Ross **Andres**

Mathematical engineering · Machine Learning · AI · Quantitative life sciences

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Having worked in multiple interdisciplinary projects I believe links between different fields to be key in 21st-century research. I have experience in a wide variety of fields such as mathematical engineering, biophysics, medical physics, and theoretical cosmology. I worked independently and in collaborations with an emphasis on computation, and aspire to be at the intersection of mathematics, engineering, and technology.

Experience

MSc Thesis (Dr. Christoph Ortner)
Vancouver, Canada

Researching the use of ML techniques for molecular simulation.
May 2020 – May 2022

- Development of nonlinear models for https://github.com/ACEsuit/ACE.jl
- NN, GNN, regularization, preconditioning, quasi-Newton, Krylov and stochastic descent methods.
- classes: stochastic diff equations, advanced machine learning, control theory, optimal transport, numerical analysis and dynamical systems.

Honors Math Research Project (Dr. Jean-Christophe Nave, Dr. Alessandro Navarra)
Montreal, Canada

"Finite difference and discrete event simulation applied to copper smelter dynamics"
Jan – May 2019

- Interdiciplinary work, linking mathematical rigour and concepts to solve industrial and mining engineering problems.
- Used Runge-Kutta methods and Newton iterations to model complex reactions inside a copper furnace.
- Used Discrete Event Simulation to model the interplay between continuous and discrete events in Pierce-Smith converters.

The Ottawa Hospital Research Institute (Dr. Eric Vandervoort)
Ottawa, Canada

"Adaptive Margins with An Early Warning System for Motion-Tracking Errors in Liver SBRT."
May – September 2018

- Used artificial intelligence to predict errors generated by the CyberKnife treatment for liver cancer patients.
- Coded a real time interface for adaptive breathing control for patients to use during treatment.
- Achieved prediction accuracy of 84% with a support vector machine, clustering and statistical and morphological (biological) features.

Dr. Paul François (McGill University)
Montreal, Canada

"Exploring the use of Mutual Information as a Fitness Function for Parameter Reduction"
May – September 2017

- Simulated the immune system with coupled differential equations, and explored the parameter space.
- Investigated the capabilities of the Mutual Information as a function for parameter reduction in this model.

Education

University of British Columbia (2020 - 2022)   MSc Applied Mathematics, GPA 4.0

McGill University (2016 - 2020)   B.S. Honors Mathematics and Physics, GPA 3.66 (First Class Honours)

Skills

Programming   Python, Julia, JAVA, and basic MATLAB, R and HTML.

Languages   fluent in English, Spanish, and French.

Quantitative   SDE's, PDE's, time series analysis, SVD, PCA, regression techniques (SGD, ADAM, LSQR, etc), neural nets, SVM, prob and stats.

Extracurricular Activity

2018	**McGill Physics Hackathon,** improving neural networks with inspiration in immunological networks	*Montreal, Canada*
2017	**McHacks,** McGill Organized Hackathon, submited a Facebook chatbot as project	*Montreal, Canada*
2017	**CUPC (Canadian Undergraduate Physics Conference),** Guest speaker on independent research project	*Montreal, Canada*
2018-19	**MCHAM,** (McGill Children's Health Alliance Montreal) volunteer	*Montreal, Canada*
2016	**Beyond Me,** mentorship program for children with disabilities	*Montreal, Canada*

Publications, Awards and Honours can be found in andresrossb.github.io