Data Analytics – Final Project Preliminary Report

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Data: I will be working on the image classification project. The objective of this project is to classify test images accurately. The dataset consists of images from nineteen classes. Each class has at least 100 images. The *Vessel* has the least number of samples with 100 images. And the class with the most number of images is the *Dog* class with 180 images. We can see that the dataset is not balanced. So we will need to come up with some regularization techniques to avoid the issue of class bias.

Analysis: We will apply the methods that we have learned in this course such as parametric models, SVM and Neural Networks. Our expectation is that the deep learning techniques based on neural networks architecture will outperform the rest of the traditional techniques. We will also show results on hyper-parameter (learning rate, batch size etc.) tuning for deep learners. Most specifically we will be using convolutional neural networks (CNN) for extracting features and then we will use MLP (Multi Layer Perceptron) for classification. We will also show the effect of transfer learning by using some pre-trained deep learning model to train on our image classification dataset. So instead of training from the scratch we will use the pre-trained weights of some network trained on some other dataset to initialize the weights of our model. Then we will do a comparison between the performance achieved using the pre-trained weights and learning from scratch. As of now we will mostly be using some version of the well known ResNet architecture. We won't be using the ResNet architecture directly, rather we will be building upon the idea of ResNet which is using the skip connections to stop the model from forgetting the features learned/extracted at the earlier stages of the network architecture. In order to address the issue of overfitting we will use different regularization techniques such as drop out, batch normalization, augmentation etc. As discussed above the dataset is not balanced so we will use the image augmentation techniques as means for making the dataset balanced. As no test or validation data has been given to us we will split the dataset into train and validation set and will do the evaluation of the models on the validation set.

The overall target for this project is to do a comparative study between different machine learning techniques for image classification task. In doing so the goal is to come up with a technique that performs best in classifying the test dataset.