

# Junaid Aftab

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## Education

- 2020– **Ph.D. Candidate**, University of Maryland, College Park, Applied Mathematics.
- 2018–2020 **M.S.**, Kansas State University, Mathematics.
- 2013–2017 **B.S.**, Lahore University of Management Sciences (LUMS), Economics & Mathematics.

## Publications & Pre-Prints

### Preprints

- **Junaid Aftab**, Christoph Schwab, Haizhao Yang, Jakob Zech. Quantum Circuit Encodings of Polynomial Chaos Expansions. Submitted to *Quantum*, [arXiv:2506.01811](https://arxiv.org/abs/2506.01811).
- **Junaid Aftab**, Dong An, Konstantina Trivisa. Multi-product Hamiltonian simulation with explicit commutator scaling. Submitted to *Communications in Mathematical Physics*, [arXiv:2403.0892](https://arxiv.org/abs/2403.0892).

### Publications

- **Junaid Aftab**, Haizhao Yang. Approximating Korobov functions via quantum circuits. *Communications in Mathematical Sciences*, 23(8):2077–2101, 2025., [doi:10.4310/CMS.250930023153](https://doi.org/10.4310/CMS.250930023153).
- **Junaid Aftab**, Adam Zaman Chaudhry. Analyzing the quantum Zeno and anti-Zeno effects using optimal projective measurements. *Scientific Reports*, 7:11787, 2017., [doi:10.1038/s41598-017-11787-9](https://doi.org/10.1038/s41598-017-11787-9).

## Research Internships

- 2023 **Quantum Computing Summer School**, Los Alamos National Laboratory.
  - Used tools from representation theory to investigate the effect of noise in quantum neural networks

## Awards & Fellowships

- 2024–2026 **Math Quantum Research Training Program Fellowship**, University of Maryland, College Park.
- 2024 **Herbert A. Hauptman Summer Fellowship**, University of Maryland, College Park.
- 2020–2022 **Dean's Fellowship**, University of Maryland, College Park.
- 2017 **NMF Gold Medal**, Lahore University of Management Sciences.
- 2013–2017 **Dean's Honour List**, Lahore University of Management Sciences.

## Talks

- 2024–2025 **Multi-product Hamiltonian simulation with explicit commutator scaling**.
  - MathQuantum Symposium 2025, University of Maryland
  - TQC Conference 2024, Okinawa Institute of Science and Technology
- 2022–2025 **Research Interaction Team (RIT)**, University of Maryland.
  - RIT on Geometry and Physics. March 2023, March 2025.
  - RIT on Machine Learning. Oct. 2022.
- 2022 **Quantum Error Correction Reading Group**, University of Maryland, Homological Product Codes.

## Conferences, Summer Schools

- June 2025 **QFT and Topological Phases via Homotopy and Operator Algebras**, Harvard University.
- August 2024 **C\*-Algebraic Quantum Mechanics and Topological Phases of Matter**, CU Boulder.
- July 2024 **Groundwork for Operator Algebras Lecture Series**, Institute for Pure & Applied Math (IPAM).
- July 2023 **PCMI Graduate Summer School**, Park City Mathematics Institute (PCMI).

## Teaching

- 2022, 2024 **Instructor, University of Maryland,**  
As the main instructor, I developed syllabi, quizzes, exams, and homework for the courses listed below.  
A star indicates I was ranked excellent by student course evaluations.
- o MATH 120: Elementary Calculus. Summer 2024\*
  - o MATH 141: Calculus II. Summer 2022\*
- 2020– **Graduate Teaching Assistant, University of Maryland,**  
I organized weekly recitation sessions which were designed to go over worksheets and homework problems. My goals were for students to learn through guided exploration.
- o MATH 240: Introduction to Linear Algebra. Fall 2023
  - o MATH 140: Calculus I. Fall 2022
  - o MATH 135: Discrete Mathematics for Life Sciences. Fall 2021
  - o MATH 141: Calculus II. Spring 2021, Spring 2023
  - o MATH 120: Elementary Calculus. Fall 2020
- 2018–2020 **Graduate Teaching Assistant, Kansas State University,**  
I organized weekly recitation sessions for students which were designed to go over worksheets and homework problems.
- o MATH 340: Elementary Differential Equations. Fall 2019, Spring 2020
  - o MATH 220: Analytic Geometry and Calculus I. Fall 2018, Spring 2019
- 2016–2018 **Teaching Assistant, Lahore University of Management Sciences,**  
I organized weekly recitation sessions for students which were designed to go over worksheets and homework problems.
- o MATH 204: Introduction to Formal Mathematics. Spring 2018
  - o MATH 120: Linear Algebra with Differential Equations. Spring 2018
  - o MATH 101: Calculus I. Fall 2017
  - o Introduction to Analysis I. Spring 2016, Spring 2017
  - o Introduction to Formal Mathematics. Fall 2016

## Mentoring

- 2025– **Research Mentor, University of Maryland.**  
I have mentored undergraduate students as part of the MathQuantum RTG.
- o Ava Petusky, Spring '25. Presented poster on quantum simulation at MathQuantum Symposium.
- 2022– **Directed Reading Program, University of Maryland.**  
The [Directed Reading Program](#) (DRP) pairs undergraduate students with graduate student mentors for semester-long independent study projects. I have mentored the following students:
- o Kelin Zhu, Fall '25. *K-Theory*.
  - o Aiden Higgs, Fall '24. *Categories in Quantum Theory*.
  - o Nashita Bhuiyan, Spring '24. *Learning Theory: PAC-Learning & VC dimension*.
  - o Koran Bailey, Spring '23. *Grover's Search Algorithm & Random Walks*
  - o Matthew Cimerola, Fall '22. *Neural Networks & Their Applications*.

## Service

- 2024–2025 **MathQuantum RTG Outreach, University of Maryland.**  
I volunteered for various outreach activities promoting quantum computing to a general audience as part of the MathQuantum RTG program.
- o Maryland Day 2025.
  - o "Spooky Math" Halloween Science Fest 2024 in Virginia.
- 2024 **Course Staff, University of Maryland.**  
I assisted professors in designing the course materials for AMSC 698: Mathematics of Quantum Information.
- 2024 **Guest Lecturer, University of Maryland.**  
I was asked to deliver two lectures for a graduate-level course on differential geometry.

## Software

- Programming Python, Julia, MATLAB, Qiskit, Mathematica, LaTeX
- Data Analysis PyTorch, Pandas, Scikit-Learn, Seaborn, Jupyter
- Mathematics SageMath, SymPy, SciPy