ASSIGNMENT #3

1. Implement Hidden Markov Model (HMM) for classification using Python for the following UCI datasets:
    a. UCI datasets (can be loaded from the package itself):
        i. Wine Dataset: https://archive.ics.uci.edu/ml/datasets/wine
        ii. Ionosphere Dataset: https://archive.ics.uci.edu/ml/datasets/Ionosphere
        iii. Wisconsin Breast Cancer Dataset: https://archive.ics.uci.edu/ml/datasets/Breast+Cancer+Wisconsin+(Diagnostic)
    b. Compare the performance the following HMM classifiers for all the three datasets and show the classification results (Accuracy, Precision, Recall, F-score, confusion matrix) with and without parameter tuning:
        i. _BaseHMM
        ii. GaussianHMM
        iii. GMMHMM
        iv. MultinomialHMM
    c. Also, compare the performance results with that of a trained ANN.

Apply different values of train-test set splits and report the corresponding results for all the classifiers.

Generate the image (heat map) of the confusion matrix for the best case of every classifier. Also, generate the images of training & loss generation curves. For each dataset, generate an image illustrating Receiver Operating Characteristic (ROC) curve and Area Under Curve (AUC) for the best case of every classifier only.

Try to achieve accuracy >=80%.

Show the performance comparison among classifiers in a table.

2. Construct a Deep Learning model using Convolutional Neural Network (CNN) for classification on the following four standard datasets:
    a. CIFAR-10: https://www.cs.toronto.edu/~kriz/cifar.html
    b. MNIST: http://yann.lecun.com/exdb/mnist/
    c. SAVEE: http://kahlan.eps.surrey.ac.uk/savee/Download.html
    d. EmoDB: http://www.emodb.bilderbar.info/navi.html

3. Experiment with the following Deep Learning models on the above the four datasets and show the performance comparison among the models along with that of CNN:
    a. VGG-16: https://github.com/fchollet/deep-learning-models/blob/master/vgg16.py
    b. ResNet-50:https://github.com/fchollet/deep-learning-models/blob/master/resnet50.py
    c. Recurrent Neural Networks (RNN): https://github.com/WillKoehrsen/recurrent-neural-networks/tree/master/models
    d. AlexNet:https://github.com/eweill/keras-deepcv/blob/master/models/classification/alexnet.py
    e. GoogLeNet: https://gist.github.com/joelouismarino/a2ede9ab3928f999575423b9887abd14

    Apply different values of train-test set splits and report the corresponding results for the Deep Learning models.

    Generate the image (heat map) of the confusion matrix for the best case of every Deep Learning model. Also, generate the images of training & loss generation curves. For each dataset, generate an image illustrating Receiver Operating Characteristic (ROC) curve and Area Under Curve (AUC) for the best case of every Deep Learning model only.

    Try to achieve accuracy >=80%.

    Show the performance comparison among Deep Learning models in a table along with a detailed discussion.

    Save the assignment in a single pdf file with the naming convention “Class Roll No_Full Name.pdf” and mail the report to us through email by 9th October, 2021 EOD to:
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