Assignment 3

Problem 1

In this question we will use the data given in file "Social Network Ads.csv" which is a categorical dataset to determine whether a user purchased a product or not by using three features to determine user's decision. Visualize the data by 3D plotting features using different colors for label 0 and 1. Use data in file "Social Network Ads.csv" to perform logistic regression by implementing the logistic function and with the available library function and compare your results. Use 90% data points from each set for training and the remaining 10% for testing the accuracy of classification. Using the confusion matrix find accuracy, precision, F1 score and recall.

Problem 2

You will work with a widely used Iris dataset. The Iris Dataset contains four features (sepal length, sepal width, petal length, and petal width) of 50 samples of three species of Iris (Iris setosa, Iris virginica, and Iris versicolor). Plot features' histogram. Compute pdf and compare it with histogram. perform the exploratory data analysis by plotting the basic statistics like mean, median, min, and max value of each feature (sepal and petal lengths and widths) for each of the three classes (setosa, virginica, and versicolor).

Problem 3

Visualize the data in the Iris Dataset by considering maximum combinations of two features in a 2D plot. Use red, green, and blue colors for labeling the three classes: Iris setosa, Iris virginica, and Iris versicolor, respectively. Comment on whether any two classes among the three can be separated by a line? Report your observations for each case.

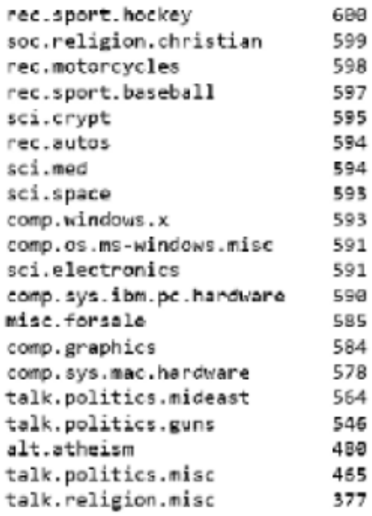
Problem 4

Perform logistic regression on Iris Dataset and plot confusion matrix. Using confusion matrix find accuracy, precision, F1 score and recall.

Problem 5

Imbalanced dataset typically refers to a dataset where the classes are not represented equally. Classification problems having multiple classes with imbalanced dataset present a different challenge than a binary classification problem. The skewed distribution makes the machine learning algorithms less effective, especially in predicting minority class examples.

In this question you will perform logistic regression for multiclass classification on the 20 News groups dataset. Since this dataset is a balanced one, you will perform the pre-processing to create an imbalanced version of the dataset (by removing some news articles from some groups). One example is given below. Perform multiclass classification using logistic regression on both the balanced and the imbalanced version of the dataset. Compare the performance in each case by obtaining the confusion matrix and accuracy. Report you observations at the end. You can refer to this article for a better understanding of multiclass classification using logistic regression.



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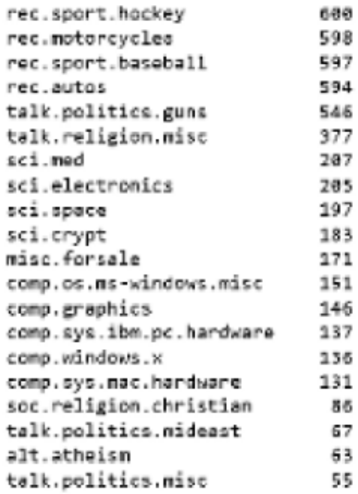
rec.sport.hockey             600
soc.religion.christian       599
rec.motorcycles              598
rec.sport.baseball           597
sci.crypt                    595
rec.autos                    594
sci.med                      594
sci.space                    593
comp.windows.x               593
comp.os.ms-windows.misc      591
sci.electronics              591
comp.sys.ibm.pc.hardware     590
misc.forsale                 585
comp.graphics                584
comp.sys.mac.hardware        578
talk.politics.mideast        564
talk.politics.guns           546
alt.atheism                  480
talk.politics.misc           465
talk.religion.misc           377
```

Balanced



```
rec.sport.hockey             600
rec.motorcycles              598
rec.sport.baseball           597
rec.autos                    594
talk.politics.guns           546
talk.religion.misc           377
sci.med                      207
sci.electronics              205
sci.space                    197
sci.crypt                    183
misc.forsale                 171
comp.os.ms-windows.misc      151
comp.graphics                146
comp.sys.ibm.pc.hardware     137
comp.windows.x               136
comp.sys.mac.hardware        131
soc.religion.christian        86
talk.politics.mideast         67
alt.atheism                   63
talk.politics.misc            55
```

Imbalanced