IST 690 Independent Study Deep Learning: Neural Networks and Deep Learning

by

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Andrew Ng's specialization course DeepLearning.ai focuses on teaching state of the art techniques and how to build them yourself.

Course 1 works on the foundations; introducing the concept of neural networks and deep learning. The course teaches how to build a neural network that is built to recognize cats, thus the deliverable for this course is a cat recognizer.

Deep learning can be defined as the layered extraction of features out of an information source. In other words deep learning uses multiple layers of neural networks to abstract information from an input source to a more structured output source. This is where the notion of deep comes from, because of the multiple neural networks.

Neural networks have only now become feasible due to us having more data as well as more computing power. Thanks to this deep learning is now helping us in every facet of our lives, from healthcare to precision agriculture to self driving cars and that's why this course is valuable.

On this course we create our own neural networks from scratch and learn about Python's numerical library NumPy.

Building Cat Recognizer Neural Network from Scratch- Step by Step

Python packages to build neural network include:

- Numpy-main package for scientific computing with Python
- Matplotlib-library to plot graphs
- H5py- common package to interact with a dataset that is stored on an H5 file
- PIL and Scipy- Used to test model with own picture

To create the neural network several "helper functions" need to be implemented. These are used to build the eventual neural networks, a two layer network and an L-layer one. The first function is used to initialize parameters for the two layer model, and the second to generalize the initialization process to layers.

After creating these functions, the two layer neural network and L layer network can be used to classify cat vs non cat images.

The data used is provided by Coursera and it contains a training set of m_train images labeled as cat(1) or non-cat(0) and a test set of m_test images labeled as cat and non-cat.

The data summarized is as follows:

```
Number of training examples: 209
Number of testing examples: 50
Each image is of size: (64, 64, 3)
train_x_orig shape: (209, 64, 64, 3)
train_y shape: (1, 209)
test_x_orig shape: (50, 64, 64, 3)
test_y shape: (1, 50)
```

Before feeding the images to the neural networks they have to be reshaped and standardized. Then we can proceed to feeding onto the 2 layer and L layer deep neural networks testing for accuracy and comparing performance between them trying out different values. Assignment indicated to also train a 5 layer model in a similar manner the 2 layer one was created

Final Results show that a 5- layer neural network has better performance than the L neural network and 2 layer networks with 84% compared to the 72% from 2 layer.

```
pred_test = predict(test_x, test_y, parameters)
```
Accuracy: 0.84

Expected Output:

Test Accuracy	0.84

Result analysis from L layer showing mislabeled images.

```
print_mislabeled_images(classes, test_x, test_y, pred_test)
```


In conclusion the first course of the DeepLearning.ai specialization taught me how to create an L shaped and layered neural network for the recognition of cat images. The verdict shows that the more multi layered the network the better the results.