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Reading Summaries

Neural Networks

I was surprised to read that neural networks could be boiled down to, “a mathematical function that maps a give input to a desired output.” They consist of an input layer x, an arbitrary amount of hidden layers, an output layer y, weights and biases, and a choice of activation function for each hidden layer. The most difficult step is training the neural network to make accurate predictions which is done through a process of fine-tuning the weights and biases from the input data. “Each iteration of the training process consists of… Calculating the predicted output y, known as feedforward” then “Updating the weights and biases, known as backpropagation.”

While feedforward is a simple calculus, the Loss Function evaluates the “goodness” of the predictions, and there are many to choose from. They each have their own advantages and the nature of the problem should dictate which one is chosen. The goal in training is to find the right combination of weights and biases that minimizes the loss function.

Now that a way of measuring the error of the prediction is found, there needs to be a mechanism that propagates the error back to update the weights and biases, backpropagate. “In order to know the appropriate amount to adjust the weights and biases by, we need to know the derivative of the loss function with respect to the weights and biases.” This is accomplished using the chain rule since the equation of the loss function doesn’t contain the weights and biases.

Neural networks typically learn the ideal set of weights to represent simple functions like the one used in the article. It was able to achieve 0 loss after about 600 iterations, and the final prediction (output) virtually matched the actual output after 1500 iterations. I wondered why there was still a difference between predictions and actual values after that many iterations, but apparently this is desirable, …”it prevents overfitting and allows the Neural Network to generalize better to unseen data.”

I learned that neural networks aren’t as complicated/scary as I previously thought. I’m also curious how Tesla, Google, and others are using this to improve self-driving car technology.

Python

Apparently, Python is generally used for 3 areas of programming: web development, data science (machine learning, data analysis, and data visualization), and scripting. I haven’t used Python in the workplace yet, but I’m excited to try it out as it’s becoming more and more popular, probably due to its readability.

There are some web frameworks based on Python which help you create server-side code in the same language. In my co-op at Kronos most of the code base was in Java, and used Angular, that did much of the same work this article is speaking to. But since Oracle, who owns Java, has been forcing subscriptions, free, for now, to install Java, I can see why some companies would migrate to Python. It also can be run right on a server which is handy.

I hadn’t heard of Flask; I’ve heard of Django before. “Flask provides simplicity, flexibility and fine-grained control. It is unopinionated (it lets you decide how you want to implement things).” It is also better if you’re a beginner and want more customization. Django provides a little more structure for simpler projects and a helpful UI.

It was interesting to learn that machine learning is based off the way babies learn, by being given lots of examples of the thing you’re trying to teach it, which makes sense in retrospect. I will be checking out the recommended machine learning courses from Stanford and Caltech.

I’ve heard people toss around the word scripting a lot but never had a concrete conceptual understanding of what it meant until this article. I realized that I’ve written dozens of these programs and Python’s ability to also be a scripting language makes it that much more attractive. I am also in the IoT class and we’re using it there as well, so it really seems like a jack of all trades.

The bit about machine learning being able to tell the difference between a dog and a table made me hopeful those tests when you are trying to log in somewhere that ask you to click on all the pictures with a bridge or a sign will be deprecated, sometimes they are never ending.