Dear Apple Hiring Manager,

I am a third-year computer science major at the University of Chicago looking for a position during the summer and I am available from June 13 to September 19th. I am interested in working at Apple to implement creative machine learning solutions, particularly using reinforcement learning for multi-context, multi-task learning.

I believe I have the qualifications, from my work-experience at Fermilab and my personal ML projects, to be a valuable member of the Apple team.

I read [this paper](https://arxiv.org/abs/1806.07366) on *Neural Ordinary Differential Equations* before my internship on how recurrent neural networks are essentially implementing Euler's method, propagating divergent errors, and requiring the signal to be in discrete time. Neural differential equations are a way of using a neural network to encode the derivative of the data, and then integrating to solve at any point in time (continuous time).

I proposed to Brian Nord (my adviser) that we try to apply neural ODEs to cosmology. The task was to use data on the brightness over time ("light curve") of different classes of astronomical objects and apply neural differential equation methods to classification and interpolation. What I found was that, while promising, particularly for interpolation, neural ODEs in [Julia](https://github.com/JuliaDiffEq/DiffEqFlux.jl) and Python lack the DE solver efficiency or stability to reliably compete with standard network architectures. As ensemble solvers improve, finding the algorithms suited to the data will largely improve the viability of these machine learning methods.

Professor Nord sent me to the 2019 LSST Conference in Arizona to present my poster on Neural ODEs in cosmology.

In my free time, I have been building a system on Google Cloud virtual machines to retrieve information from a variety of sports websites, primarily from REST APIs. The Python package collects time series information on the odds, point spreads, and over-unders, as well as statistics on players, teams, coaches, and referees. I use an LSTM and a binary-classifier to asses and predict the future state. Additionally, I have built a reinforcement learning environment using the OpenAI Gym Python package to formulate bet-hedging as a game for an agent to learn. Using Deep Reinforcement learning algorithms from TF-Agents, the agent learns the long-term reward dependencies needed to understand a risk-mitigated hedge.

On my programming capabilities:

I am by far strongest with Python in terms of knowledge of machine learning packages, debugging, unit testing, and documentation. I use Linux and my capabilities with bash scripting and git/[github](https://github.com/anandijain) are strong. I have a decent familiarity with Julia for differential equations and plotting, Go (C++ like language), and C from my coursework. I have some experience with assembly (x86) from my Computer Systems class, although I don't code in assembly. I should note that I don't currently have experience with Objective-C, Java, or Swift.

If you'd like to discuss further, I'd be happy to talk over the phone or however is most convenient for you.

Thank you for your time,

Anand Jain

Job number: **200067520**