Sharjeel Ahmad

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Education

University of Illinois Urbana-Champaign (UIUC) **Aug 2024 – Present**
Master of Science in ***Physics*** *Urbana-Champaign, Illinois*
cGPA: **3.95**/4.00

Graduate Courses: Quantum Information and Optics, **Quantum Information Theory and Processing**, Quantum Physics, Modern Computational Physics

Lahore University of Management Sciences (LUMS) **Sep 2020 – Jun 2024**
Bachelor of Science ***Physics Major, Mathematics Minor*** *Lahore, Pakistan*

Research Experience

Graduate Research Assistant **May 2025 – Present**
Supervisor: Dr Eric Chitambar *UIUC*

- Testing various **Dense Coding** and **Teleportation Protocols** using analytical derivations and numerical simulations on **MATLAB** and **Python(Qiskit)** to improve fault tolerance and reduce noise
- Evaluating **fidelity** across various **entangled states** to identify optimal resource configurations for dense coding and teleportation protocols

Graduate Research Assistant **Aug 2024 – Present**
Supervisor: Dr Kejie Fang *UIUC*

- Designing an experiment to demonstrate **quantum teleportation** via a **nanophotonic** nonlinear Bell state analyzer on a **4-dimensional qubit**
- Conducted experiments for telecom **photon wavelength conversions** under low power conditions using **Indium gallium phosphide** (InGaP) micro-waveguides
- Did a literature review and fidelity derivations on **Heralded Entanglement Photon Generation** on SPDC systems and Non-linear Sum-Frequency Generation systems
- Explored various photonic systems to derive equations for experimentally calculating **Non-Gaussian Correlations** in entangled photons

Graduate Research Assistant **Aug 2024 – May 2025**
Supervisor: Dr Paul Kwiat *UIUC*

- Successfully developed computer-generated **Multi-depth Holograms** using **iterative backpropagation** on MATLAB
- **Optimized** the system to yield **high-resolution outputs** for triple-depth holograms on a photographic film platform
- Analyzed experimental data to **accurately predict** variations in hologram focal length based on project parameters

Senior Year Project **Spring 2024**
Supervisor: Dr Adam Zaman *LUMS*

- Did a literature review on the **Lindblad Master Equations** and **Liouville's Theorem**
- Applied a variation of Kubo Formulation to study the **Time Evolution** of particular **Open Quantum Systems** such as driven **Spin-Boson** systems
- Studied various **Perturbation Theories** which are commonly applied in Open Systems as well as **Heat Transport** equations

Directed Research Project **Spring 2023**
Supervisor: Dr Adam Zaman *LUMS*

- Carried out **literature review** to compile a **report** on the fundamental principles of **Quantum Linear Response Theory**, and its potential uses in solving out of equilibrium Quantum Systems

Approximate Quantum Fourier Transforms (AQFT) **Spring 2023**
Supervisor: Dr Sabieh Anwar *LUMS*

- Investigated the use of AQFTs in various **Quantum Algorithms** including Periodicity Estimation, Shor's Factoring and Quantum Addition
- Presented a **report** showcasing the advantages of AQFTs in reducing **Decoherence** by reducing the number of gates required to carry out the algorithm
- Utilized **Qiskit** to verify theoretical findings under various initial conditions

Plastic Detection using Liquid Crystals **Summer 2023 – Present**
Research Assistant under Dr Ammar Ahmed *LUMS*

- Collaborated with the life sciences department to utilize the **Nematic Liquid Crystal '5CB'** to differentiate various plastics found in the local environment through **Optical Birefringence**
- Submitted a **presentation** which analyzed the collected data through **Rotational Analysis** in a **Polarized Microscope** on the plastic samples coated with 5CB
- Currently working on creating a roughness profile of the various plastic samples by taking **2D Fast Fourier Transforms** of the captured images in **MATLAB**

Topological Defects and Photo-lithography in Liquid Crystals **Spring 2021 – Spring 2023**
Research Assistant under Dr Ammar Ahmed *LUMS*

- Conducted experimental research on **Lyotropic** and **Non-Lyotropic Liquid Crystals** and their applications in bacterial transport
- Employed **Auto-CAD** to generate micropatterns on a photo-lithography mask for the **Functional Materials and Optoelectronic Devices** group which is still used today

Professional & Volunteer Work

Pakistan National Debate Team **Jan 2023 - Jul 2024**
Coach *Lahore, Pakistan*

- Selected to to train and **manage** the National Team to **Serbia WSDC 2024** held in July
- Streamlined the team selection process by creating a Python code to collect and analyze **36 unique data points** across **40 shortlisted applicants** to sort them by their weighted Z-scores
- Held regular training camps to improve the team's persuasive speaking skills by focusing on strategic thinking, enabling them to reach the Octafinals of WSDC 2024

Lahore Grammar School Defence Campus **Oct 2021 – May 2024**
Parliamentary Debates Coach *Lahore, Pakistan*

- Hired as a **full-time debates coach** to teach over a **100 high-school students** logical analysis, critical thinking and persuasive speaking
- Assisted the LGS Defence Debates Team in reaching the **Final** of All Pakistan Senior Debating Championship 2022 for the first time in **seven years**

Community Service Society - Bloodlink **Fall 2021 – Fall 2022**
Volunteer *Lahore, Pakistan*

- Introduced a **Digitization Framework** to reduce response time and alleviate the need for manual oversight
- Maintained a **24-hour helpline** on designated days, connecting hundreds of patients with blood donors

Honors & Awards

Dean's Honor List **Fall 2020 – Fall 2024**

- Awarded for maintaining a **cGPA greater than 3.6** in each semester *LUMS*

Chandrasekhar Honorific Fellowship **Fall 2022 – Fall 2024**

- Awarded twice for **academic excellence in basic science** from a cohort of 60 candidates *LUMS*

50% Merit Scholarship **Fall 2020 – Fall 2022**

- Awarded for being in the **Top 10 freshman and sophomore undergraduate students** in the LUMS School of Science and Engineering

World Schools Debating Championship **Jul 2019, 2020**
Two time Member of national team *Thailand, Online*

- Selected to serve in the **National Team** out of a pool of **300 candidates** from all across Pakistan
- Ranked as the **8th Best Speaker in the world** in the English as Second Language Category

120% Merit Scholarship **Sep 2018 – 2020**

- Awarded for the entirety of high school A Levels program based on **outstanding academics** and extracurriculars

Course Projects & Presentations

Photonic Quantum Computing **Spring 2025**
PHY 513 - Quantum Optics and Information

Resource Theory of non-Gaussian Operations **Fall 2024**
ECE 498 - Quantum Information Processing & Theory

On Recurrent Neural Networks in Unsupervised Deep Learning **Fall 2023**
PHY 603 - Machine Learning for Physics

On Path Integral Quantization in Scalar, EM and Spinor Fields **Spring 2023**
PHY 539 - Introduction to Quantum Field Theory

On Chaos in Simple Chua Circuits **Spring 2023**
PHY 300 - Experimental Physics Lab II

On Quantum Nature of Light **Spring 2023**
PHY 300 - Experimental Physics Lab II

Skills & Interests

Skills: Data Analytics (Python (Qiskit) & MATLAB), LaTeX, Microsoft Office
Interests: Public Speaking, Tennis, Mixed Martial Arts, Fantasy Novels, Poker