IST 690 Independent Study Deep Learning: Structuring Machine Learning Projects

by

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Course 3 of Andrew Ng's Specialization on Deep Learning is different from the previous two courses in the series. Instead of teaching applied information via coding or math regarding the construction of neural networks, he teaches industry tips based on his own experience. He does this with case studies showing different scenarios regarding autonomous driving and object recognition.

This is a shorter course compared to the previous ones but I believe it to be the most important so far, or perhaps at least the easiest one to grasp. The course helps consolidate the skills already learned and guides into the setting up, or implementation of projects. It teaches how to tackle projects by pointing out best practices for developing deep learning/machine learning models.

The course emphasizes the importance of having three different data sets: training, validation or dev and testing. Training set with the input examples, that the model will be fit into, or trained on by adjusting the parameters or weights for neural networks.The validation set for evaluation done by calculating the loss or error rate, which tells how accurate the model is. It's important because eventually the model will tune its parameters based on the frequent evaluation results of the validation set. Lastly, the test set which corresponds to the final evaluation that the model goes through after training phase with training and validation steps. Using this set, we get the accuracy of the model.

According to Andrew, the first step to start a project is to decide what matrices to use and optimize on. He explains that one should optimize the Bayes Optimal Error or BOE of the domain in which the model performs, respective of the Human Level Error or HLE. Then to evaluate the performance of the model you can compare the dev error to the BOE respective of HLE, and training error. Once this has been done, you can also compare the avoidable bias, which is BOE to training error to variance which is the training to dev error of the model.

Based on the results you can change approaches to increase performance. If there's a problem with variance you can get more data, add regularization or use a different approach with different hyperparameters and so on.

The two case studies showcased by Andrew makes you think about how deep learning can be used to solve the specific problems when working with object recognition or autonomous driving, or how the deep learning system in the case studies could be improved. To emphasize the importance of this course, the following quote by Andrew Ng perfectly summarizes it: "I've seen teams waste months or years through not understanding the principles taught in this course.

A brief summary of the case studies in this course:

Case Study 1: Autonomous driving- This case study tells you that you are employed by a startup that builds self driving cars. The main task is the detection of road signs including pedestrian crossing, stop sight and construction ahead signs, as well as the red and green lights. The goal is to recognize which of the objects appear in different shown images, given 100,000 labeled images as data set.

Case Study 2: Bird recognition in the city of Peacetopia- In this case you're a famous researcher in the City of Peaceotopia, where people are afraid of birds. The main task is to build an algorithm that will detect any flying bird over the city to alert the population. For this task you are given a dataset of 10,000,000 images taken from security cameras.

The course is perfect to learn about the different strategies to set up a deep learning projects and work with specifics from beginning to end. It not only focuses on demonstrating how to structure deep learning projects by teaching how to decide the train, dev, and test splits for the dataset but it also shows how to define human level performance and how to handle mismatched training, dev and test data sets.