

Justin Furlotte

MSc Mathematics

I am a graduate student researching mathematical physics (in particular, the Quantum Hall Effect) as a member of the Institute of Applied Mathematics at the University of British Columbia. Other than physics, I also have a strong interest in all facets of applied mathematics, including scientific computing, mathematical modelling, and machine learning.

✉ justin.furlotte@gmail.com

☎ (506) 304-7625

📍 Vancouver

📄 justin-furlotte.github.io/#

EDUCATION

MSc in Mathematics

University of British Columbia

09/2020 - Present

GPA: 87%

Awards

- NSERC Canada Graduate Scholarship - Master's (CGS-M).
- Faculty of Graduate Studies Award (x2).

B.Sc (Honours) in Mathematics-Physics

University of New Brunswick

09/2015 - 12/2019

GPA: 4.0

Awards

- NSERC Experience Award (2018).
- Dr. Ker-Ping Lee Memorial Scholarship (2019).
- The Arthur and Sandra Irving Primrose Scholarship (2015-2019).
- Older awards available upon request.

RECENT WORK EXPERIENCE

Head Teaching Assistant

University of British Columbia

09/2020 - Present

MATH 110 (Introduction to Differential Calculus); MATH 307 (Applied Linear Algebra)

Achievements/Tasks

- Promoted from Graduate TA (2020-2021) to Head TA for MATH 110 in January 2022. I now manage all workshops and lead all TAs for the course. I was also a Graduate TA for MATH 307 in 2020.
- Created weekly problem sets and solutions that were used for roughly 200 students, and created lecture plans for other TAs to use in their tutorials.
- Delivered tutorials to students with very high reviews from student evaluation surveys.

Assistant Physicist

C-Therm Technologies

06/2017 - 08/2020

Fredericton, NB, Canada

Achievements/Tasks

- C-Therm is a thermal analysis company which sells sensors and software that allow researchers to determine the thermal properties of sample materials.
- Programmed various analytical solutions of the heat equation which were developed to model the experimental configurations of C-Therm's sensors.
- Designed and implemented regression algorithms in Python on these solutions in order to obtain thermal conductivity, diffusivity, or effusivity from an experimental curve.
- Was in charge of creating the algorithm for C-Therm's "Flex TPS" (Transient-Plane-Source) sensor, which is now one of their core test methods.
- Performed R&D on other unreleased projects, which ultimately resulted in a publication.
- Implemented solutions into software for customer use, and performed experiments to verify and improve test methods.

SKILLS

Python

Julia

MATLAB

C#

LaTeX

Machine Learning

Mathematics

Physics

Scientific Computing

Research & Development

PROJECTS & PUBLICATIONS

Publication with C-Therm Technologies

- M. Emanuel, M. Bhouri, J. Furlotte, D. Groulx, J. Maassen: Temperature Fields Generated by a Circular Heat Source (CHS) in an Infinite Isotropic Medium: Treatment of Contact Resistances with Application to Thin Films, International Journal of Heat and Mass Transfer 137:677-689 (April 2019).

NHL Goal Scoring Outlier Detection

- A personal project where I created a machine learning model (using LASSO, random forest regressor, support vector regressor, and ultimately a stacking model) using data from moneypuck.com.
- The model predicts the total goals scored by a each player in a given year. A player is considered an outlier if their goal totals differ drastically from the model's prediction.
- Can be used to analyze, e.g., the top N over/underperformers from any given season. This type of analysis is valuable for teams in conducting trades, drafts, contract signings, etc.

Master's Thesis - The Quantum Hall Effect

- Researching the mathematical foundations of a fairly recently discovered phenomenon known as the Quantum Hall Effect, wherein a strong magnetic field and nearly 0 Kelvin temperatures can combine to create a very robust quantization in two dimensional electric currents.
- The effect is fairly well-understood using models which do not account for interactions between electrons. My thesis uses the tools of quantum lattice theory to account for these interactions, which makes the theory much more complicated.
- Ultimately, the goal of my thesis is to prove the famous "bulk-edge correspondence" of the Quantum Hall Effect in several geometric cases, and potentially discover a new result about the time evolution of a fundamental quantum operator called the ground state projection.

Other Projects & Where to View

- All of these projects and many more can be browsed in greater detail on my personal website, listed above beside my contact information.

COMMUNITY INVOLVEMENT

Panelist - Atlantic Student Research Journal, Research Higher Conference (2021)

Spoke and answered questions about the transfer from academic to industrial science, and what type of research one might expect in industry.

Invited Speaker - University of New Brunswick (2019)

Speaker at the BIG (Business, Industry, and Government) UNB mathematics networking event.

Invited Speaker - Atlantic Association of Research in the Mathematical Sciences (2019)

Presented in the 2019 industrial problem solving workshop on behalf of C-Therm Technologies.

Physics & Astronomy Club Secretary - UNB (2018 - 2019)

Organized events, sent emails to members, and managed social media accounts.