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).
- Quantum Error-Correcting Codes (QECC)
  - Worked on constructing multimode Gottesman-Kitaev-Preskill (GKP) codes with better error-correcting properties through the lens of lattice theory.
  - I also audited a course on QECC taught by Prof. Navin Kashyap at IISc.
  - I have been part of the Quantum Codes reading group, where I have presented Qudit Stabilizer Codes.
- Advisor: Dr. P Vijay Kumar

Jun 2022 - Jun 2023   **Research Intern**, Technical University of Munich (Remote).
- Codes for Distributed Storage (Literature Review)
  - Presented papers on Convertible Codes.
- Coding Theory for Blockchains (Literature Review)
  - Did comprehensive literature survey on the topic and presented the same.
- Advisor: Dr. Rawad Bitar
- I was unable to continue working after graduating from IIIT-H and joining IISc.

May 2021 - Jun 2023   **Research Assistant**, IIIT-H.
- Coded Caching via Locally Recoverable Codes (To be submitted soon)
  - Constructed a scheme that has parameters identical to Maddah-Ali-Niesen scheme.
  - Have a few more interesting results.
- 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.
- Lower bound for the Coded Data Rebalancing (CDR) problem (To be submitted soon)
  - Devised an algorithm to find a lower bound using index coding proof techniques.
- 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.
- Advisor: Dr. Prasad Krishnan

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

May 2019 - Jun 2020	**Undergraduate Researcher**, IIIT-H.
	○ A software framework for annotation of manuscript document images (Showcased at a workshop, ICDAR, 2019)
	○ Advisor: Dr. Ravi Kiran Sarvadevabhatla

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. 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]

2. Athreya Chandramouli*, **Abhinav Vaishya***, Prasad Krishnan, "Coded Data Rebalancing for Distributed Data Storage Systems with Cyclic Storage", IEEE Information Theory Workshop, 2022. [IEEE][Arxiv][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

- 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.