

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, and technology.

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

- Interdisciplinary 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, submitted 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).