Zhi Han

Senior Undergraduate Student

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Research Experience

University of Alberta (Prof. Joseph Maciejko) — *Edmonton, Canada*

Research Assistant — *May 2019 - present*

- Interaction Driven Topological Superconductivity
- Numerical simulation of a many body quantum model showing the existence of a topological quantum phase transition, verified through comparing with analytical methods.

IceCube Neutrino Observatory (Prof. Darren Grant, Prof. Kopper Claudio) — *Edmonton, Canada*

Research Assistant — *April 2018 - August 2018*

- Reconstructing Particles with IceCube
- Writing and testing numerical algorithms for reconstructing particles

Honors & Awards

2019	**Jason Lang Scholarship**, Academic Scholarship	*Edmonton, Canada*
2019	**A Faculty of Science Undergraduate Scholarship**, Academic Scholarship	*Edmonton, Canada*
2019	**Summer 2019 NSERC USRA**, Research Funding	*Edmonton, Canada*
2019	**Offered Department SUPRE**, Departmental Research Funding	*Edmonton, Canada*
2018	**A Faculty of Science Undergraduate Scholarship**, Academic Scholarship	*Edmonton, Canada*
2017	**Jason Lang Scholarship**, Academic Scholarship	*Edmonton, Canada*
2017	**Undergraduate Academic Scholarship Competition**, Academic Scholarship	*Edmonton, Canada*
2016	**Rutherford Scholarship**, Entrance Scholarship	*Edmonton, Canada*
2016	**Governor General's Academic Medal**, Blessed Oscar Romero High School	*Edmonton, Canada*
2016	**CEMC Euclid Math Contest 2016 School Champion and Certificate of Distinction**, Euclid Math Competition	*Edmonton, Canada*

Presentations

Canadian Undergraduate Physics Conference 2019 at McGill University — *Montreal, Canada*

Presenter — *Nov. 2019*

- Interaction Driven Topological Superconductivity
- https://slides.com/zhihan/topology
- Both Oral and Poster Presentation

Show and Tell: A Student Research Celebration — *Edmonton, Canada*

Poster Presenter — *Sept. 2019*

- Interaction Driven Topological Superconductivity

Undergraduate Summer Research Poster Session — *Edmonton, Canada*

Poster Presenter — *Aug. 2019*

- Interaction Driven Topological Superconductivity

Undergraduate Research Symposium — *Edmonton, Canada*

Oral Presenter — *Aug. 2018*

- Reconstructing Particles with IceCube

Computer Skills

Numerical Methods	Root finding, Interpolation, ODE solving, Curve fitting, Monte Carlo, Interactive plotting, Data Analysis with Pandas, Physical Modelling, Data Visualization
Machine Learning	Scikit-learn, Pytorch, Classification, Regression, Neural Networks, Clustering, Data Mining
Programming	Node.js, Expertise in Python and Mathematica (4 years) for Computational Physics, Jupyter Notebook, LaTeX, React, MATLAB, GatsbyJS, JavaScript
Languages	English, Chinese

Education

University of Alberta — *Edmonton, Canada*

B.S. Honors in Mathematical Physics — *Sept 2016 - present*

- Dean's list, In major GPA: 3.7

Blessed Oscar Romero High School — *Edmonton, Canada*

Alberta High School Diploma — *Sept 2014 - June 2016*

Leadership/Volunteering

Leadership

Canadian Undergraduate Physics Conference 2018 Planning Committee — *Edmonton, AB*

VP Social/Communications — *2017-2018*

Planning and hosting social events, as well as managing social media, advertising, and building external relationships all in preparation for CUPC 2018 at the University of Alberta

Undergraduate Physics Society — *Edmonton, AB*

VP Social — *2017*

Planning and hosting club social events, advertising and doing class talks

Blessed Oscar Romero High School Graduation Ceremony — *Edmonton, AB*

Master of Ceremonies — *2016*

Hosted and spoke at Blessed Oscar Romero graduation ceremony at the Jubilee Auditorium in front of 400 people

Volunteering

2017 **Public Relations Volunteer,** Interdepartmental Science Students Society — *Edmonton, AB*

2014-2016 **Piano Therapy Volunteer,** Misericordia Hospital — *Edmonton, AB*

Interests

Research Interests

- I am interested in many diverse areas of Physics including **High Energy/Particle Physics, Condensed Matter, Quantum Computation and Quantum Information, and connections to Information Theory.**
- Mainly interested in using modern numerical techniques to better understand/visualize/share theoretical physics in addition to using traditional analytical approaches.
- Non-physics areas includes Machine Learning and Web development.

Science Outreach

- I'm interested in science outreach in the form of interactive computing, data visualization, and reproducible research using Jupyter Notebook and Github.
- Can be seen in my personal blog, and CUPC 2019 slides. https://lessthanepsilon.net
- The goal is to show off how beautiful theoretical physics is by overcoming traditional mathematical barriers through numerical visualization.

Extracurricular Activities

Less Than Epsilon — *Edmonton, Canada*

Personal Blog — *Oct. 2018 - present*

- https://www.lessthanepsilon.net/

Piano — *Edmonton, Canada*

Pianist — *2011 - present*

- Attained RCM Level 10

Relevant Coursework

Pure Mathematics

- MATH 117/118/217/317 Honors Multi-variable Calculus/Real Analysis,
- MATH 125/225 Linear Algebra,
- MATH 311 Complex Analysis,
- MATH 328/MA PH 464 Group and Representation Theory,
- MATH 447 Introductory Topology,
- MATH 600 Differential Geometry,
- MATH 334/337 Ordinary and Partial Differential Equations,
- MA PH 451 Mathematical Methods

Physics

- PHYS 281/381/481 Electrodynamics,
- PHYS 144/244/MA PH 343 Classical Mechanics,
- PHYS 271/458 General Relativity,
- PHYS 271/372/472 Quantum Mechanics,
- PHYS 310/311 Thermodynamics/Statistical Mechanics

Computing Science

- CMPUT 174 Intro to Foundations of Computing
- PHYS 234/420 Computational Physics
- CMPUT 466 Machine Learning
- CMPUT 604 Quantum Computing
- All other skills self-taught.