *May 2016 – June 2016*

- **Optimal Matchings in Bipartite Graphs**: Studied algorithms for matchings on bipartite graphs that meet optimality criteria such as *fairness, popularity*, and *rank-maximality*. In collaboration with Prof. Nimbhorkar, came up with a linear-time algorithm for dynamic rank-maximal matchings. Work accepted to COCOON 2017.

Projects

- **COVID-19 Infection Rate Estimator**: Part of a project involving graduate students and Professors Navin Kashyap and Manjunath Krishnapur at IISc, which involved building an estimator of the actual daily number of new COVID-19 infections in states across India.

Honors and Awards

- Recepient of the Best Paper Award at the National Conference on Communcations (NCC) 2024
- Recepient of a Jack Keil Wolf ISIT Student Paper Award 2023
- Recipient of a Best Presentation Award at the EECS Research Students Symposium - 2023, IISc
- Recipient of a Best Student Paper Award at the IEEE 2022 International Conference on Signal Processing and Communications (SPCOM)
- Part of a team that won a Qualcomm Innovation Fellowship India 2022 and was a Superwinner (with a fellowship extension) in 2023
- Recipient of a Best Paper Award at the National Conference on Communications (NCC) 2021
- Recient of a Prime Minister's Research Fellowship (PMRF) 2020, awarded by the Ministry of Education, Govt. of India
- Part of a team that won a Qualcomm Innovation Fellowship India 2020
- Gold medallist, BITS Pilani, Hyderabad Campus, for being ranked first across streams
- Recipient of a KVPY fellowship (under the Mentorship scheme), in 2013, awarded by the Department of Science and Technology (DST), Govt. of India
- Recipient of an NTSE scholarship, in 2010, awarded by the National Council of Educational Research and Training (NCERT), Govt. of India

Research Skills

Error-Control Coding, Information Theory, Differential Privacy, Boolean Functions, Markov Decision Processes (Dynamic Programming), Algorithm Design

Computer Skills

MATLAB, LaTeX

Soft Skills

Public Speaking, Communication, Teamwork, Technical Writing

Publications

Journal

[1] V. Arvind Rameshwar, Anshoo Tandon, Abhay Sharma, "Optimal Tree-Based Mechanisms for Differentially Private Approximate CDFs," under review at the IEEE Transactions on Information Forensics and Security, Oct. 2024.

[2] V. Arvind Rameshwar, Shreyas Jain, and Navin Kashyap, "Sampling-based estimates of the weight enumerators of Reed-Muller codes," under review at the IEEE Transactions on Communications, Sep. 2024.

[3] V. Arvind Rameshwar and Anshoo Tandon, "Improving the privacy loss under user-level DP composition for fixed estimation error," under review at the IEEE Transactions on Information Theory, Aug. 2024.

[4] V. Arvind Rameshwar and Nir Weinberger, "Information rates over multi-view channels," under review at the IEEE Transactions on Information Theory, May 2024.

[5] V. Arvind Rameshwar, Anshoo Tandon, Prajjwal Gupta, Aditya Vikram Singh, Novoneel Chakraborty, and Abhay Sharma, "Mean Estimation with User-Level Privacy for Spatio-Temporal IoT Datasets," under review at the ACM Transactions on Privacy and Security, Apr. 2024.

[6] V. Arvind Rameshwar and Navin Kashyap, "Estimating the sizes of binary error-correcting constrained codes," in IEEE Journal on Selected Areas in Information Theory, vol. 4, pp. 144-158, 2023, doi: 10.1109/JSAIT.2023.3279113.

[7] V. Arvind Rameshwar and Navin Kashyap, "Coding schemes based on Reed-Muller codes for (d, ∞)-RLL input-constrained channels," in IEEE Transactions on Information Theory, vol. 69, no. 11, pp. 7003-7024, Nov. 2023, doi: 10.1109/TIT.2023.3296207.

[8] Prajakta Nimbhorkar and V. Arvind Rameshwar, "Dynamic rank-maximal and popular matchings," Journal of Combinatorial Optimization, vol. 37, no. 2, pp. 523–545, 2019.

Conference

[1] Vivian Papadopoulou, V. Arvind Rameshwar, Antonia Wachter-Zeh, "How Many Noisy Copies of a Sequence are Needed on Average for Exact Reconstruction?," accepted to the 2024 IEEE Information Theory Workshop (ITW), Shenzhen, China.

[2] V. Arvind Rameshwar and Nir Weinberger, "Information rates over DMCs with many independent views," 2024 IEEE International Symposium on Information Theory (ISIT).

[3] Shreyas Jain, V. Arvind Rameshwar, and Navin Kashyap, "Estimating the weight enumerators of Reed-Muller codes via sampling," 2024 IEEE International Symposium on Information Theory (ISIT).

[4] Prajjwal Gupta, V. Arvind Rameshwar, Anshoo Tandon, Novoneel Chakraborty, "Mean estimation with user-level privacy for spatio-temporal IoT datasets," 2024 IEEE International Conference on Signal Processing and Communications (SPCOM). **Finalist for a Best Paper Award**.

[5] V. Arvind Rameshwar and Navin Kashyap, "Sampling-based estimates of the sizes of constrained subcodes of Reed-Muller codes," 2024 National Conference on Communications (NCC). **Recepient of the Best Paper Award**.

[6] V. Arvind Rameshwar and Navin Kashyap, "A version of Delsarte's linear program for constrained systems," 2023 IEEE International Symposium on Information Theory (ISIT), Taipei, Taiwan, Jul. 2023. **Recepient of a Jack Keil Wolf ISIT Student Paper Award**.

[7] V. Arvind Rameshwar and Navin Kashyap, "Counting constrained codewords in binary linear codes via Fourier expansions," 2023 IEEE International Symposium on Information Theory (ISIT), Taipei, Taiwan, Jul. 2023.

[8] V. Arvind Rameshwar and Navin Kashyap, "Linear runlength-limited subcodes of Reed-Muller codes and coding schemes for input-constrained BMS channels," 2022 IEEE Information Theory Workshop (ITW), Mumbai, Nov. 2022.

[9] V. Arvind Rameshwar and Navin Kashyap, "A feedback capacity-achieving coding scheme for the (d, ∞)-RLL input-constrained binary erasure channel," 2022 IEEE International Conference on Signal Processing and Communications (SPCOM), IISc, Bengaluru, Jul. 2022. **Recipient of a Best Student Paper Award**.

[10] V. Arvind Rameshwar and Navin Kashyap, "On the performance of Reed-Muller codes Over (d, ∞)-RLL input-constrained BMS channels," 2022 IEEE International Symposium on Information Theory (ISIT), Espoo, Finland, Jun. 2022.

[11] V. Arvind Rameshwar and Navin Kashyap, "Numerically computable lower bounds on the capacity of the $(1, \infty)$-RLL input-constrained binary erasure channel," 2021 National Conference on Communications (NCC), IIT Kanpur, Jul. 2021. **Recipient of a Best Paper Award**.

[12] V. Arvind Rameshwar and Navin Kashyap, "Bounds on the feedback capacity of the (d, ∞)-RLL input constrained binary erasure channel," in 2021 IEEE International Symposium on Information Theory (ISIT), Melbourne, Australia, Jul. 2021.

[13] V. Arvind Rameshwar, Aryabhatt M. Reghu, and Navin Kashyap, "On the capacity of the flash memory channel with feedback," in 2020 International Symposium on Information Theory and its Applications (ISITA2020), Kapolei, USA, Oct. 2020.

[14] V. Arvind Rameshwar and Navin Kashyap, "Computable lower bounds for capacities of input-driven finite-state channels," in 2020 IEEE International Symposium on Information Theory (ISIT 2020), Los Angeles, California, USA, Jun. 2020.

[15] V. Arvind Rameshwar and Navin Kashyap, "Achieving secrecy capacity of minimum storage regenerating codes for all feasible (n, k, d) parameter values," in 2019 National Conference on Communications (NCC), IISc, Bengaluru, Feb. 2019. **Finalist for a Best Paper Award**.

[16] V. Arvind Rameshwar, Dusi Aditya, M. Balasubramanian, U. Poorna Lakshmi, and Prasant Kumar Pattnaik, "Effect of longitudinal and shear stress on photonic crystal-based ring resonator," in 2018 3rd International Conference on Microwave and Photonics (ICMAP), Dhanbad, Feb. 2018.

[17] D. Shivakrishna, V. Arvind Rameshwar, Vadlamani Lalitha, and Birenjith Sasidharan, "On maximally recoverable codes for product topologies," in 2018 Twenty Fourth National Conference on Communications (NCC), IIT Hyderabad, Feb. 2018.

[18] Prajakta Nimbhorkar and V. Arvind Rameshwar, "Dynamic rank-maximal matchings," in Computing and Combinatorics – 23rd International Conference, COCOON 2017, Hong Kong, China, August 3–5, 2017, Proceedings (Y. Cao and J. Chen, eds.), vol. 10392 of Lecture Notes in Computer Science, pp. 433–444, Springer, 2017.

Workshop

[1] Vivian Papadopoulou, V. Arvind Rameshwar, Antonia Wachter-Zeh, "On Exact Sequence Reconstruction Over a Stochastic t-Error Channel," Workshop on Coding Theory and Algorithms for DNA-based Data Storage at the ISIT 2024.

[2] V. Arvind Rameshwar, Anshoo Tandon, Abhay Sharma, "User-Level Differentially Private Mean Estimation for Real-World Datasets," ISIT 2024 Workshop on Information-Theoretic Methods for Trustworthy Machine Learning (IT-TML).

[3] Vivian Papadopoulou, V. Arvind Rameshwar, Antonia Wachter-Zeh, "Sequence Reconstruction over Exact-t Adversarial Channel Repetitions: An Average Case Analysis," Munich Workshop on Coding and Cryptography 2024.