BUILD A PACKAGE FOR SIMPLE PERCEPTRON

CS5331 Homework - 3 , Fall 2017

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Libraries Used: **devtools**, Roxygen2 to build package and **rgl** for 3D plot.

Input Files: 2Ddata.csv and 3Ddata.csv

- 2Ddata.csv file contains uniformly distributed data between 0 to 10 with two dimensions as 2nd and 3rd columns. First column being a class label. If mean of any row in input data frame is less than the mean of entire data then it is classified as -1. If mean of any row in input data frame is greater than the mean of entire data then it is classified as 1.
- 3Ddata.csv file contains uniformly distributed data between 0 to 10 with three dimensions as 2nd and 3rd columns. First column being a class label. If mean of any row in input data frame is less than the mean of entire data then it is classified as -1. If mean of any row in input data frame is greater than the mean of entire data then it is classified as 1.

Package: The package we build here is a named Perceptron. It has 2 functions percep2D() and percep3D() to build a classifier that separates the data into two classes and plots the result of 2 dimensional and 3 dimensional data respectively. Both the functions takes in data and classify it based on mean i.e.,

- Both the functions binds the input of bias column(column containing 1's) to the input data.
- Both the functions also take the bias value as the mean of all the values in dataset.
- Then we initialize the weight vectors for both 2D and 3D data sets with random values and iterates through the entire data set until we get correct weight vectors which classifies the data correctly. This is done using sign() function which calculates the sign of dot product of vectors : weight and input(1*3 and 3*1)dimensions respectively for 2d data and weight and input(1*4 and 4*1)dimensions respectively for 3d data

```
#starts with random weights and iterates untill it find the exact weight for the class
w <- c(-threshold, runif(ncol(pts) - 2))
n <- nrow(pts)
label <- pts[ , 1]
obs <- pts[ , 2:ncol(pts)]

misclassfied <- TRUE
while (misclassfied) {
  misclassfied <- FALSE
  for (i in 1:n) {
    if ((label[i] * sign(obs[i , ] %*% w)) <= 0) {
      w <- w + label[i] * obs[i , ]
      misclassfied <- TRUE
    }
  }
}
```
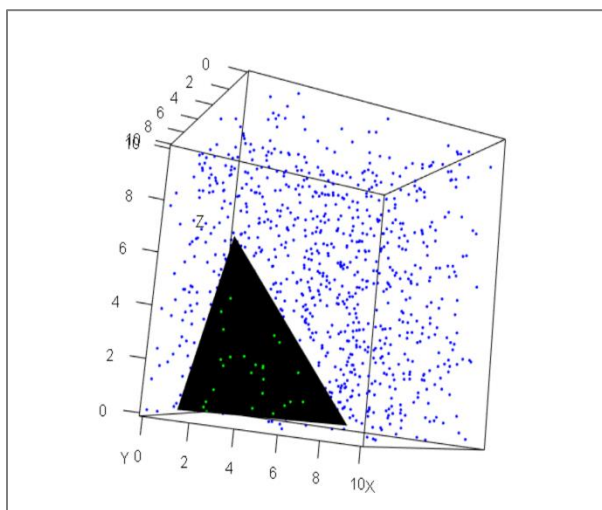
STEPS to run:

- Load the library
  >library(Perceptron)
- Input the 2Ddata
  >input <- read.csv("2Ddata.csv")

- Call the percep2D function
  >percep2D(input)
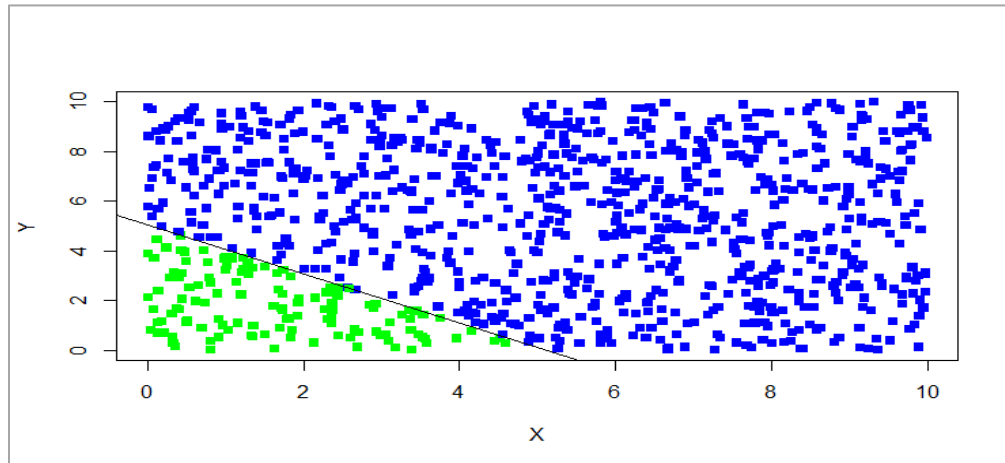
- Input 3Ddata
  >input <- read.csv("3Ddata.csv")
- Call the percep3D function
  >percep3D(input)

Note: This accept any 2 class data but make sure the first column is class label.