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Machine Learning

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Assignment #2

1)

Supervised Learning: Just like a kid is supervised when he is playing, an AI developer supervises the training process in supervised learning. But how? The goal of the developer is to provide the correct answers to the model. In this case, the correct answers are in terms of labels for the inputs. The goal is for the model to find relationships between the labels and inputs. Once the relationship is figured out, new data can be fed to the supervised model and we can ensure it will be correct since we have ensured it with old data. A good example is a student using the correct answers to learn how to solve similar problems in the future.

Unsupervised Learning: Unsupervised learning is almost the opposite of supervised learning. No emphasis is placed on the labels or input. However, the model is still attempting to find a relationship in the data. The data is given to the model, with no AI developer to feed it correct answers or hints, and the model attempts to find out what it can from just the data. Unsupervised models try to learn independently, trying to infer the patterns from the data itself. Let’s say I have a bunch of data on demographics, income, and interest rates, all of which is unlabeled. This data would be fed to the unsupervised model and it would try to look for patterns such as higher spending from a certain demographic.

Reinforcement Learning: Reinforcement learning is like trying to train a dog. If the dog does the correct thing such as following commands correctly, then a reward is given to the dog to REINFORCE that it is the desired behavior. Overtime, the dog eventually catches on since it gets what it wants after doing certain actions. The same applies for reinforcement learning in AI models. The AI developer is the trainer, who watches the results of the models and adjusts accordingly, rewarding the model when desirable results are achieved. In turn, this forms a relationship between the data and the model.

2) The learning is feasible when the sample data obtained represents the desired population as a whole. Is there enough data to accurately represent the population in both small and large scales? Since we are dealing with populations, its important to notice that everybody is different. Therefore, additional features are involved such as demographics, location, height, salary, etc. It would do the model no good if only 1 subset of the population is being used to train it despite attempting to give results for the population as a whole. This means that there should be no bias and the data must be as randomized as possible.

3) Logistic regression predicts the chances of a binary outcome. This means that it is a binary classifier which works best when the data is binary; 1s and 0s, yes’s and no’s, light or dark, bad or good, etc. Logistic regression is linear just like linear regression is since it calculates the weighted sum of the features involved. For example, y = weight\_1 + (weight\_2)(x\_1) +….. + (weight\_n)(x\_n). (Therefore, we can set a threshold (just like cpu’s read voltage to determine if its 1 or 0), where if the chances are below 0.5, then the answer is no. If greater, then the answer is yes. This is known as the sigmoid function, which is essential to the logistic regression algorithm. The output heavily depends on the weights. To achieve the best weights we use gradient descent method to iteratively adjust the weights and minimize final error. Error is calculated using cross entropy error function.

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6) PLEASE CHECK ATTACHED FILE FOR JUPYTER NOTEBOOK FILE WITH CODE. For proof, here is a screenshot.

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