<u>Overview of Machine Learning</u>

Machine Learning is a software field focused on training computers to accurately recognize and predict data patterns. This training allows people to use computes for data analytics and data predictions.

There is a specific importance in Machine Learning of data, pattern recognition and accuracy. As stated above, machine learning trains machines to recognize data patterns meaning that without data there is no means to teach a computer. The data is the crux of everything in machine learning and with no data there is nothing to be learned or taught. As for Pattern Recognition, it is important because it is through teaching machines to recognizer patterns that we can also teach them to recognize and predict data patterns. Through the use of pattern recognition specific algorithms can make specific conclusions and predictions based on data its provided and trained by. And finally, Accuracy is important in Machine Learning for much of the same reasons its important in any scenario because without Accuracy the conclusions and predictions drawn form ML can not be relied upon. There is then no use for the algorithms as they could be giving random answers rather than reliable conclusions drawn from the data.

Many people find it difficult to differentiate Artificial Intelligence and Machine Learning without knowing the nuances of each field. However, while they fall in the same domain with Machine learning being a sub-category of Artificial Intelligence they are different despite being very closely related. Artificial Intelligence (AI), as the name suggests, is when a computer system has the capability to simulate human cognitive functions such as learning and problem-solving[1]. In AI computers are taught to 'react' the way humans do and apply human reasoning and logic to decisions. AI is the general field in which other AI subsets, such as Machine Learning, fall under. Machine learning however, is specifically where computers are trained to recognize and predict data patterns not mimic human behaviors. The focus of ML is about data analysis and prediction rather than mimicry of human cognitive functions. The specific relationship between AI and ML would be that Machine Learning is a subset of the AI genre/field, but that Machine Learning branches out beyond what is used in AI and also relies on other fields such as Probability & Statistics, and Computer Science.

Due to their natures, Machine Learning applications cannot be built using traditional programming. For context, Machine Learning applications input data with the purpose of training an algorithm then outputting a ML data model while Traditional Programming applications input data and process through that data with an algorithm before outputting a result. Some of example of Machine Learning Application where Traditional Programming can not be used are as follows:

Social Media filters such as Snapchat face filters use machine learning applications to detect when there might be a persons face in the camera. This app can not be created with traditional programming because there is no way to specifically code a program to recognize a face whereas we can *train* a machine to recognize what is probably a face. Traditional programming requires specific rules to be encoded within it and there are no specific rules we can give a program to recognize a face.

Product recommendations are also made using a machine learning model/application. These recommendations can not be made using traditional programming due to the vast amount of data that needs to be analyzed to produce a sufficient recommendation and because the output required would be a pattern/prediction.

There is a lot of important terminology in Machine Learning with specific meanings, some of the main ones are: observation, feature, Quantitative Data, and Qualitative data.
An observation is a sample data point and a full row in a data table, this is important because it is an example data row. Observations make up a data set and as stated before, without data there is no Machine Learning. A feature is a column on a data table and is also known as a predictor or attribute. The importance of a feature is that it allows us to help predict other aspects of data based on its own values/information. Observations gives us entire examples of data and patterns can be found using features which allows Machine Learning algorithms to output a data model. Quantitative Data is a feature classification that deals with numeric data while Qualitative Data is a feature classification that deals with categorical data meaning that that possibilities for this data are finite (there are finite options). Both these classifications are important to Machine learning because they allow for a ML algorithm to learn and eventually recognize patterns in the data.

My initial interest in Machine Learning comes from when one of my managers suggested I look into it while in school due to its prevalence in the Software Industry. This pushed me to research into the topic and now I would like to learn machine learning both for my own personal interests and for professional application. I enjoy data analytics, so I feel Machine Learning is a good way to start branching into that field and gain some skills that will prove useful for my future career. I would like to have a career where I could move around into different Software sectors and don't want to be pigeonholed into one specific sector and I feel Machine Leaning could help with this. I also feel it is important to have some knowledge of all the prevalent software technologies today and Machine Learning is one of those.

<div align="center">References</div>

[1] "Artificial Intelligence vs. Machine Learning: Microsoft Azure." *Artificial Intelligence vs. Machine Learning | Microsoft Azure*, Microsoft, https://azure.microsoft.com/en-in/solutions/ai/artificial-intelligence-vs-machine-learning/#introduction.

Mazidi, Karen. ". The Craft of Machine Learning." *Machine Learning Handbook Using R and Python*, 2nd ed.