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Prof. Andre Augusto Cire
Department of Management & Rotman School of Management
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105 St George St,
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Dear Profs. Cire and Diamant,

I am very excited to learn of the opportunity to work on research related to optimization under uncertainty with application to Healthcare and Social Good. As a matter fact, I have just published article that is very pertinent to this topic in the IEEE Transactions on Computational intelligence (preprint: <https://www.gerad.ca/en/papers/G-2021-07/view>). I feel that my research experience in the area of stochastic optimization is a very good fit for the research conducted at your labs since I have solved stochastic optimization problems involving agent-based models, mechanical simulations, and machine learning models.

I have developed an agent-based model for modeling the spread of COVID-19 in a sample population. Agent-based models are expensive simulations that use random seeds to model uncertainty regarding population dynamics and demographics. The random seeds result in a stochastic outcome that is difficult to interpret when making public health policies using the agent-based model. I have collaborated with researchers at Polytechnique Montréal and the group for research in decision analysis (GERAD) to develop a state-of-the-art derivative-free optimization algorithm known as stochastic mesh adaptive direct search (StoMADS) for solving stochastic optimization problems. The algorithm showed superior performance in comparison to other conventional optimization algorithms such as genetic algorithms.

Furthermore, I have co-developed a machine learning model for forecasting COVID-19 incidence using cross-sectional patient data. The machine learning model will also be used to support public health policy-making. I used StoMADS to tune the hyperparameters of the neural network used for forecasting incidence. This is because training neural networks involves random dropout, and initial weights.

My strong mathematical background in research related to numerical optimization, simulation and data-driven models stems from my research during my PhD. I conducted research into all three areas to automate time-consuming simulation-based design problems in the aerospace industry and was able to transform my ideas into industrial practice through the training programs and workshops that I conducted for our industrial partners (GKN Aerospace).

I realize that being a researcher entails three things: 1) Mentorship and supervision acumen 2) Strong research skills 3) Good communication skills to present key takeaways from cutting-edge research.

I have ample experience with all three fields and thrive on mentoring and teaching my students. Nothing gives me a greater sense of joy than hearing about the accomplishments of my students. As you can tell from my career profile, I made it a habit to always engage in research and mentorship simultaneously and never turned away anyone that asks for my opinion or guidance.

I understand that this position was posted back in May and may have already been filled but I felt compelled to apply since my research experience and interests are very well-aligned with the position. I am also open towards co-authoring an NSERC postdoctoral fellowship application which is due in October, 2021. The funding for the fellowship would

begin early 2022 just in time for in-person activities to resume. I already have a research proposal drafted based on the use of reinforcement learning for solving public health policy problems related to COVID-19. I would be happy to share it if there is interest in working together.

Yours sincerely,

Khalil Al Handawi