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Arsalan Khan

Undergraduate Researcher

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I'm an undergraduate student and Photonics Researcher at University of Toronto, studying physics and computer science. Actively undertaking optics projects as part of University of Toronto's Aerospace Team.

EDUCATION

University of Toronto, *Honours Bachelor of Science in Physics* **Sept 2020 - June 2025 (Expected)**

- **Cumulative GPA:** 3.74/4.00
- **Awards:** Dean's List Scholar, The Victoria College Faculty Award, The Elizabeth (Eastlake) Vosburg Scholarship
- **Relevant Courses:** Circuit Theory & Lab, Relativistic Electrodynamics, Advanced Classical Mechanics, Software Design, Theory of Computation, Quantum Physics, Quantum Information, Multivariable Calculus, Linear Algebra

EXTRACURRICULARS

Optical Testing Engineer, *University of Toronto Aerospace Team (UTAT)* **May 2023 — Present**

- Involved in UTAT's Space Systems Division, contributing to the **Optics team** for FINCH – a 3U CubeSat mission for crop residue mapping from Low-Earth Orbit, launching Q4 2024 aboard a SpaceX Falcon 9 rocket.
- Using **Zemax OpticStudio** and in-lab **optical tools** to **benchmark** the optical payload for the satellite.

Robotics Engineer, *Robotics for Space Exploration Club (RSX)* **May 2022 — September 2022**

- Involved in building a rover for the **Canadian International Rover Challenge competition** in Alberta
- Programmed motors in **C++** utilizing **Arduino boards** as part of the **Electrical team**.

WORK EXPERIENCE

Undergraduate Photonics Researcher, *University of Toronto Photonics* **May 2023 — Present**

- Using advanced **optical equipment** such as optical fibers, spectrum analyzers, probing stations, detectors, and power meters to conduct **characterization and testing of waveguide** properties, supporting the development of Bragg Reflection Lasers (BRL) for **nonlinear optics applications**.
- **Utilized Python** to automate **spectral analysis** and evaluation of lasing thresholds for diverse waveguide lasers. Further **data analysis and curve-fitting** was also performed.
- **Co-authored two papers** regarding nonlinear and quantum optics, presenting results at a **national conference**.
- Currently **leading a project** developing a monolithic source of entangled photons.

Research Assistant (Robotics), *University of Toronto* **May 2022 — December 2022**

- **Engineered and built** a compact, **wearable spectrometer** using off-the-shelf components to collect lighting data for architecture research on circadian rhythms. Programmed the device in **C++**.
- **Utilized Python** to develop and implement a **data calibration algorithm**, improving accuracy and reliability of spectrometer measurements.
- Conducted thorough **testing and benchmarking** and presented results at a **research conference**, demonstrating strong skills in **experimental design**, **data analysis**, and **communication**.

Software Engineer Intern, *TAPP (The Teacher App)* **June 2022 — August 2022**

- **Developed and implemented** key functionalities utilizing **ReactJS, NodeJS, and PostgreSQL**, leading the development of the main feed for a social media platform, implementing **software development best practices**.
- **Collaborated with a software team** to understand pre-existing code and add new updates, overcoming challenges through **continuous learning and communication** with team members.

PERSONAL PROJECTS

Deep Learning & Higgs Boson, *Machine Learning Project* **May 2023**

- Developed and implemented a **deep neural network** model using **TensorFlow** and **Keras** in **Python**, leveraging the Higgs Boson dataset to detect the particle, demonstrating proficiency in **machine learning theory** and practice.
- Utilized advanced techniques such as network **capacity tuning**, incorporating diverse **activation functions**, and employing **early stopping** to mitigate **overfitting**, achieving a commendable **accuracy of 99%**.

Tunable FM Transmitter Circuit, *Electronics Hardware Project* **April 2023**

- **Designed and constructed** an **FM transmitter circuit** using an electret condenser microphone, LC oscillator, and frequency modulator based on 2n2222 transistors, demonstrating proficiency in **analog electronics design and RF engineering**.
- **Successfully tested** the circuit by wirelessly transmitting audio over a short range of frequencies via a wire antenna, showcasing practical knowledge of **frequency modulation principles and circuit design**.
- **Documented** the construction process and testing procedure in a lab report, highlighting strong **technical writing** skills and the potential for the circuit's use in short-range wireless communication systems.