

THOMAS ROCHEFORT- BEAUDOIN

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EDUCATION

- PhD Candidate in Mechanical Engineering Polytechnique Montréal, 2020-2024
Thesis subject: Accelerating Structural Optimization through Deep Reinforcement Learning
- Bachelor's Degree in Aerospace Engineering Polytechnique Montréal, 2016-2020

EXPERIENCE

Mount Murray Investment

- **Data Science Intern** **Since March 2021**
Development of a monitoring system for the portfolio management team

Polytechnique Montréal

- **Teaching Assistant & Lecturer** **Fall 2022**
Teaching assistant and lecturer for the Mechanical Components Calculations class (MEC8354)
- **Teaching Assistant** **Since August 2019**
Teaching assistant for the Finite Element in Thermofluids class (MEC8270)

Defence Research and Development Canada, Valcartier

- **Research Intern, Directed Energy Section** **Summer 2019**
Numerical and experimental study of the impact of structural damage on the aerodynamic stability of future surveillance and reconnaissance UAVs.
- **Research Intern, Directed Energy Section** **Summer 2018**
Preliminary study of UAV vulnerability under high-powered laser radiation.

AWARDS

- Doctoral Canadian Graduate Scholarship - NSERC** **2022**
• Doctoral scholarship offered by the federal government for high performing students.
- Academic Excellence Scholarship, Hydro-Québec** **2021**
• Prize recognizing academic excellence and the quality of the research project of doctoral candidates whose project is linked to sustainable development
- Da Vinci Scholarship, Polytechnique Montréal** **2020**
• Scholarship for academic excellence and societal commitment awarded by Polytechnique Montréal

PEER – REVIEWED PUBLICATIONS

Comparative Study of First-Order Moving Asymptotes Optimizers for the Moving Morphable Components Topology Optimization Framework. Rochefort-Beaudoin, T., Vadean, A., Gamache, J.-F., Achiche, S. (2022). Presented at ASME-IDETC 2022 in St-Louis, Missouri.

Complexity-Driven Conceptual Exploration for Aircraft Structure. Gamache, J.-F., Vadean, A., Capo, M., Rochefort-Beaudoin, T., Dodane, N., Achiche, S. (2021) Submitted to *Design Science*, currently in second review round.

A Novel Use of the Ground Structure Topology Optimization for the Design of Pressurized Stiffened Panels. Capo, M., Gamache, J.-F., Rochefort-Beaudoin, T., Vadean, A., Achiche, S. (2021) Presented at ICTAM Milan 2020+1.

Aerodynamics of an Unmanned Aerial Vehicle Damaged by Small Caliber Projectiles and a High Energy Laser. Rochefort-Beaudoin, T., Pudo, D., Sirois, A. (2021) [Defense Research report # DRDC-RDDC-2021-R088].

Preliminary Study of UAV Vulnerability under High Power Laser Irradiation. Rochefort-Beaudoin, T., Daigle, J.-F. (2020) [Defence Research report # DRDC-RDDC-2019-R144].

ML PROJECTS

- **so-gym** *Python, Gym, Stable-baselines3, PyTorch, SciPy*
Developed an open-source reinforcement learning environment integrating structural analysis for the development of structural optimization RL agents. Used the open-source *gym* library to build the environment and *stable-baselines3* to benchmark deep reinforcement learning algorithms like PPO and TD3 on the task.
- **cerebro-dashboard** (@Mount Murray Investment) *Python, AWS, HF transformers, NLTK, pandas, dash*
Built a news monitoring pipeline for the holdings of the emerging markets portfolio managers. I implemented a serverless news aggregation pipeline using *Lambda* functions and deployed multiple finetuned-BERT models for financial/ESG sentiment analysis and classification of the various news articles. Implemented the *Googletrans* translation library to support news sources in many languages. Deployed a dashboard on *Elastic Beanstalk* built with *dash* for visualization of the most relevant news and used *AWS SES* to build an email alert system.
- **sp1500stockPicker** *Python, scikit-learn, pandas*
Developed an open-source stock selection algorithm based on financial ratios of the companies in the S&P1500 index to introduce myself to machine learning and data analysis. Implemented a random forest model from *scikit-learn* to predict the probability that a specific company will outperform the index based on its financial ratios of the past 7 years. Built a sliding-window backtesting script to validate the performance of the model.

TECHNICAL SKILLS

- Programming language of choice: *Python*. Capable in *MATLAB*
Used on occasions: *C++*, *JavaScript*, *SQL*
- Technologies of choice: *TensorFlow*, *Jax*, *Keras*, *Git*, *Gym*, *Stable-baselines3*, *Linux*
Familiar with: *Slurm*
- Cloud platform of choice: *AWS* (Certified Cloud Practitioner)
Capable with: *AWS Lambda*, *EC2*, *Elastic Beanstalk*, *S3*, *DynamoDB*, *Route53*

EXTRACURRICULAR

Vice-president investment, PolyFinances **2019 - 2020**

In charge of managing the 65 000\$ student investment fund.

- Bring about a complete overhaul of the investment policy to ensure the continuity of the fund for the next cohorts.
- Propose and lead the establishment of a responsible investment policy to better reflect Polytechnique's sustainable development values through the fund's investment decisions.

President, PolyFinances **2018 - 2019**

Lead the student investment club to promote the financial literacy among students at the engineering school.

- Coordinate the 28 students and the 5 internal teams to maximize internal communication.
- Work to expand ties between the student community and the financial industry.

Member of the glider club of Quebec City (CVVQ) **2019 - 2020**

- Participation in various promotional activities for glider flight in the Quebec region.
- Recipient of the CVVQ's 2019 annual scholarship for the next generation of glider pilots.

Private Pilot Licence (Licence # 922162)

- Transport Canada theory exam completed with distinction (88%) in September 2018
- Transport Canada practical exam completed with distinction (19/20) in November 2018

LANGUAGES

Fluent in English and French