**BCS Project Description:**

1.Problem Statement

* Here we need to predict the BCS classes. Basically it’s a Multiclass Classification Problem.
* We have 1,2,3,4 classes.

2.Preprocessing Steps & Feature Engineering

* Here we have train , test data & labels.csv file. So based on this csv file i created a separate folders . so that each folder indicates different classes (Class\_1,Class\_2,Class\_3,Class\_4) .
* These data divided into train-valid data(each folder contains Class\_1,Class\_2,Class\_3,Class\_4 folders). You can find these in this file (Step\_1\_Train-Validation Split\_final.ipynb).
* here we have less amount of data. We applied a data agumentation steps & also applied transformations, filters on images like Gradient, Negative Images, Box filter , Adaptive + Gassiun thresholding , Discrete Fourier Transform , Est. transformation , Fitting Polygons , log\_transformation , Gassiuan filters + Kernals , Canny\_edge , Image\_temparature , Contrast Stretching ,K-means , Keras augmentation.
* You can find all these image preprocessing steps in (Image Preprocessing.ipynb ) file.
* After applying all the above feature engineering steps finally we’re with 2466 images of train,719 images of valid.
* Data Visualization analysis is available in (visualization.ipynb) file

3. Models Applied & Results

* We used a base CNN model along with Reguralization techniques(Drop out , Batch Normalization , MaxPooling) etc.
* We have used activation functions ( Relu, swish) . and also used softmax as in the last layer.
* Base CNN model given Train\_Accuracy of 73.01% , Validation\_Accuracy of 69.96% (After applying all filters & Keras augmentation).
* You Can see this model in (Base\_CNN.ipynb) file
* After this we tried with transfer learning techniques VGG16 , Resnet101.
* The same preprocessed images are given input to these above transfer techniques.
* VGG16 has given Train\_accuracy of 72.43% , Valid\_accuracy of 68.98% (After applying all filters & Keras augmentation).
* You Can see this in (VGG16.ipynb) file.
* Resnet has given Train\_accuracy of 70.85% , valid\_accuracy 69.40% (After applying all filters & Keras augmentation).
* You can see this in (Resnet101.ipynb) file.
* You can see some of the model analysis results images are store in Output\_images folder.