Aiqi Zhang

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Education

University of Toronto **Sept 2022 - May 2026**
BASc in EngSci, Major in Engineering Physics, Minor in Artificial Intelligence *Toronto, Canada*

NOIC academy **Sept 2021 - June 2022**
Secondary School Diploma, Valedictorian student of year 2022 *Markham, Canada*

The Affiliated High School of Peking University **Sept 2016 - June 2021**
Junior Middle School Diploma *Beijing, China*

Research Experience

Research Trainee - University of Toronto **May 2025 - Sept 2025**
Supervisor: Dr. Debra Wunch *Toronto, Canada*

- Built up computer vision pipelines integrating manual labeling with automated segmentation to derive high-resolution vegetation color indices through series of digital images.
- Validated phenology signals against flux-tower observations and developed a color-index driven model of urban carbon dynamics.
- Calibrated high-resolution camera using a grey-foam reference and absolute reflection plate to derive a linear correction across three bands.
- Thesis in progress: applying downscale high-resolution SIF signals with models to compare techniques across temporal and spatial resolutions.

Lab Technician - University of Toronto **May 2025 - Ongoing**
Supervisor: Dr. Ania Harlick *Toronto, Canada*

- Built on Advanced Physics Lab work to study domino chain effects, developing full-motion capture software using high-speed camera and presenting findings at the Women+ in Physics Canada 2025 Conference.
- Set up a digital holography apparatus and authored a comprehensive lab manual to enhance hands-on learning in the Advanced Physics Laboratory course.
- Resolved multiple lab setups through hardware design, CAD modeling, and software programming, while supporting students in the lab.

Research Intern - Nanyang Technological University **May 2024 - Sept 2024**
Supervisor: Dr. Xiaodong Chen *Singapore*

- Designed and optimized a large battery charging-discharging cycle database framework for battery life prediction, improving data management and analysis efficiency.
- Developed and refined feature extraction models to integrate machine learning with empirical and theoretical frameworks, enabling scientific analysis and interpretability in battery life modeling.
- Investigated and addressed the end-of-life definition problem in battery life prediction, conducting preliminary analysis to evaluate machine learning accuracy under varying definitions.

Conference Presentations

Zhang, A., Braverman, B., and Harlick, A.: Computer Vision for Domino Chain Dynamics, Women+ in Physics Canada, Toronto, ON, July 2025 (poster).

Projects

Domino Chain Effect | *Advanced Physics Laboratory Project* **Sept 2024 - Ongoing**
Supervisor: Dr. Boris Braverman and Dr. Ania Harlick

- Developed a stereo 3D reconstruction pipeline for capturing full domino dynamics using high-speed cameras, based on computer vision calibration, triangulation, and coordinate transformation.
- Quantified six-degree-of-freedom chain reaction mechanics through color-marker tracking, revealing significant rotational effects perpendicular to the transmission direction.
- Preparing a paper on the foundational model and classical analysis of domino wave dynamics for publication.

PatchouLink | *Praxis III Engineering Design Project* **Jan 2024 - April 2024**

- Prototyped an IoT system for real-time patchouli plant cultivation monitoring, enabling real-time data communication from in-ground sensors to the user interface.
- Led design and implement on the full-stack web platform for real-time cultivation monitoring, after receiving long-range Arduino sensor data to an SQL database, where it is decoded, stored, analyzed, and visualized using a Python-Django framework.

Satellite Image Segmentation | *Final Project of Deep Learning Course* **Feb 2024 - April 2024**

- Led efforts on develop and implement autoencoder-based deep learning model for satellite image segmentation, significantly improving accuracy over the baseline model.
- Designed and optimized data processing pipelines, including dataset augmentation, image normalization, and loss function computation for multi-class segmentation.
- Engineered and trained the model using PyTorch, leveraging encoder-decoder architectures inspired by U-Net and ResNet, and fine-tuned hyper-parameters for optimal performance.

OpenSOS Emergency Response AI Agent | *2023 NewHacks Hackathon* **Oct 2023**
1st place in Smart Cities category

- Developed an automated emergency response agent that interacts with callers, extracts critical information, and relays data to first responders.
- Led implement on voice recognition and LLM-powered analysis using Python libraries, GPT-3.5 API, and prompt engineering for accurate crisis assessment.

Betta-Trap | *Praxis II Engineering Design Project* **Jan 2023 - April 2023**

- Designed and prototyped a high-efficiency, all-weather storm drain filter to prevent microplastic entry into the Great Lakes, enhancing overflow prevention and ease of maintenance.
- Led design and CAD modeling for a double-liner system with an overflow mechanism and an automated maintenance alert, improving user and maintenance accessibility.

Scholarships and Honors

Samuel Beatty Physics Conference Travel Award, July 2025
Physics Summer Student Program Fellowship, May 2025

Technical Skills

Programming: Python, C/C++, Matlab, SQL, R, HTML, JavaScript, CSS, Verilog, LaTex
Hardware and CAD Design: Arduino, Raspberry Pi, Fusion360, Solidworks
Photography and Video Editing: Final Cut Pro, Adobe Photoshop, Adobe Lightroom, Adobe After Effects
Language: English, Mandarin

Relevant Coursework

Physics: Atmospheric Physics, Computational Physics, Advanced Classical Mechanics, Thermal Physics, Fluid Mechanics, Electromagnetism, Statistical Mechanics, Quantum Mechanics, Physics of the Earth, Advanced Physics Laboratory

Electrical and Computer Engineering: Data Modeling Prediction and Control, Introduction of Machine Learning, Deep Learning, Fundamental Algorithm, Data Structure, Electronics, Digital and Computer Systems, Electromagnetic Fields

Mathematics: Complex Analysis, Differential Equations, Vector Calculus, Probability and Statistics, Linear Algebra, Calculus I, Calculus II.

Other Engineering Course: Praxis I&II&III (Engineering Design Course), Structural Engineering, Molecules and Materials, Biomedical Engineering, Engineering and Society, Economic Analysis and Decision Making.

Design Team / Extracurricular

UTSM Urban Concept Aero-structural Team **Sept 2023 – May 2024**

Team Member *University of Toronto*

- Contributed to the prototype and CAD design of the outer shell for the first version of a Hydrogen Fuel Cell vehicle.

Natural Observation Team **Sept 2016 – Present**

Team Member *Wings of Nature - Natural Observation Club*

- Served as a tutor during a field trip for insect observation in the Gaoligong national natural conservation area, in July, 2023.
- Joined eight field trips to multiple national natural conservation area in China.