Abhinav Vaishya

Education

Jul 2018 - Jun 2023 **Bachelor of Technology (Honours) and Master of Science by Research**, *Computer Science and Engineering*, International Institute of Information Technology, Hyderabad (IIIT-H).
Advisor: Dr. Prasad Krishnan
Thesis Title: Low Complexity Cache-Aided Communication Schemes for Distributed Data Storage and Distributed Computing
Specialization: Algorithms and Theory [Certificate]

Research Experience

Jul 2023 - Present **Research Associate**, Indian Institute of Science, Bangalore (IISc).
- Erasure decoding algorithms for Quantum LDPC codes
  - Worked on erasure decoding of Quantum Expander Codes under the supervision of Prof. Lalitha Vadlamani. (Accepted at IEEE ISIT, 2025)
- Gottesman-Kitaev-Preskill (GKP) codes
  - Worked on constructing multimode GKP codes with better error-correcting properties through the lens of lattice theory.
- Additional involvements / contributions
  - Audited a course on QECC taught by Prof. Navin Kashyap at IISc.
  - Have been a part of the Quantum Codes reading group, where I have presented Qudit Stabilizer Codes, Small-Set-Flip decoding algorithm for Quantum Expander Codes, and Cluster Decomposition for Improved Erasure Decoding of Quantum LDPC Codes.
- Advisor: Prof. P Vijay Kumar

Jun 2022 - Jun 2023 **Research Intern**, Technical University of Munich (Remote).
- Codes for Distributed Storage and Coding Theory for Blockchains
  - Did comprehensive literature survey on the topics and presented the same.
- Advisor: Dr. Rawad Bitar

May 2021 - Jun 2023 **Research Assistant**, IIIT-H.
- Coded Caching via Locally Recoverable Codes (In progress)
  - Constructed a scheme with parameters identical to the rate-optimal Maddah-Ali-Niesen scheme.
  - Have a few more interesting results on the connection between Coded Caching and Locally Recoverable Codes.
- Coded Caching via Subspace Designs (Accepted at IEEE JSAIT, 2023)
  - Worked on the proof and numerical results for a coded caching (and distributed computing) scheme based on the q-analogs of combinatorial designs, i.e., subspace designs.
- Coded Data Rebalancing for Distributed Storage Systems with Cyclic Storage (Accepted at IEEE ITW, 2022)
  - Constructed rebalancing schemes for single-node removal and addition scenarios in replication-based distributed storage systems.
  - Derived a lower bound using index coding proof techniques. (Submitted to IEEE TIT)
- Advisor: Prof. Prasad Krishnan

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Aug 2020 - Apr 2021 **Undergraduate Researcher**, IIIT-H.
- Coded Data Rebalancing for Distributed Storage Systems
- Advisor: Prof. Prasad Krishnan

Work Experience

Jan 2023 - May 2023 **Teaching Assistant**, IIIT-H.
- Information-Theoretic Methods in Computer Science, Spring '23
- Introduction to Coding Theory, Spring '22
- Linear Algebra, Spring '21
- The role involved conducting tutorials, setting and evaluating assignments and exams.

Jun 2019 - Oct 2019 **Problem Setter**, Hackerrank.
- Prepared various original programming and algorithmic problems along with strong testcases.

Aug 2018 - Dec 2018 **Web Developer**, VLEAD, IIIT-H.
- Worked on building a web application for interactive online learning modules.

Publications

1. Jefrin Sharmitha Prabhu*, **Abhinav Vaishya***, Shobhit Bhatnagar, Aryaman Manish Kolhe, V. Lalitha, P. Vijay Kumar, "On the Efficacy of the Peeling Decoder for the Quantum Expander Code", IEEE International Symposium on Information Theory (ISIT), 2025. [arXiv]
2. **Abhinav Vaishya**, Athreya Chandramouli, Srikar Kale, Prasad Krishnan, "Coded Data Rebalancing for Distributed Data Storage Systems with Cyclic Storage", preprint, submitted to IEEE Transactions on Information Theory (TIT). [arXiv]
3. Shailja Agrawal, K V Sushena Sree, Prasad Krishnan, **Abhinav Vaishya**, Srikar Kale, "Cache-Aided Communication Schemes via Combinatorial Designs and their q-analogs", IEEE Journal on Selected Areas in Information Theory (JSAIT), 2023. [IEEE][arXiv]
4. Athreya Chandramouli, **Abhinav Vaishya**, Prasad Krishnan, "Coded Data Rebalancing for Distributed Data Storage Systems with Cyclic Storage", IEEE Information Theory Workshop, 2022. [IEEE][Slides]

* indicates equal contribution

Course Projects (Selected)

Spring 2021 **Encoding and Decoding of Reed Solomon Codes (Language: Python 3)**
- Implemented the encoding and decoding procedures of Reed Solomon Codes. Sympy was used in the implementations. This project was a part of the course Topics in Coding Theory. [GitHub]

Spring 2020 **Distributed Systems and Algorithms**
- Implemented many graph based and sorting algorithms, a simple single server architecture (supports multiple clients), for distributed systems using OpenMP(C++), MPI(C++), Cuda(C++/Python), and RMI(Java). This project was a part of the course Distributed Systems. [GitHub]

Spring 2020 **Applications of Linear Programming (Language: Python 3)**
- Used Linear Programming for solving various interesting problems such as - Jigsaw Puzzle, Sudoku, Convex Hull, and Largest Circle in a Polygon. This project was a part of the course Optimization Methods. [GitHub]

Relevant Courses

Algorithms and Theory (at IIIT-H)	Algorithms, Complexity and Advanced Algorithms, Computational Complexity Theory, Principles of Information Security, Introduction to Coding Theory*, Topics in Coding Theory, Information-Theoretic Methods in Computer Science*, Advanced Mathematical Structures.
Theory (at IISc)	Quantum Error-Correcting Codes**

* indicates that I attended the course as a Teaching Assistant
** indicates that I audited the course

Skills

Languages	C, C++, Python, MATLAB, Java, Javascript, SQL, Erlang, TeX
Libraries	numpy, scipy, sympy, MPI

Miscellaneous

- Selected for the school and workshop on HDX and Codes at ICTS, Bengaluru. [Link]
- Ranked 88th in ACM-ICPC Online Round 2019-20. (Honorable Mention) [Certificate]
- Selected for the Onsite Round of ACM-ICPC Asia Regionals, Amritapuri 2019-20.
- Certificate for Problem Solving (Advanced) by Hackerrank. It covers topics like Data Structures such as Trees, Graph Traversal, using Dynamic Programming and Specialized Algorithms, among others. [Certificate]
- Merit List awardee.