Matthew Penner

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Education

University of Toronto — Toronto, ON
Masters of Science Physics — *Starting September 2024*

St. Francis Xavier University — Antigonish, NS
Bachelor of Science in Computer Science — *May 2024*

- Average: 90%
- Courses of interest: Machine Learning, Artificial intelligence, Evolutionary Computation

St. Francis Xavier University — Antigonish, NS
Bachelor of Science First Class Honours in Physics, Minor in Mathematics — *May 2023*

- Average: 86%
- Final Year Average: 90%
- Recipient of Canadian Scholarship ($24,000)
- Recipient of Yogi Joshi Prize for Excellence in Physics($1,000)
- Recipient of Dr. M.S. Gautam Memorial Prize for Physics($300)
  awarded for the highest average in Honours Physics.

Research Experience

Research — May2021 -August 2022
St. Francis Xavier University — *Antigonish, NS*
Recipient of NSERC Undergraduate Student Research Award (USRA) ($7,500)

- In my honours thesis, "Finding Energy Difference in Relativistic Cosmic Muons," I utilized a scintillator Muon detector. I calibrated the detector and programmed a ROOT macro to analyze muon behaviour, including lifetime decay rate and energy calculations by taking the detector to various elevations and measuring the flux difference. This research culminated in the presentation of my honours thesis.
  Subsequently, I delved into charged lepton flavour violation, aiming to uncover new physics beyond the standard model. Here, I became acquainted with the BaBar analysis framework and developed ROOT macros for data analysis provided by Dr. Ahmed, focusing on the invariant mass in the upsilon (2s) decay. My machine learning coursework includes a project that detects this rare phenomenon. When trained for optimal accuracy, this method demonstrated a success rate of over 99%. When I fine-tuned the model to achieve perfect sensitivity, it still maintained a notable accuracy of 75%
  Lastly, I'm working on a paper "Investigating Cosmic Muon Behavior Using Monte Carlo Simulations" with Dr. Ahmed. This unique study uses a time-reversed technique, starting from sea-level measurements and simulating upward through the atmosphere. Developed in C++, our Monte Carlo simulation offers insights into muon dynamics, considering factors like energy, height, and angle of entry. This method is not only novel but also more efficient than conventional simulations.

Paid Experience

Tutor — September 2022 – Present
St. Francis Xavier University — *Antigonish, NS*

- Tutored students in classes ranging from Physics for Engineers to Quantum Mechanics and Relativity.

Teaching Assistant — September 2021 – Present
St. Francis Xavier University — *Antigonish, NS*

- I work under the first-year lab supervisor and set up and explain experiments that will help students see and understand physical concepts and improve their comprehension of physics.

County Recreation Supervisor — May 2019 – August 2022
Antigonish County Recreation — *Antigonish, NS*

- Multiple roles including swim instructor, swimming lessons supervisor, summer camp leader, summer camp supervisor, and lifeguard.

Lifeguard — May 2018 – May 2024
St. Francis Xavier University Recreation Department — *Antigonish, NS*

- Ensuring the safety of all patrons by preventing accidents and responding to emergencies.

Community & Volunteer Experience

Tutor May 2021 – May 2023

St. Francis Xavier University Physics Society *Antigonish, NS*

- Facilitated free weekly physics tutorials for undergraduate students

President of St. Francis Xavier University Physics Society May 2022 – May 2023

St. Francis Xavier University Physics Society *Antigonish, NS*

- I was responsible for hosting tutorials for the lower years, hosting fundraisers, and bringing students' issues to professors' attention.

Vice President of St. Francis Xavier University Physics Society May 2021 – May 2022

St. Francis Xavier University Physics Society *Antigonish, NS*

- I had similar responsibilities as president

World University Service of Canada Local Co-head of fundraising September 2022 - May 2023

World University Service of Canada (WUSC) Antigonish branch *Antigonish, NS*

- WUSC is an organization that aims to improve young refugees's access to quality education. As Co-Head of fundraising for my local branch of WUSC it was my job to make sure that we had the proper funds to help and support refuges, and also help with executive matters.

Equity Co-Head of Orientation Crew September 2023

Stfx Orientation Crew *Antigonish, NS*

- I was a Co-Head of the Equity Before Anything Else (EBAE) committee on my university orientation crew. This includes taking the Positive Space Facilitator Training, and training the members of EBAE to ensure that all incoming students feel like they belong and are accepted.

Waves of Change Facilitator September 2023

StFX Student Services *Antigonish, NS*

- Waves of Change teaches people about sexual violence prevention, how to be a good bystander to help prevent it, and what consent is. I have facilitated this training multiple times to incoming students and the members of the StFX Orientation Crew

Technical Skills

Programming Languages

* Proficient in multiple programming languages with the ability to seamlessly transition between them. Strongest expertise in: C++, C, Python, and Java.

Machine Learning

* I have used machine learning techniques in a wide variety of projects ranging from analyzing the Dead Sea Scrolls to particle physics to mnist. I am comfortable using machine learning techniques and have learned about them in depth, so I know which approach is best and how to validate the results.

Web development

* I have experience making websites and applications with Django. a project finished an online assignment system for physics that can understand complex math. has encrypted log-ins, and different teacher and student views where teachers can make questions, assignments and classrooms.
  Click here to go to Newton's Notebook

Other Technical Skills

* Proficient in the following tools and technologies:
  - CERN's ROOT
  - MATLAB
  - Maple
  - LaTeX
  - Advanced features of Microsoft 365 software
  - Linux
  - DRAC (formerly Compute Canada)
  - Django