

Mahathi Vempati

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Education

University of Maryland, College Park

PhD in Computer Science

- Advisor: Andrew Childs
- CGPA: 3.71/4.0

College Park, USA

2022 – Present

International Institute of Information Technology, Hyderabad

MS by Research in Computational Natural Sciences

- Thesis: *Towards Detection and a Resource-Theoretic Characterization of Negative Quantum Conditional Entropy*
- Advisor: Indranil Chakrabarty
- CGPA: 9.75/10.0

Hyderabad, India

2020 – 2021

International Institute of Information Technology, Hyderabad

B.Tech in Computer Science

- CGPA: 8.73/10.0

Hyderabad, India

2016 – 2020

Publications and Conference Papers

- **Quantum Advantage and Lower Bounds in Parallel Query Complexity** by Joseph Carolan, Amin Shiraz Gilani and Mahathi Vempati. Accepted at **ITCS 2024**, **QIP 2025**. [[arxiv:2410.02665](https://arxiv.org/abs/2410.02665)].
- **A-unital operations and quantum conditional entropy** by Mahathi Vempati, Saumya Shah, Nirman Ganguly and Indranil Chakrabarty, 2 February, 2022. Published in **Quantum journal**.
- **Witnessing negative conditional entropy** by Mahathi Vempati, Nirman Ganguly, Indranil Chakrabarty and Arun K. Pati, 19 July, 2021. Published in **Physical Review A**, **104(1)**. [[arxiv:2001.11237](https://arxiv.org/abs/2001.11237)] , [[github](https://github.com)].

Experience

Research Intern

Phasecraft

- Applied molecular symmetries to speed up Variational Quantum Eigensolvers.
- Ran and evaluated classical simulations in Julia

Bristol, UK

Summer 2024

Teaching Assistant

UMD and IITH

- Introduction to Cryptography
- Advanced Data Structures
- Introduction to Cryptography
- Introduction to Quantum Information and Computation
- Introduction to Quantum Information and Computation
- Discrete Structures (Mathematics)

UMD, Fall 2023
UMD, Spring 2022
UMD, Fall 2022
IITH, Spring 2021
IITH, Spring 2020
IITH, Monsoon 2018

Duties included conducting weekly tutorials and office hours, setting and evaluating assignments, quizzes and student project presentations, preparing programming assignments

College Park/ Hyderabad

Quantum Annealing and Machine Learning Research Intern (remote)

University of Calgary

- Advisor: Barry Sanders
- Project title: Searching for the Quantum Computing Advantage
- Worked on the formulation of an intelligent search for problem classes that demonstrate a scaling advantage for the DWave quantum annealer over classical algorithms.

Calgary, Canada

June 2020 – June 2021

USEQIP Summer School (online)

University of Waterloo

- Explored various aspects of experimental quantum information processing.

Waterloo, Canada

May 2021 – July 2021

Software Projects

- **Compiler and Interpreter:** Designed the grammar for a programming language similar to Decaf, and wrote a scanner and parser for the same. Developed an interpreter, as well as a compiler to convert the language source code to **LLVM intermediate representation**. Used Flex, Bison and the C programming language. [\[github\]](#)
- **Search Engine:** Developed a search engine for large data dumps from Wikipedia. The search engine takes as input a data dump, and creates an inverted index after parsing the input data using various **NLP techniques**. It then returns the top titles matching different types of input queries, based on the tf-idf ranking. The k-way merge algorithm and Python shelves were used during the creation of the large index which does not fit in main memory. [\[github\]](#)
- **Bomberman Game:** Developed a single-player multi-level game in Python in which the player uses the keyboard to control a character moving around in a maze, and drops bombs to destroy enemies. Features include asynchronous enemy movement and random maze generation. [\[github\]](#)
- **Deadlock Detection:** Given as input a Wait-For graph, the program spawns processes which depend on each other in accordance with the graph, runs global deadlock detection algorithms on these spawned processes, and returns whether or not they are deadlocked. Implemented the Kshemkalyani-Singhal and Deng-Attie-Sun detection algorithms. The **Erlang functional programming language** was used. [\[github\]](#)

Software Skills

- **Over 10,000 lines:** C, C++, Python
- **Familiar:** Flex, Bison, LLVM, Java, MATLAB, Erlang, MySQL, Javascript, HTML, Q#, L^AT_EX

Achievements

- One of the eight recipients of the UMD CS Summer 2023 Research Fellowship of \$7500.
- Recipient of Dean's List Award [Top 15% of batch] at IIITH for three semesters (2017, 2019, 2020).
- Placed 70th out of around 600 participants in the Microsoft Q# Quantum Coding Contest (2020).
- Won Megathon, a hackathon organized by IIT Hyderabad and IIIT Hyderabad (2017).
- Recipient of the NTSE scholarship, a national level award based on a competitive exam (2012).

Service

- Reviewer at TQC 2024, QIP 2025, QIP 2026
- Volunteered at IndiQ Introduction to Quantum Computing Workshop (IIIT Hyderabad, 2020), Microsoft Workshop on Quantum Computing for Women (Microsoft Hyderabad, 2019), National Workshop on Quantum Information and Information Security (IIIT Hyderabad, 2018)

Interests

- I used to do competitive programming and record my progress on my [Youtube channel](#). I also did a tutorial on **Linearity of Expectation** there.
- Was a member of the **IIITH Theory group**. Hosted reading groups on quantum information, quantum algorithms and ZX Calculus. Presented a seminar on ZX Calculus: [Youtube link](#).
- Occasionally write blog posts. My best articles: [A tutorial on the nuances of backpropagation](#), [How Grover's search algorithm emerges from quantum signal processing](#), [The Hadamard Sandwich](#)
- Used to be active on [Quantum Computing Stack Exchange](#).
- Served as the **editor** of [Ping!](#), the IIITH college magazine from 2018 – 2019.