Ross **Andres**

Mathematical engineering · Machine Learning · 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, biology, and physics.

Education

McGill University (2016 - 2020)   B.S. Honors Mathematics and Physics, GPA 3.63

Skills

Programming   Python, JAVA, and HTML.

Languages   fluent in English, Spanish, and French.

Experience

Dr. Jim Cline (McGill University)   *Montreal, Canada*

"Calculating maximal mass and radius of neutron stars when incorporating dark matter numerically as a mirror copy of the ordinary neutron"   *May – July 2019*

- Calculated numerically and analytically an upper bound on the amount of dark matter allowed in a neutron star given the most recent observations.

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 machine learning techniques 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.

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

A. Navarra, A. Ross, N. Toro, F. Ayala and T. Marin, "Quantitative methods for copper smelter reengineering projects", Peer-reviewed contribution to the proceedings of the Philip Mackey Honorary Symposium (Copper 2019).

M. Liu, A. Ross, J. E. Cygler, and E. Vandervoort. " TH-A-SAN2-10: Adaptive Margins with An Early Warning System for Motion-Tracking Errors in Liver SBRT." Med. Phys. 46(6), 499-500, 2019. Presented at 61st American Association of Physicists in Medicine Annual Meeting (San Antonio, TX).