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Apple Special Projects Team
Santa Clara Valley (Cupertino), CA, United States
Re: Sr. Machine Learning Simulation Engineer - SPG
Role Number: 200355037

Dear hiring manager,

I am postdoctoral fellow at the Université de Montréal, department of computer science and operations research (DIRO), https://diro.umontreal.ca/accueil/ and I am very excited about this particular role and opportunity at Apple because of my knowledge and understanding of simulation-based engineering design on which my doctorate is based on. I have considerable research experience in this field and particularly, the area of design space exploration. Based on the job description, I can tell that the Apple Special Projects Group is looking for someone that is able reconcile physics-based simulation with data-driven and statistical models.

My doctoral and postdoctoral experiences at McGill University and Chalmers University of technology (Sweden), involved the need for accelerating product design through automation and design space exploration. Conventionally, product design relies on physics-based simulation models to evaluate performance, etc. I used an ensemble of statistical models to substitute physics-based models as a means of accelerating the search algorithm. This fits into stream (B) of the job description.

For example, I developed a thermo-mechanical simulation model to asses the impact of geometry, process parameters, and design on the performance of an additively manufactured aeroengine part. The computational cost of exploring the high dimensional could be mitigated by the use of statistical models as surrogates for the simulation. Numerical search algorithms were also used to reduce the computational cost of exploring the design space. This work has been published in the Journal of Mechanical Design (JMD), where it was selected for an editor's choice award.

My software development experience comes from small scale projects at various research labs where I have worked. Examples include:

- A tool for performing sensitivity studies on design problems where only observations from simulation models are available https://github.com/khbalhandawi/scale_AM_webapp.
- A tool for designing under uncertainty by allocating design margins as a buffer against changing requirements https://sed-group.github.io/mvmlib/.
- An agent-based model for modelling populations of agents described by individual demographics (used for modeling the spread of diseases in a population). In this project I tried to maximize the throughput of the simulation model by profiling the code and accelerating certain parts of it using parallel compute. This could fit into stream (A) of the job description.
  https://github.com/khbalhandawi/COVID_SIM_GPU

I understand that the role involves the reinforcement learning branch of ML. I have not worked on any practical projects involving reinforcement learning but it is an area that excites me a lot and I am willing to put a lot of extra effort to bring myself up to speed with the state-of-the-art.

I believe that my strong mathematical and simulation skills, experience in software development, and domain knowledge in mechanical engineering should prove useful for increasing the expressiveness of ML models for physical systems. I feel that being a part of the SPG Team at Apple is way to fulfil my career goals and make an impact in the lives of millions of people. I hope you enjoy going through my profile and my projects on my website. https://khbalhandawi.github.io/projects/

Yours sincerely,

Khalil Al Handawi