CIS520: Implementation of Models

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The four models we implemented were a generative model, an instance based method, a discriminative model, and a semi-supervised dimensionality reduction method with a GMM model. The first two models are trained with the text data in words\_train.mat and the last two models are trained with the color data in train\_color.mat. We used a 10-fold cross validation to calculate the average cross validation errors of the models.

**Generative Model**

Our generative model was a Naive Bayes Model. We used the Matlab function, fitcnb() and specified the distribution as a multinomial distribution. The model had a 10-fold cross validation error of 0.2027.

To run the the Naïve Bayes model, open NB\_model.m and run the function. The function takes in train\_words.mat from the train\_set folder and outputs the 10-fold cross validation error and the model.

**Discriminative Model**

The discriminative model we fit was a cross-validated SVM classifier. The model classifies the color features as 0 or 1 using the fitcsvm() function with a Gaussian Kernel and a uniform prior. We use our own partition function, make\_xval\_parition which partitions the data. The model has a 10-fold cross validation error of 0.4211.

To run the model open SVMwords.m and run the file. The input of the model is train\_words.mat and train\_color.mat from the train\_set folder. The output of the function is the model the 10-fold cross validation error.

**Instance Based Method**

The instance based model is a K Nearest Neighbors model. We used the MATLAB function, fitcknn(), with K = 449 number of neighbors and the spearman distance. We used 10-fold cross validation to determine these specifications. The 10-fold cross validation error was 0.2798.

To run the model, open knnWords.m and run the file. The input of the model is train\_words.mat from the train\_set folder. The output is the model and the 10-fold cross validation error.

**Semi-Supervised Dimensionality Reduction**

We reduced the dimensionality of the train\_color.mat data with PCA to 30 principal components, a regularization value of 0.0001, and specified a diagonal covariance matrix with the pca() function. We ran a Gaussian mixture model to predict the reduced training data of the colors with two clusters with the fitgmdist() function. We picked two clusters to represent the two outputs we are trying to predict The 10-fold cross validation error was 0.4489.

To run the model open PCA\_GMM.m and run the function. The function takes in train\_words.mat and train\_color.mat from the train\_set folder and outputs the 10-fold cross validation error and the model.