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BrainBox AI, 2075 Blvd Robert-Bourassa Suite 500, Québec, Canada
Subject: ML Developer

Dear Hiring Manager,

I am writing to express my interest in the ML developer role at BrainBox AI. I am excited about the opportunity to leverage my optimization, simulation, and statistical modeling experience for advancing sustainability and energy efficiency in the building sector.

I understand that as part of the role, I will be solving automation problems using various optimization and machine learning techniques. I have relevant experience in the field of optimization and machine learning as an instructor at McGill and as a researcher at McGill and Université de Montréal. I have 6 years of experience doing research on aerospace and aviation related projects at said institutions.
I am currently a post-doctoral researcher at the department of computer science and operations research (DIRO) at the Université de Montréal as part of an industrial project with the international air transport association (IATA). My current research focuses on graph representation learning from aviation data collected over the last decade to assess the effectiveness and impact of the IATA operation safety audit (IOSA) on air travel accessibility and cooperation between airlines.
Prior to this research project, I worked on aerospace design related projects, where I had to solve design optimization problems in relation to aeroengines. Although not within the scope of operations of BrainBox AI, I believe this experience is relevant as I had to use machine learning surrogate models to accelerate simulation workflows. Examples, of such machine learning models include weak learners such as Guassian processes, radial basis function networks and support vector machines. I authored a Python library and a web application to support the design activities of our industry partner, GKN Aerospace engine systems which relied on automating the setup, training, and tuning of said statistical models at its core.
I was also an adjunct lecturer at McGill University, teaching the engineering systems optimization course (MECH559) to engineering students. I covered various topics in optimization and covered some of the basic of machine learning since gradient descent is used to train most non-parameteric machine learning models. I authored several notebooks in Python and Julia to help the students understand the implementation of said algorithms and solve real-world engineering problems in their projects.
I also worked on healthcare related projects, where I had to develop machine learning models for forecasting the trajectory of the COVID-19 pandemic. As part of these projects I used deep learning (with PyTorch) to build recurrent neural networks for the purpose of providing short term predictions.
I believe these experiences are relevant to the role in the following ways:

- I can apply machine learning and statistical modeling given my experience in surrogate modeling, graph representation learning, and deep learning.
- I can create software prototypes along with unit tests and documentation given my past experience authoring a Python library.

- I can deploy said statistical and machine learning models to web frameworks such as Flask, given my past experience in deploying models to cloud platforms such as Heroku.
- I can investigate conflicts within datasets as I had to work with real-world data during the IATA and healthcare projects. I had to identify missing and conflicting data as part of data preparation to avoid introducing bias when applying learning algorithms to the data.
- I can create data pipelines for training and inference given my experience in settings up mySQL databases.
- I can develop and validate models (both simulation-based, and statistical) given my previous modeling and simulation experience during aerospace design, healthcare, and aviation related projects.
- I can apply mathematical optimization techniques given my optimization background and experience in research and teaching to improve existing BrainBox AI algorithms and frameworks from an operations research point of view.

Thank you for considering my application. I would be honored to have the opportunity to discuss my qualifications further and show you my portfolio of projects. Please feel free to contact me through any of the channels at the top of this letter.

Best regards,

Khalil Al Handawi