

12CS369 Applied Machine Learning SEE: Day 1

Date: 25th May 2015

Time: 8:30 pm to 5:45 pm IST

Batch # 3, Day 1: Object Recognition using Neural Networks and Deep Neural Networks

The objective of this problem is to recognize the object given the JPEG image using neural networks and deep neural networks. This problem has 2 parts: Perform object recognition using neural networks and do the same with deep networks and compare the results. The broad steps are:

- Normalize the images to a standard size
- Build and train the neural network
- Test and fine tune

Phase 1: Image normalization

1. You are provided with a dataset of images that are drawn from different categories. The images may be of different sizes
2. Normalize the images using a image processing library in to a common format. Initially choose the format to be 16 x 8, later you are required to try 16 x 16, 32 x 32

3. Report to the invigilator: Normalized JPEG (double click the image and observe)

Phase 2: Build Neural Network

4. Form the features such that each pixel is a feature. Note that the pixel is a vector of RGB. Thus if you have 16 x 8 image, you will form $128 \times 3 = 384$ input units or features
5. Based on the category of the image form the output vector. Form the expected output vector by setting the bit position for the expected word to 1 and other bits zero
6. Partition the data in to training and test datasets in the ratio 70%, 30%
7. Train the neural network using backpropagation
8. Test the system on the test dataset

9. Report to the invigilator: Neural network feature set, parameters, test results

Phase 3: Visualize and Fine tune

10. Plot the weight matrix W1 and W2.
11. Observe the edges being recognized, fine tune the hidden layer size

12. Report to the invigilator: Visualization demo

Part 2: Build a DNN and repeat the tests

1. Develop an autoencoder using the neural network that you already have
2. Stack the autoencoders to form a deep neural network, where we may want to build systems of arbitrary depth
3. Note: You can test the DNN using synthetically generated data (ask the invigilator for the dataset)
4. Repeat the object recognition experiment and compare the test results with previous experiment
5. Report to the invigilator: Results of the tests
6. Fine tune by altering number of hidden layer, units etc
7. Visualize different weight matrices
8. Report to the invigilator the test results and visualization

Deliverables:

1. Source code of all your py modules
2. Pickle file of your classifier

Best wishes from your faculty ☺