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 of Quantum Low-Density Parity-Check (qLDPC) codes
  - Worked on erasure decoding of Quantum Expander Codes. (Accepted at IEEE ISIT, 2025)
  - Worked on devising a better decimation technique for belief-propagation-based erasure decoding of general qLDPC codes. (Accepted at IEEE ITW, 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 quantum error-correcting codes 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

Preprints / Under Review

P1. **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]

Journals

J1. 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]

Conferences

C1. Gayathri R., Shobhit Bhatnagar, **Abhinav Vaishya**, P Vijay Kumar, "An Improved Decimation Technique for Erasure Decoding of Quantum LDPC Codes", accepted at IEEE Information Theory Workshop (ITW), 2025. [preprint]

C2. 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", accepted at IEEE International Symposium on Information Theory (ISIT), 2025. [arXiv]

C3. 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][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.

References

Prof. P Vijay Kumar
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Prof. Lalitha Vadlamani
(Mentor and Collaborator)
IIIT Hyderabad
✉ lalitha.v@iiit.ac.in

Prof. Prasad Krishnan
(Undergraduate and Master's Mentor)
IIIT Hyderabad
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