

ASHIFUL BHUIYAN

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Toronto, ON

SUMMARY

Dedicated professional with a robust foundation in mathematical physics and computational methods. Experienced in numerical modeling, simulation-based research, and machine learning applications in physics. Proven ability to lead academic initiatives, demonstrated by co-founding a successful tutoring business. Skilled in data analysis, digital media, and academic support. Committed to advancing knowledge through rigorous analysis, innovative research, and collaborative problem-solving.

RESEARCH FOCUS

Interested in the application of applied mathematics and machine learning to physics. Focused on data-driven modeling of physical systems, numerical methods for differential equations, and exploratory simulation-based research. Particular interests include gradient-based optimization, backpropagation, and computational techniques for analyzing high-dimensional dynamics in physical models. Also interested in the applications of SPDE in statistical mechanics.

EDUCATION

McMaster University	Hamilton, ON
M.Sc. in Physics	Sept 2025 – <i>In Progress</i>

York University	Toronto, ON
Non-degree Studies	Sept 2024 – June 2025
<i>Selected Coursework:</i> Data Science (A+), Elementary Particle Physics (B+)	

Trent University	Peterborough, ON
Honors B.Sc. in Mathematical Physics	May 2019
Minor in Biology	
<i>Selected Coursework:</i> Statistical Mechanics (A), Advanced Numerical Methods (A), Combinatorics (A-)	

EXPERIENCE

Gifted Center	Toronto, ON
<i>Director & Co-founder</i>	<i>Sept 2024 – Present</i>

- Founded and lead a tutoring organization focused on STEM education for high school and university students.
- Designed academic programs and resources across mathematics, physics, and science curricula.
- Provided direct instruction in subjects including calculus, mechanics, statistics, and academic writing.
- Led website development, client communication, and digital outreach; supported dozens of students in achieving grade improvements and university readiness.

Zylor Education	Toronto, ON
<i>Tutor</i>	<i>Feb 2024 – Present</i>

- Delivered personalized tutoring in mathematics and science aligned with Ontario high school curriculum and university prerequisites.
- Designed custom lesson plans targeting conceptual gaps and exam preparation for students across diverse ability levels.
- Helped students move from failing grades to 80–100% scores; documented progress and maintained regular contact with parents and guardians.

- Designed customized learning strategies focused on enhancing analytical problem-solving skills, mathematical reasoning, and conceptual understanding in STEM subjects.

Air Canada

Station Attendant

Toronto, ON

Nov 2022 – Feb 2024

- Maintained operational safety in a fast-paced environment, ensuring timely service delivery.
- Strengthened communication, reliability, and attention to detail through team-based tasks.

Nordia (Canada Post Contract)

Customer Service Agent

Peterborough, ON

Aug 2019 – Aug 2021

- Provided support for Canada Post customers in mail tracking, insurance claims, and service inquiries.
- Operated under strict confidentiality protocols and maintained high call resolution rates.

PROJECTS

Natural Convection and Heat Transfer in Enclosures

Developed a Python toolkit to simulate 2D natural convection in rectangular enclosures for both clear fluids and porous media. Numerically solved the vorticity-streamfunction and energy equations using finite difference and SOR methods, considering varying thermal boundary conditions, orientations, and aspect ratios. Explored the effect of Rayleigh, Prandtl, and Darcy numbers, and computed Nusselt numbers to assess heat transfer performance. Implemented and visualized exact analytical solutions for temperature/concentration fields in elliptical domains, and symbolically verified these results. Visualizations and data analysis performed with Matplotlib.

github.com/AshifulBhuiyan/Natural-Convection-Enclosure

Two-Body Decay Simulation (π^0)

Simulated the decay process $\pi^0 \rightarrow \gamma\gamma$ using Python. Generated synthetic data using a uniform distribution and applied two-body kinematic analysis in both rest and lab frames. Used these results to explore momentum conservation and relativistic invariance.

github.com/AshifulBhuiyan/Two-Body-Decay

Collider Event Analysis – Estimating Neutrino Species

Analyzed proton-proton collision data to estimate the number of neutrino species. Processed datasets using Python to reconstruct missing energy and mass distributions. Applied statistical techniques to fit energy spectra and infer the number of undetectable decay products based on conservation laws.

github.com/AshifulBhuiyan/Analyzing-Collider-Events

Music Popularity Prediction from Spotify Audio Features

Developed models to estimate the popularity of songs using over 2 million entries from the Spotify API. Applied data cleaning, clustering, and feature engineering to extract signals from audio features (e.g., tempo, loudness). Benchmarked models including AdaBoost, Random Forest, and Neural Networks; achieved 86% recall on top-performing tracks. Integrated a pricing tool to estimate royalties based on the predicted popularity.

huggingface.co/ConquestAce/Spotify-Popularity-Predictor

Partition Numbers and Integer Partitions

Presented as part of a Combinatorics course. Covered integer partition theory, Young diagrams, generating functions, and asymptotic formulas. Included results from Euler, Ramanujan, and Ken Ono, with applications to statistical mechanics and number theory.

[View presentation \(PDF\)](#)

Applied Machine Learning Projects in NLP and Generative AI

Conducted multiple exploratory projects applying machine learning to language and image generation tasks. Fine-tuned lightweight language models (LLMs), trained and customized Stable Diffusion models for creative image synthesis under low-resource constraints. Created deep reinforcement learning agents in OpenAI Gym environments, using policy gradients to optimize performance.

EXTRA-CURRICULAR

Gzowski College Cabinet*Sustainability Ambassador*

2015-2018

Peterborough, ON

- Led campus-wide sustainability initiatives and mandatory risk-assessment training while collaborating with cross-disciplinary student teams to promote environmental awareness.

Kawartha Muslim Religious Association*Media Coordinator*

2017-2018

Peterborough, ON

- Produced digital media, managed website content, and organized outreach events to enhance community engagement.