Write me the whole code in python so that I can run it in Kaggle. My topic is diabetic retinopathy classification. My base dir has 3 subfolders train, test and val. Each subfolder has 5 subfolders 0, 1, 2, 3, 4. These subfolders represent labels. The train set has balanced images. Write me the whole classification code. Use VGG16 as feature extractor and SVM as classifier.

Now I want to add some preprocessing steps here, Please add the pre-processing steps in separate functions. I want to to check the output of each pre-processing image. Example: [Before Resizing, After Resizing], [Before CLAHE, After CLAHE]. I will give you the pre-processing methods one by one and you have to write me the whole code. Also I want to visualize the train, validation and test samples, the confusion matrix and evaluation metrices in accuracy, precision, recall, f1 score, AUC, sensitivity, Specificity.

Pre-processing Methods: 1) Image Resizing

2) Normalization

3) Data Cleaning (Crop out black borders or irrelevant regions, Remove images with severe artifacts or poor quality (if possible, based on dataset size)

Note that the whole code has to run. Don't let the pre-processing disturb the deep learning model VGG16.

This works, Thank you. I want to do a bit modification, I want to visualize the images of train, val, test max 2 images of each unique label. Also I want to add the following pre-processing, Please do remember the pre-processing don't disturb the deep learning model VGG16.

Pre-processing Methods:

4) Data Augmentation (Basic geometric transformation, Color based augmentation, Noise injection) [Note that I want each data augmentation to be separate functions. Example: Data\_aug\_geo\_transform, Data\_aug\_color, Data\_aug\_noise\_inject]

5) Contrast Enhancement (CLAHE and global histogram equalization or gamma correction) [Note that I want each Contrast Enhancement in separate functions.]

6) Color Space Conversion (HSV or LAB, green channel)

7) Image Denoising ( Gaussian Blur, Laplacian Filter, Median filtering or bilateral filtering) [Note that I want to each Image Denoising method in separate functions ]

8) Region of Interest (ROI) Extraction (Hough Transform)

9) Vessel Segmentation (Use open CV methods for simplicity) [Note: Please comment out this code as it tend to give errors