Lucas MacQuarrie

Student in Mathematics at University of Prince Edward Island

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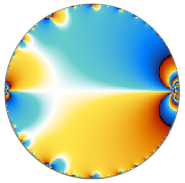
GPA : 4.165/4.3 *Course list available upon request*



I am an undergraduate student at the University of Prince Edward Island where I study Mathematics. I am very grateful having worked alongside Dr. Nasser Saad and Dr. Shafiqul Islam first in mathematical oncology and then in developing the theory of Hahn difference equations. I have a strong interest in mathematical biology as well as q-series and orthogonal polynomials. My current goal is to complete a PhD in applied mathematics to help people through my research.

Research Interests

Mathematical Modeling in Biology	The development of the calculus for the Hahn operator and its applications to orthogonal sequences of polynomials
Mathematical Oncology	How mathematical models of cancer can lead to new understanding and treatment methods
q-series	q-Series in combinatorics, q-calculus, q-difference equations, special functions
Dynamical Systems	Analyzing dynamical systems such as PDEs, ODEs, DDEs, for using in modelling or for pure purposes.

Research Experience

August 2020 – May 2020 — **Research Assistant | Asymptotic Iteration Method(AIM) for the Hahn Operator, UPEI, Dr. Nasser Saad and Dr. Shafiqul Islam**

- Extending the AIM method for solving second order linear homogeneous ODEs to the **Hahn operator**
- Presented results at the **Canadian Undergraduate Mathematics Conference**
- Use of various mathematical languages and packages for symbolic computations
- **In the process of publishing results**
- Weekly meetings to present and discuss work

Mathematica | Maple | Matlab | Python | LaTeX | q-series | difference equations | Hahn operator

August 2019 – May 2019 — **Research Assistant | Mathematical Oncology, UPEI, Dr. Nasser Saad and Dr. Shafiqul Islam**

- Look at various mathematical models of cancer and mathematical biology in general
- Worked with Python to simulate **differential equation models** in oncology and competing populations.
- Attended AARMS summer school at UPEI with courses *q-series in Analysis and Combinatorics by* **Dr. Mourad Ismail**, *The Mathematics and Science of Chaos by* **Dr. James Yorke** and *Iterated Fractal Systems by* **Dr. Franklin Mendiliv.**
- Attended **Society of Mathematical Biology** conference 2019 in Montreal
- Attended **Fields Institute's Summer Course on Nonlinear Dynamics in Life Sciences** in Toronto
- Presented at **Science Atlantic** at Dalhousie University in Halifax

Maple | Python | PDEs | ODEs | IFSs | Mathematical Oncology

Presentations and Publications

August 2020 — **PREPRINT , UPEI,**

Hahn-difference Asymptotic Iteration Method qwAIM

Abstract : The Hahn difference operator $D_{q;w}f(x) = \frac{f(qx+w)-f(x)}{(q-1)x+w}$, $q, w > 0$, is used to unify the recently founded the difference and q-Asymptotic Iteration Methods (DAIM, qAIM). The technique is applied to solve the second-order linear homogeneous Hahn-difference equations. The necessary and sufficient conditions for polynomial solutions are introduced and examined for the $(q; w)$-hypergeometric equation.

August 2020 — **Canadian Undergraduate Mathematics Conference, Western University, Online**

q,w-AIM for the Second Order Linear Difference Equation

A poster presentation for the results of my supervisors and I's results for the extension of the Asymptotic Iteration Method to the Hahn differential operator. Conditions for solutions and examples are given to a general audience.

February 2020 | **UPEI Undergraduate Journal Club, UPEI, Charlottetown, PE**
Sudden Cardiac Death, a Problem in Topology
A presentation of the paper of the same name by Arthur T. Winfree published in Scientific American. Presented to an audience of biology students to share the connection between Mathematics and Biology beyond typical statistical models.

October 2019 | **Science Atlantic 2019, Dalhousie University, Halifax, NS**
An Introduction to Mathematical Biology and Modelling of Tumour Growth
A contributed talk presenting simulations and methodologies of cancer modelling and presentation of recent research in radiotherapy sequencing by JCL Alfonso et al.

August 2019 | **Summer Program for Academic Research(SPUR), UPEI, Charlottetown, PE**
Understanding Cancer using Mathematical Modeling
A poster presentation on common methodologies and current research in mathematical modelling of biological systems with a focus on oncology. Included results from "*Immunologic Consequences of Sequencing Cancer Radiotherapy and Surgery*" JCL Alfonso et al.

Awards and Scholarships

2020 Academic Excellence Award, University of Prince Edward Island
2019 NSERC Undergraduate Student Research Award
2019 TD Bank SMCS Scholarship, University of Prince Edward Island
2019 Summer Program for Undergraduate Research Award, University of Prince Edward Island
2019 Academic Excellence Award, University of Prince Edward Island
2018-2019 Dean's Honours List
2018 John H. Bell County Scholarship, University of Prince Edward Island
2018 Hart-Gorrill Entrance Award, University of Prince Edward Island

Community Involvement

Tutoring
2018-Present

UPEI Tutorbank

I've tutored many students in a lot of areas in undergrad and highschool. I've been a part of a few tutoring groups including the help center at UPEI's math and computer science department, tutoring for residence buildings at UPEI, and a writing center for IB students in highschool. I also do private tutoring in various subjects.

Calculus | Linear Algebra | discrete math | ODES | PDEs | Computer Science | Statistics | Biology | Chemistry | Writing | IB Math SL | IB English HL | IB History HL | IB Biology HL | IB French SL | Python | Java

English Language Center at UPEI
2020-Present

English Language Center

Working with the English Language Center (ELC) at UPEI involves organizing activities and helping international students get involved at UPEI and help in the English Academic Program(EAP). The EAP is a mandatory program for international students to evaluate and improve their English level to academic standards. I run online social and academic events, prepare resources for teachers, and answer any questions or concerns students may have.

Buddy Program and Language Exchange Program
2019-Present

UPEI Buddy Program

I've participated in buddy programs and language exchange programs where students from PEI are paired with international students to help them become accustomed to PEI and meet new friends. The language exchange is similar in that new students are paired together to help them learn English or another target language. **I have been organizing the language exchange program since Fall 2020.**

French Translator for Free Software Foundation
2016 - 2017

Gnuastro

Translating the manual and website for Gnuastro into French. I'm very proud of my work because I strongly support free software and I'm glad to have contributed. I collaborated with programmers from different parts of the world through git and e-mail to make sure documents were formatted and uploaded correctly.

Git | emacs | HTML

Representative and Planner for Renewable Transport PEI
2017-2018

RTPEI on CBC

Renewable Transport PEI(RTPEI) was a student group that pushed for incentives from the government to support electric vehicles. My role was planning meetings, collecting signatures for petitions, and designing pamphlets, as well as participating in the main actions of the group. We organized meetings with local politicians to talk about what ways the government can support the move from gas and diesel powered vehicles to electric.

References

Dr. Nasser Saad, Professor
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