Group 4: Object Recognition (Proposal)

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1 Data Set & Software

We will be using the Caltech 256 dataset which has images of 256 object categories and one clutter category taken at varying orientations, lighting conditions, and with different backgrounds. There are 30608 such images in total, with at least 80 images per category. If time permits, we will venture into other object recognition benchmark datasets like CIFAR-10 and CIFAR-100.

Primarily, we will be implementing code using Python, exploiting popular libraries and packages such as sklearn, TensorFlow and Keras, to name a few.

2 Project Idea

The objective is to create an object recognition model that would accurately identify the category to which an image belongs. We intend to attack this problem in both supervised and unsupervised (clustering) fashion.

For now, we plan on using the traditional ZCA whitening algorithm for preprocessing, but will be exploring other algorithms as well. The idea is to train a Convolutional Neural Network for accurate image classification wherein we shall use the train/validation set to tune the hyper-parameters and find an optimal network structure. The generalization error of our model on unseen data will be approximated using the test set. The train-test split will be achieved by disproportionate stratified random sampling to generate a representative sample. We will also be studying and developing a clustering model that would group all images belonging to the same category into a single cluster, thus proceeding with object recognition as an unsupervised task.

3 Papers

1. Yann LeCun, Yoshua Bengio & Geoffrey Hinton, *Deep Learning*
2. Alex Krizhevsky, Ilya Sutskever & Geoffrey E. Hinton, *ImageNet Classification with Deep Convolutional Neural Networks*
3. Aysegul Dundar, Jonghoon Jin & Eugenio Culurciello, *Convolutional Clustering for Unsupervised Learning*

4 Work Division & Midterm Milestone

As per our current plan, Varsha and Ashwin will be working on supervised object recognition and Kevin and Darshil on unsupervised recognition. For our midterm milestone, we intend to come up with a reasonable working model that would perform object recognition task with decent accuracy.