# VISVESVARAYA TECHNOLOGICAL UNIVERSITY

**"JnanaSangama", Belgaum -590014, Karnataka.**

**LAB REPORT**
**on**

# MACHINE LEARNING
# (20CS6PCMAL)

***Submitted by***

**PRITHVIRAJ T CHAVAN(1BM19CS123)**

***in partial fulfillment for the award of the degree of***
**BACHELOR OF ENGINEERING**
***in***
**COMPUTER SCIENCE AND ENGINEERING**

**B.M.S. COLLEGE OF ENGINEERING**
**(Autonomous Institution under VTU)**
**BENGALURU-560019**
**May-2022 to July-2022**

# B. M. S. College of Engineering,

**Bull Temple Road, Bangalore 560019**

(Affiliated To Visvesvaraya Technological University, Belgaum)

## Department of Computer Science and Engineering

## CERTIFICATE

This is to certify that the Lab work entitled “**MACHINE LEARNING**” carried out by **PRITHVIRAJ T CHAVAN(1BM19CS123),** who is bonafide student of **B. M. S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2022. The Lab report has been approved as it satisfies the academic requirements in respect of a **Machine Learning - (20CS6PCMAL)**work prescribed for the said degree.

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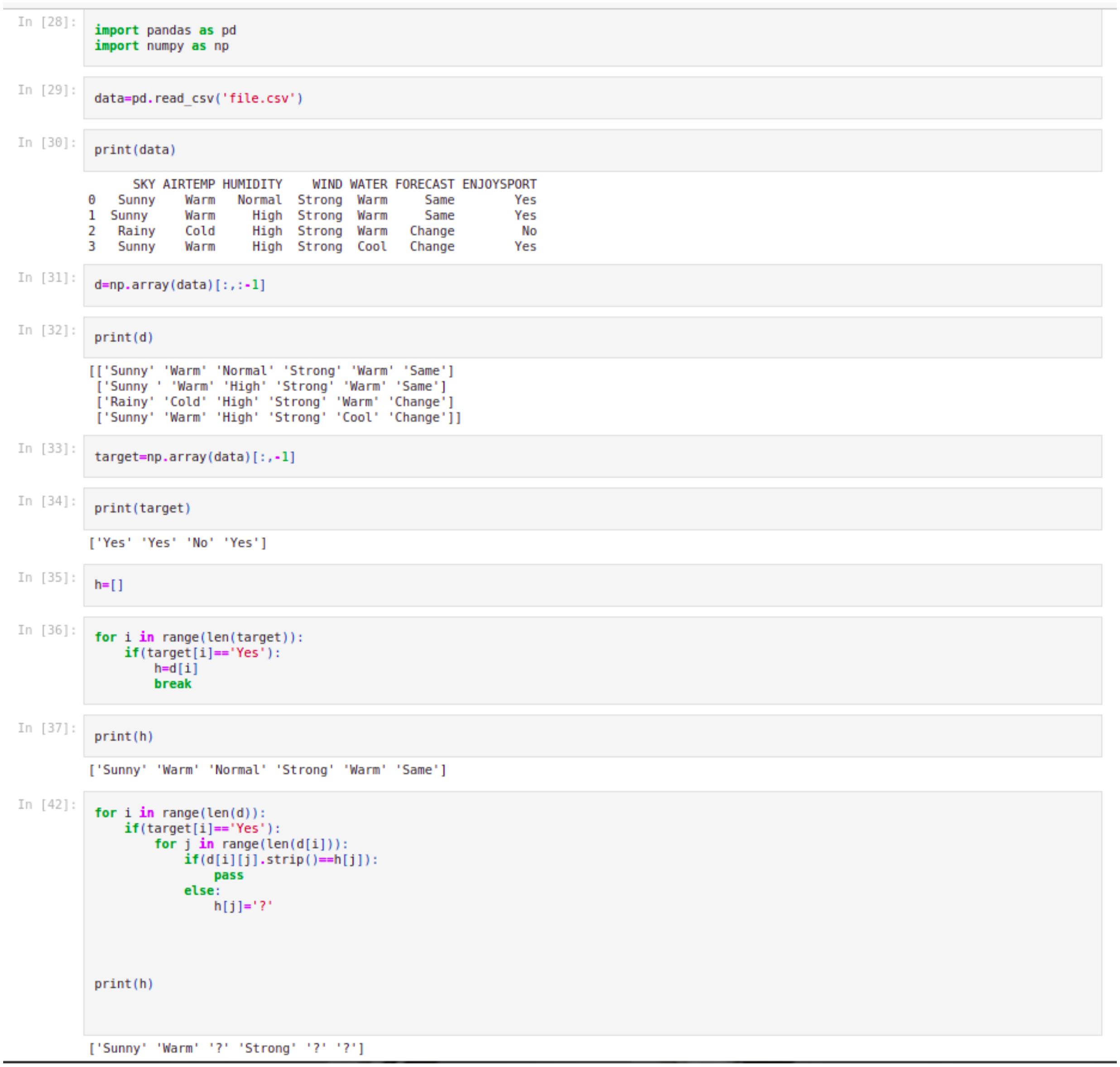
# PROGRAM TO IMPLEMENT FIND S  ALGORITHM



In [28]:

```
import pandas as pd
import numpy as np
```

In [29]:

```
data=pd.read_csv('file.csv')
```

In [30]:

```
print(data)
```

```
      SKY AIRTEMP HUMIDITY    WIND WATER FORECAST ENJOYSPORT
0   Sunny    Warm   Normal  Strong  Warm     Same        Yes
1  Sunny     Warm     High  Strong  Warm     Same        Yes
2   Rainy    Cold     High  Strong  Warm   Change         No
3   Sunny    Warm     High  Strong  Cool   Change        Yes
```

In [31]:

```
d=np.array(data)[:,:-1]
```

In [32]:

```
print(d)
```

```
[['Sunny' 'Warm' 'Normal' 'Strong' 'Warm' 'Same']
 ['Sunny ' 'Warm' 'High' 'Strong' 'Warm' 'Same']
 ['Rainy' 'Cold' 'High' 'Strong' 'Warm' 'Change']
 ['Sunny' 'Warm' 'High' 'Strong' 'Cool' 'Change']]
```

In [33]:

```
target=np.array(data)[:,-1]
```

In [34]:

```
print(target)
```

```
['Yes' 'Yes' 'No' 'Yes']
```

In [35]:

```
h=[]
```

In [36]:

```
for i in range(len(target)):
    if(target[i]=='Yes'):
        h=d[i]
        break
```

In [37]:

```
print(h)
```

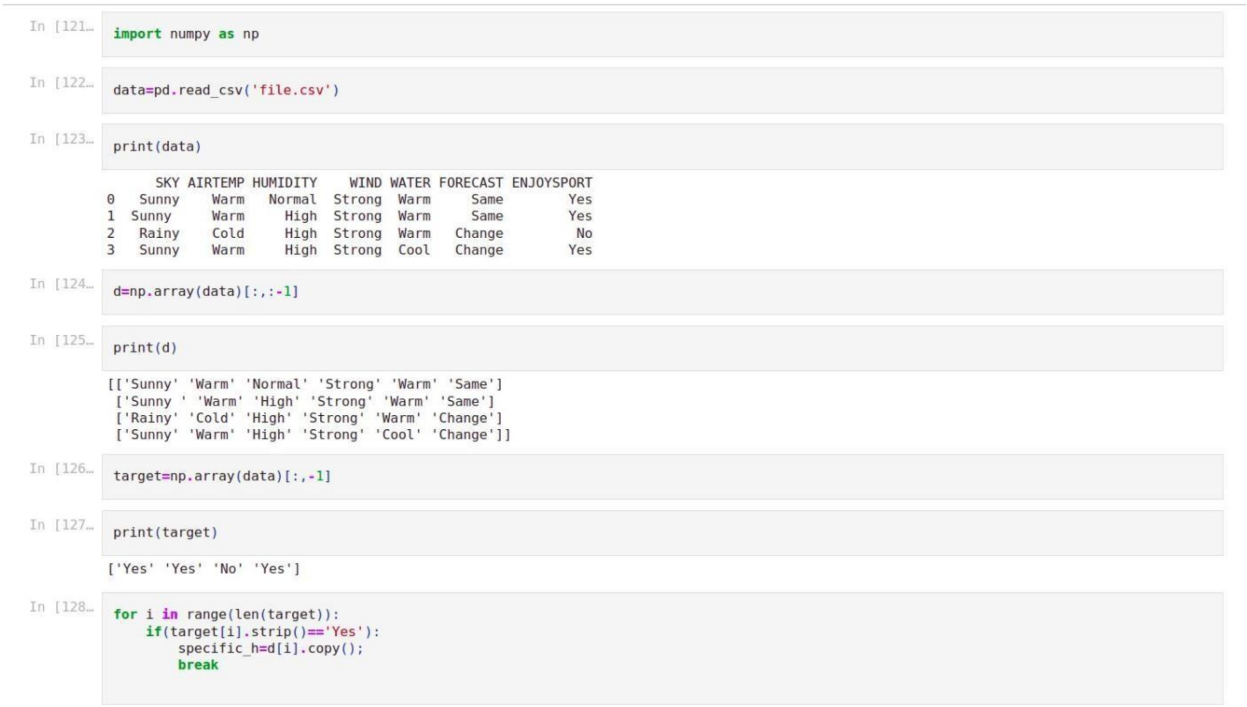
```
['Sunny' 'Warm' 'Normal' 'Strong' 'Warm' 'Same']
```

In [42]:

```
for i in range(len(d)):
    if(target[i]=='Yes'):
        for j in range(len(d[i])):
            if(d[i][j].strip()==h[j]):
                pass
            else:
                h[j]='?'



print(h)
```

```
['Sunny' 'Warm' '?' 'Strong' '?' '?']
```

# PROGRAM TO IMPLEMENT CANDIDATE ELIMINATION ALGORITHM



In [121…

```
import numpy as np
```

In [122…

```
data=pd.read_csv('file.csv')
```

In [123…

```
print(data)
```

```
      SKY AIRTEMP HUMIDITY    WIND WATER FORECAST ENJOYSPORT
0   Sunny    Warm   Normal  Strong  Warm     Same        Yes
1  Sunny     Warm     High  Strong  Warm     Same        Yes
2   Rainy    Cold     High  Strong  Warm   Change         No
3   Sunny    Warm     High  Strong  Cool   Change        Yes
```

In [124…

```
d=np.array(data)[:,:-1]
```

In [125…

```
print(d)
```

```
[['Sunny' 'Warm' 'Normal' 'Strong' 'Warm' 'Same']
 ['Sunny ' 'Warm' 'High' 'Strong' 'Warm' 'Same']
 ['Rainy' 'Cold' 'High' 'Strong' 'Warm' 'Change']
 ['Sunny' 'Warm' 'High' 'Strong' 'Cool' 'Change']]
```

In [126…

```
target=np.array(data)[:,-1]
```

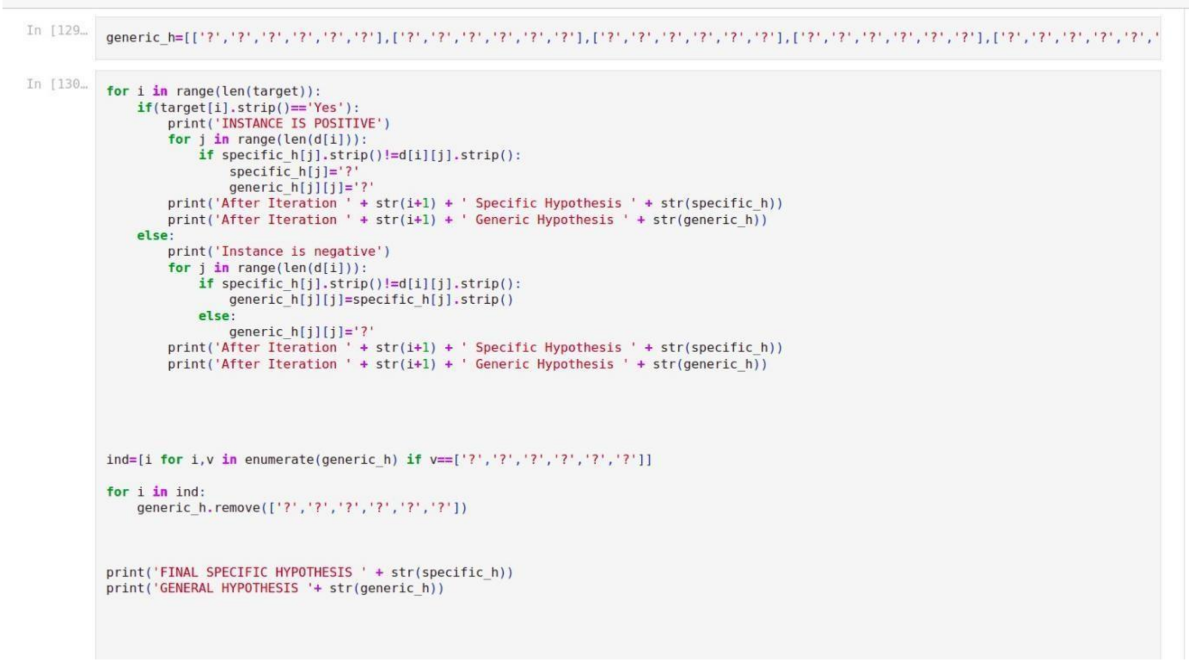
In [127…

```
print(target)
```

```
['Yes' 'Yes' 'No' 'Yes']
```

In [128…

```
for i in range(len(target)):
    if(target[i].strip()=='Yes'):
        specific_h=d[i].copy();
        break
```



In [129…

```
generic_h=[['?','?','?','?','?','?'],['?','?','?','?','?','?'],['?','?','?','?','?','?'],['?','?','?','?','?','?'],['?','?','?','?','?','
```

In [130…

```
for i in range(len(target)):
    if(target[i].strip()=='Yes'):
        print('INSTANCE IS POSITIVE')
        for j in range(len(d[i])):
            if specific_h[j].strip()!=d[i][j].strip():
                specific_h[j]='?'
                generic_h[j][j]='?'
        print('After Iteration ' + str(i+1) + ' Specific Hypothesis ' + str(specific_h))
        print('After Iteration ' + str(i+1) + ' Generic Hypothesis ' + str(generic_h))
    else:
        print('Instance is negative')
        for j in range(len(d[i])):
            if specific_h[j].strip()!=d[i][j].strip():
                generic_h[j][j]=specific_h[j].strip()
            else:
                generic_h[j][j]='?'
        print('After Iteration ' + str(i+1) + ' Specific Hypothesis ' + str(specific_h))
        print('After Iteration ' + str(i+1) + ' Generic Hypothesis ' + str(generic_h))




ind=[i for i,v in enumerate(generic_h) if v==['?','?','?','?','?','?']]

for i in ind:
    generic_h.remove(['?','?','?','?','?','?'])


print('FINAL SPECIFIC HYPOTHESIS ' + str(specific_h))
print('GENERAL HYPOTHESIS '+ str(generic_h))
```

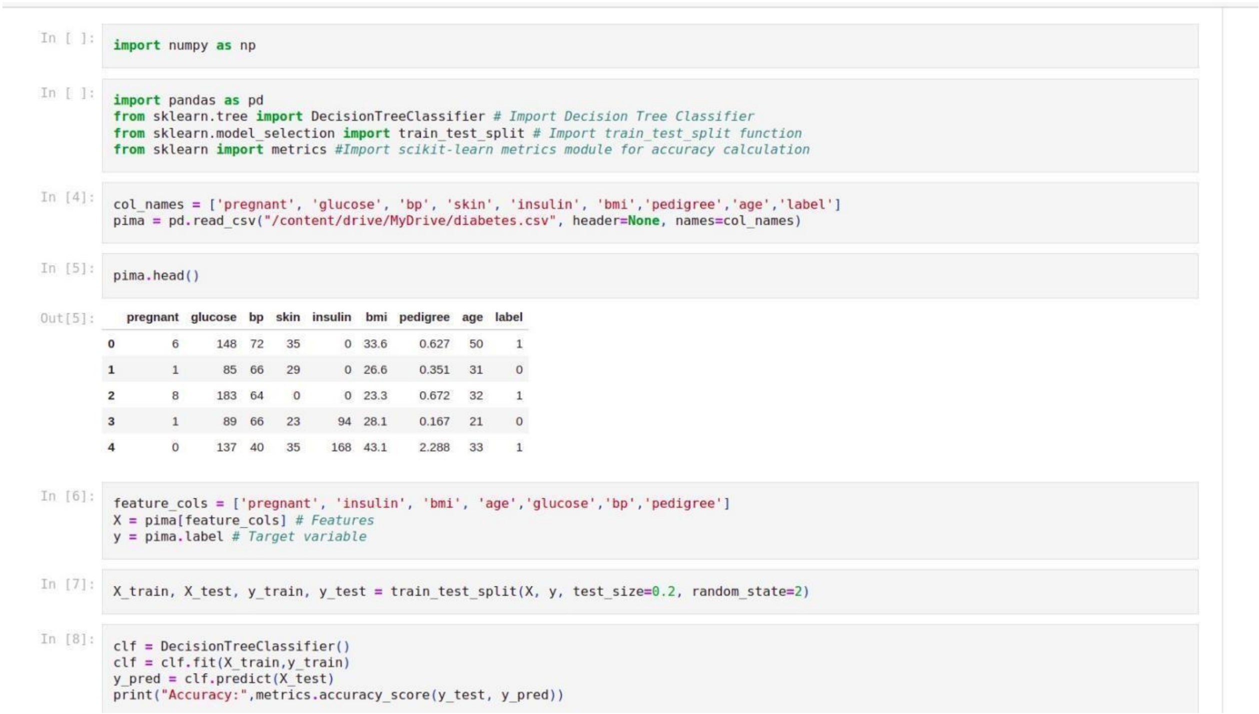
```python
print('FINAL SPECIFIC HYPOTHESIS ' + str(specific_h))
print('GENERAL HYPOTHESIS '+ str(generic_h))
```

```
INSTANCE IS POSITIVE
After Iteration 1 Specific Hypothesis ['Sunny' 'Warm' 'Normal' 'Strong' 'Warm' 'Same']
After Iteration 1 Generic Hypothesis [['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'],
['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?']]
INSTANCE IS POSITIVE
After Iteration 2 Specific Hypothesis ['Sunny' 'Warm' '?' 'Strong' 'Warm' 'Same']
After Iteration 2 Generic Hypothesis [['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'],
['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?']]
Instance is negative
After Iteration 3 Specific Hypothesis ['Sunny' 'Warm' '?' 'Strong' 'Warm' 'Same']
After Iteration 3 Generic Hypothesis [['Sunny', '?', '?', '?', '?', '?'], ['?', 'Warm', '?', '?', '?', '?'], ['?', '?', '?', '?', '?',
'?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', 'Same']]
INSTANCE IS POSITIVE
After Iteration 4 Specific Hypothesis ['Sunny' 'Warm' '?' 'Strong' '?' '?']
After Iteration 4 Generic Hypothesis [['Sunny', '?', '?', '?', '?', '?'], ['?', 'Warm', '?', '?', '?', '?'], ['?', '?', '?', '?', '?',
'?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?']]
FINAL SPECIFIC HYPOTHESIS ['Sunny' 'Warm' '?' 'Strong' '?' '?']
GENERAL HYPOTHESIS [['Sunny', '?', '?', '?', '?', '?'], ['?', 'Warm', '?', '?', '?', '?']]
```

]:

]:

# PROGRAM TO IMPLEMENT ID-3 ALGORITHM



```
In [ ]:  import numpy as np
```

```
In [ ]:  import pandas as pd
         from sklearn.tree import DecisionTreeClassifier # Import Decision Tree Classifier
         from sklearn.model_selection import train_test_split # Import train_test_split function
         from sklearn import metrics #Import scikit-learn metrics module for accuracy calculation
```

```
In [4]:  col_names = ['pregnant', 'glucose', 'bp', 'skin', 'insulin', 'bmi','pedigree','age','label']
         pima = pd.read_csv("/content/drive/MyDrive/diabetes.csv", header=None, names=col_names)
```

```
In [5]:  pima.head()
```

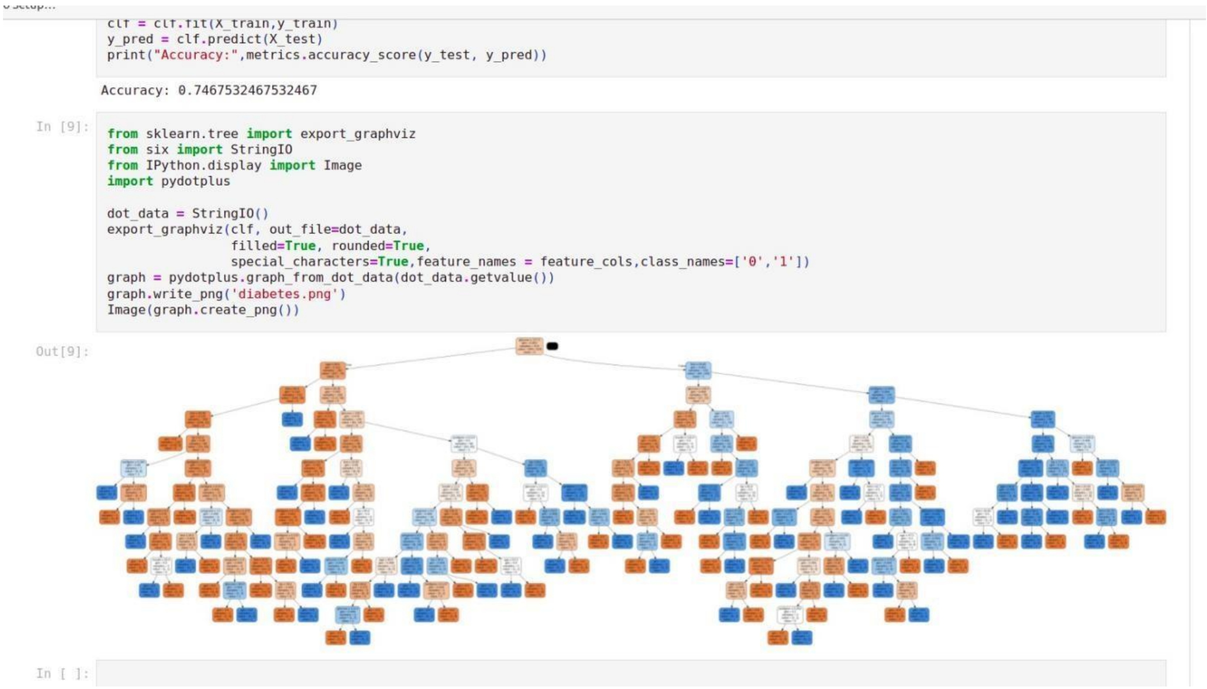
Out[5]:

| | pregnant | glucose | bp | skin | insulin | bmi | pedigree | age | label |
|---|---|---|---|---|---|---|---|---|---|
| **0** | 6 | 148 | 72 | 35 | 0 | 33.6 | 0.627 | 50 | 1 |
| **1** | 1 | 85 | 66 | 29 | 0 | 26.6 | 0.351 | 31 | 0 |
| **2** | 8 | 183 | 64 | 0 | 0 | 23.3 | 0.672 | 32 | 1 |
| **3** | 1 | 89 | 66 | 23 | 94 | 28.1 | 0.167 | 21 | 0 |
| **4** | 0 | 137 | 40 | 35 | 168 | 43.1 | 2.288 | 33 | 1 |

```
In [6]:  feature_cols = ['pregnant', 'insulin', 'bmi', 'age','glucose','bp','pedigree']
         X = pima[feature_cols] # Features
         y = pima.label # Target variable
```

```
In [7]:  X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=2)
```

```
In [8]:  clf = DecisionTreeClassifier()
         clf = clf.fit(X_train,y_train)
         y_pred = clf.predict(X_test)
         print("Accuracy:",metrics.accuracy_score(y_test, y_pred))
```



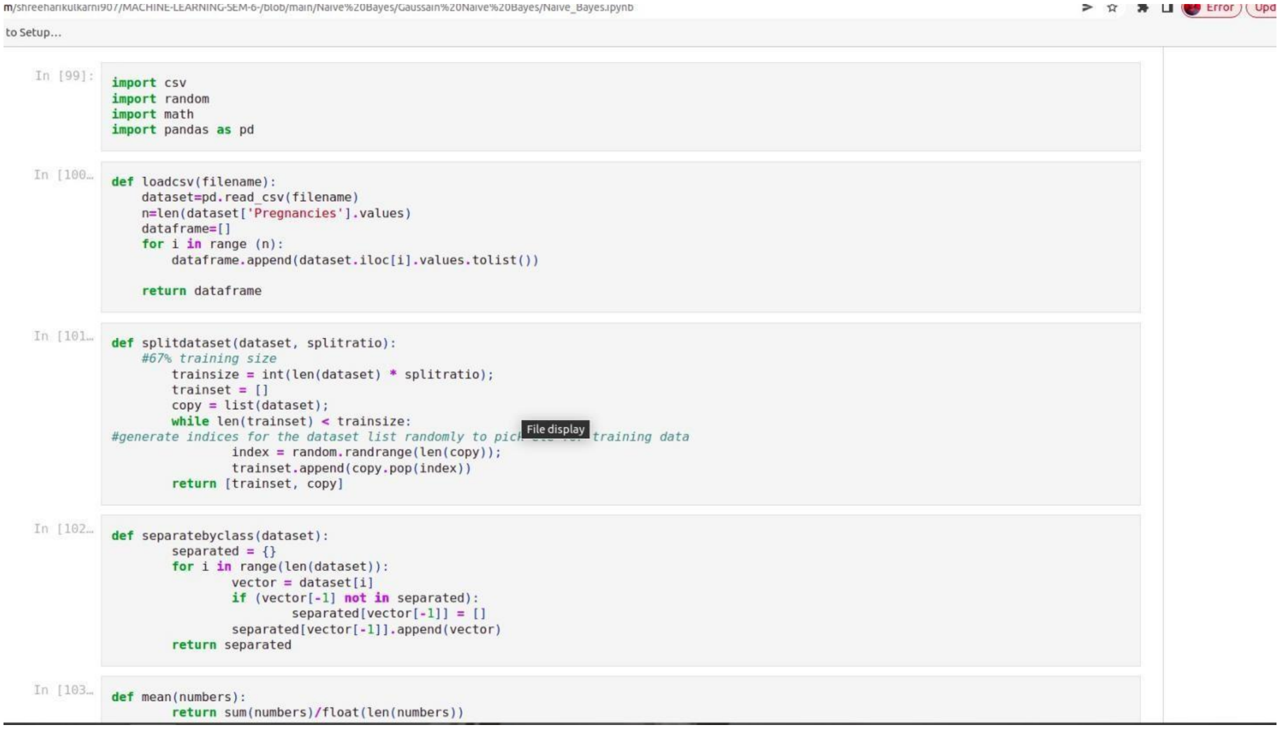
```
u setup...
         clf = clf.fit(X_train,y_train)
         y_pred = clf.predict(X_test)
         print("Accuracy:",metrics.accuracy_score(y_test, y_pred))

         Accuracy: 0.7467532467532467
```

```
In [9]:  from sklearn.tree import export_graphviz
         from six import StringIO
         from IPython.display import Image
         import pydotplus

         dot_data = StringIO()
         export_graphviz(clf, out_file=dot_data,
                         filled=True, rounded=True,
                         special_characters=True,feature_names = feature_cols,class_names=['0','1'])
         graph = pydotplus.graph_from_dot_data(dot_data.getvalue())
         graph.write_png('diabetes.png')
         Image(graph.create_png())
```

Out[9]:

```
In [ ]:
```

# PROGRAM TO IMPLEMENT NAIVE BAYES


m/shreeharikulkarni907/MACHINE-LEARNING-SEM-6-/blob/main/Naive%20Bayes/Gaussain%20Naive%20Bayes/Naive_Bayes.ipynb
Error
Upd
to Setup...
File display

In [99]:

```
import csv
import random
import math
import pandas as pd
```

In [100…

```
def loadcsv(filename):
    dataset=pd.read_csv(filename)
    n=len(dataset['Pregnancies'].values)
    dataframe=[]
    for i in range (n):
        dataframe.append(dataset.iloc[i].values.tolist())

    return dataframe
```

In [101…

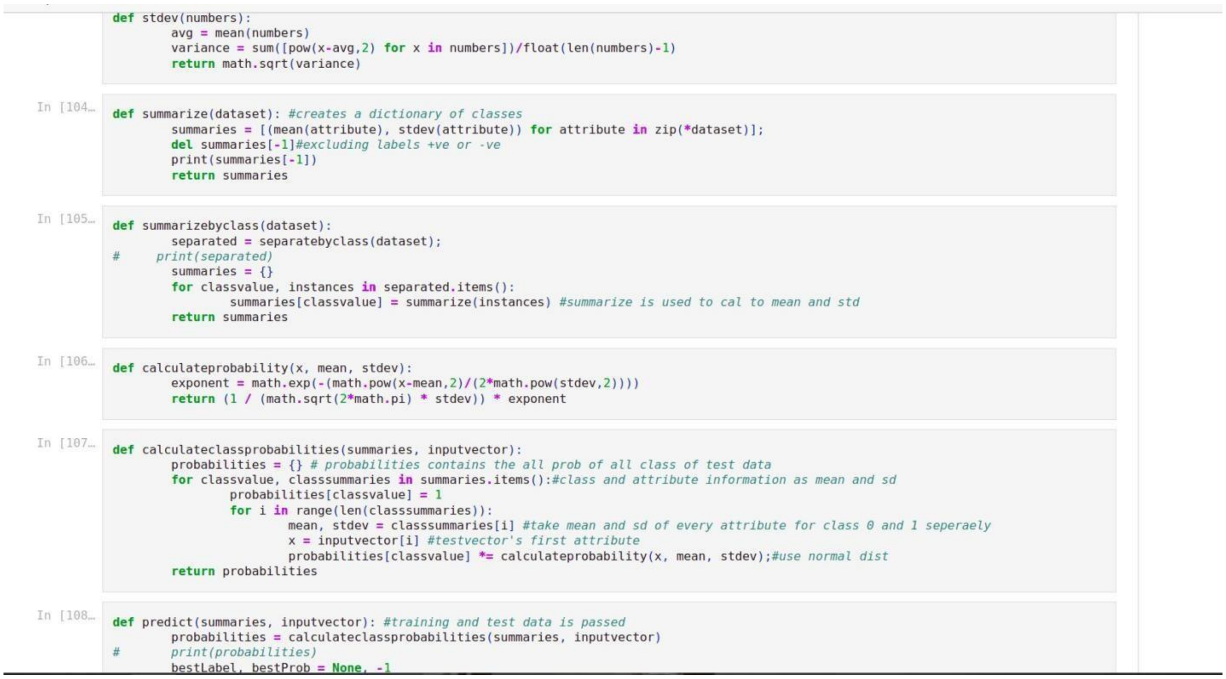
```
def splitdataset(dataset, splitratio):
    #67% training size
        trainsize = int(len(dataset) * splitratio);
        trainset = []
        copy = list(dataset);
        while len(trainset) < trainsize:
#generate indices for the dataset list randomly to pick etc for training data
                index = random.randrange(len(copy));
                trainset.append(copy.pop(index))
        return [trainset, copy]
```

In [102…

```
def separatebyclass(dataset):
        separated = {}
        for i in range(len(dataset)):
                vector = dataset[i]
                if (vector[-1] not in separated):
                        separated[vector[-1]] = []
                separated[vector[-1]].append(vector)
        return separated
```

In [103…

```
def mean(numbers):
        return sum(numbers)/float(len(numbers))
```



```
def stdev(numbers):
        avg = mean(numbers)
        variance = sum([pow(x-avg,2) for x in numbers])/float(len(numbers)-1)
        return math.sqrt(variance)
```

In [104…

```
def summarize(dataset): #creates a dictionary of classes
        summaries = [(mean(attribute), stdev(attribute)) for attribute in zip(*dataset)];
        del summaries[-1]#excluding labels +ve or -ve
        print(summaries[-1])
        return summaries
```

In [105…

```
def summarizebyclass(dataset):
        separated = separatebyclass(dataset);
#     print(separated)
        summaries = {}
        for classvalue, instances in separated.items():
                summaries[classvalue] = summarize(instances) #summarize is used to cal to mean and std
        return summaries
```

In [106…

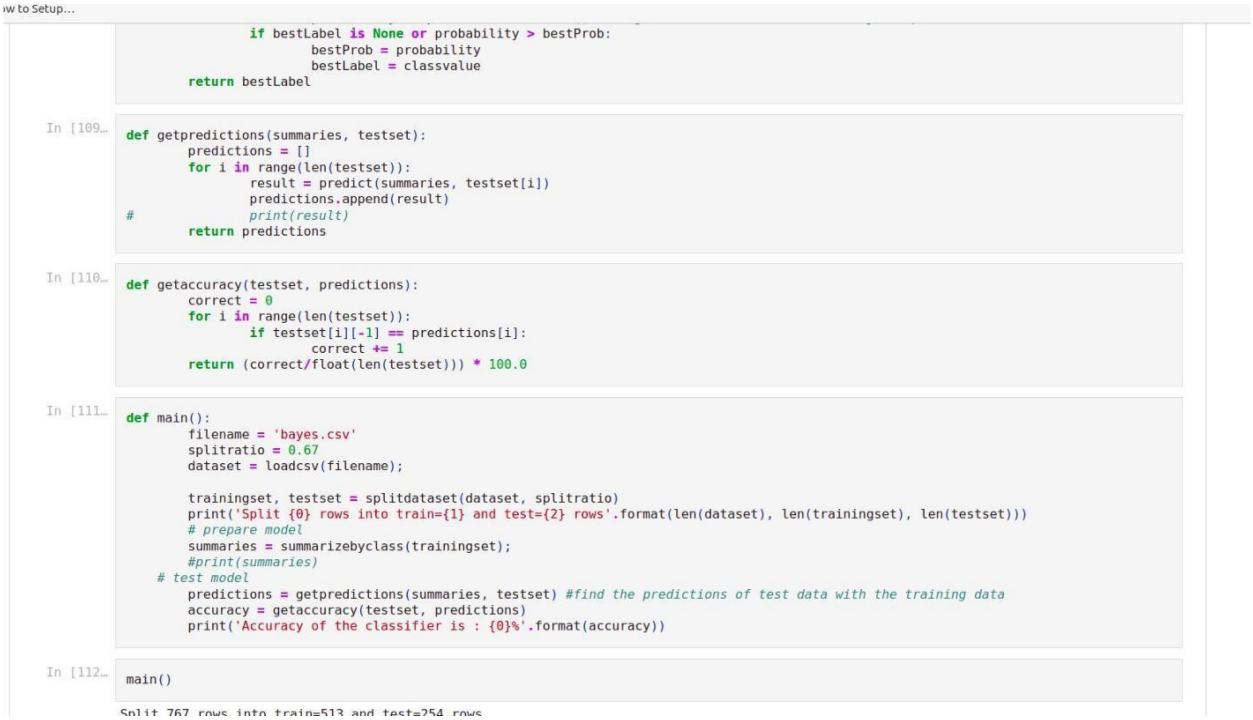
```
def calculateprobability(x, mean, stdev):
        exponent = math.exp(-(math.pow(x-mean,2)/(2*math.pow(stdev,2))))
        return (1 / (math.sqrt(2*math.pi) * stdev)) * exponent
```

In [107…

```
def calculateclassprobabilities(summaries, inputvector):
        probabilities = {} # probabilities contains the all prob of all class of test data
        for classvalue, classsummaries in summaries.items():#class and attribute information as mean and sd
                probabilities[classvalue] = 1
                for i in range(len(classsummaries)):
                        mean, stdev = classsummaries[i] #take mean and sd of every attribute for class 0 and 1 seperaely
                        x = inputvector[i] #testvector's first attribute
                        probabilities[classvalue] *= calculateprobability(x, mean, stdev);#use normal dist
        return probabilities
```

In [108…

```
def predict(summaries, inputvector): #training and test data is passed
        probabilities = calculateclassprobabilities(summaries, inputvector)
#       print(probabilities)
        bestLabel, bestProb = None, -1
```



```
                if bestLabel is None or probability > bestProb:
                        bestProb = probability
                        bestLabel = classvalue
        return bestLabel
```

In [109…

```
def getpredictions(summaries, testset):
        predictions = []
        for i in range(len(testset)):
                result = predict(summaries, testset[i])
                predictions.append(result)
#               print(result)
        return predictions
```

In [110…

```
def getaccuracy(testset, predictions):
        correct = 0
        for i in range(len(testset)):
                if testset[i][-1] == predictions[i]:
                        correct += 1
        return (correct/float(len(testset))) * 100.0
```

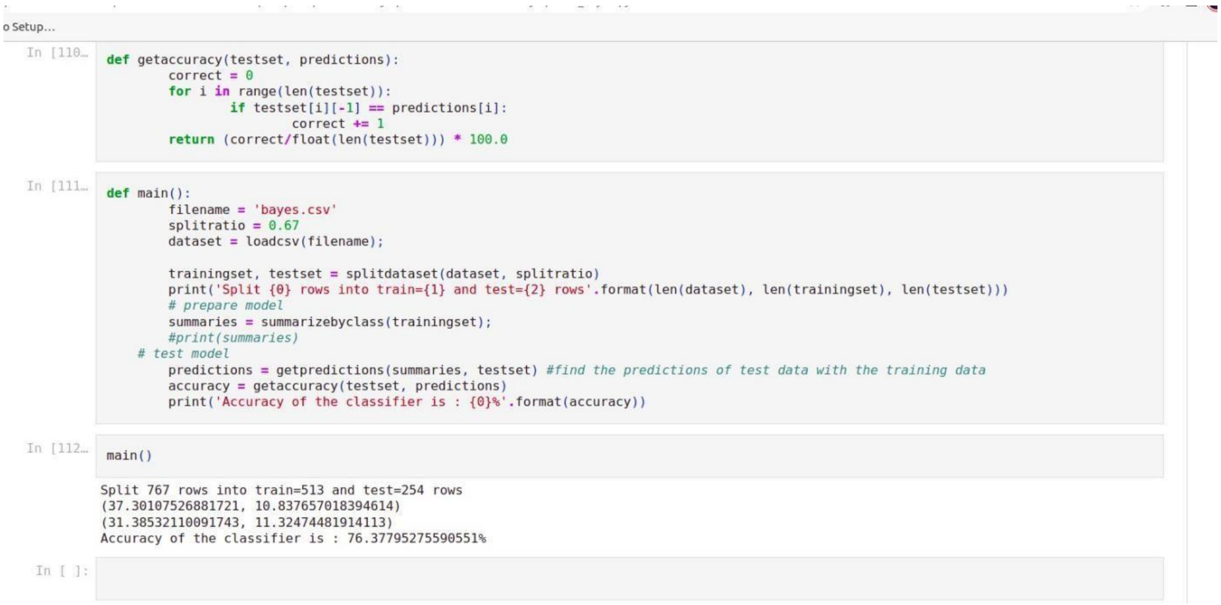
In [111…

```
def main():
        filename = 'bayes.csv'
        splitratio = 0.67
        dataset = loadcsv(filename);

        trainingset, testset = splitdataset(dataset, splitratio)
        print('Split {0} rows into train={1} and test={2} rows'.format(len(dataset), len(trainingset), len(testset)))
        # prepare model
        summaries = summarizebyclass(trainingset);
        #print(summaries)
    # test model
        predictions = getpredictions(summaries, testset) #find the predictions of test data with the training data
        accuracy = getaccuracy(testset, predictions)
        print('Accuracy of the classifier is : {0}%'.format(accuracy))
```

In [112…

```
main()
```

```
Split 767 rows into train=513 and test=254 rows
```



In [110…

```
def getaccuracy(testset, predictions):
        correct = 0
        for i in range(len(testset)):
                if testset[i][-1] == predictions[i]:
                        correct += 1
        return (correct/float(len(testset))) * 100.0
```

In [111…

```
def main():
        filename = 'bayes.csv'
        splitratio = 0.67
        dataset = loadcsv(filename);

        trainingset, testset = splitdataset(dataset, splitratio)
        print('Split {0} rows into train={1} and test={2} rows'.format(len(dataset), len(trainingset), len(testset)))
        # prepare model
        summaries = summarizebyclass(trainingset);
        #print(summaries)
    # test model
        predictions = getpredictions(summaries, testset) #find the predictions of test data with the training data
        accuracy = getaccuracy(testset, predictions)
        print('Accuracy of the classifier is : {0}%'.format(accuracy))
```

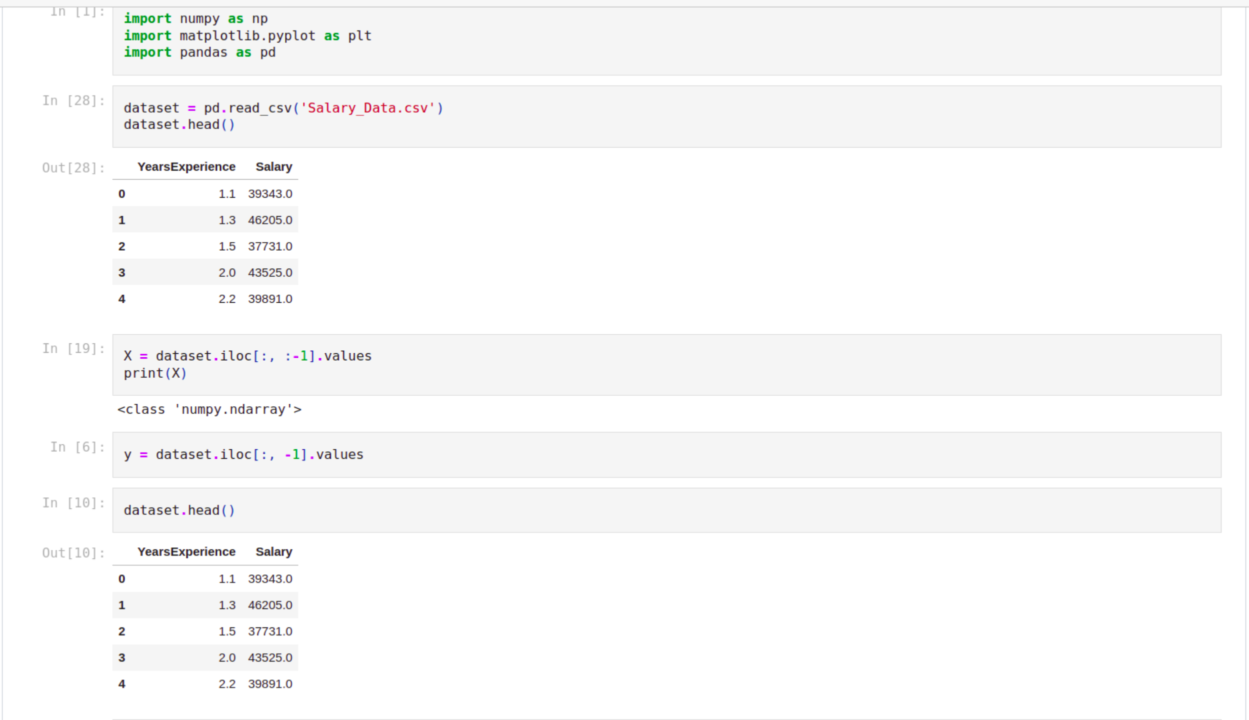
In [112…

```
main()
```

```
Split 767 rows into train=513 and test=254 rows
(37.30107526881721, 10.837657018394614)
(31.38532110091743, 11.32474481914113)
Accuracy of the classifier is : 76.37795275590551%
```

In [ ]:

## PROGRAM TO IMPLEMENT LINEAR REGRESSION



```
In [1]:  import numpy as np
         import matplotlib.pyplot as plt
         import pandas as pd
```

```
In [28]: dataset = pd.read_csv('Salary_Data.csv')
         dataset.head()
```

Out[28]:

|  | YearsExperience | Salary |
|---|---|---|
| **0** | 1.1 | 39343.0 |
| **1** | 1.3 | 46205.0 |
| **2** | 1.5 | 37731.0 |
| **3** | 2.0 | 43525.0 |
| **4** | 2.2 | 39891.0 |

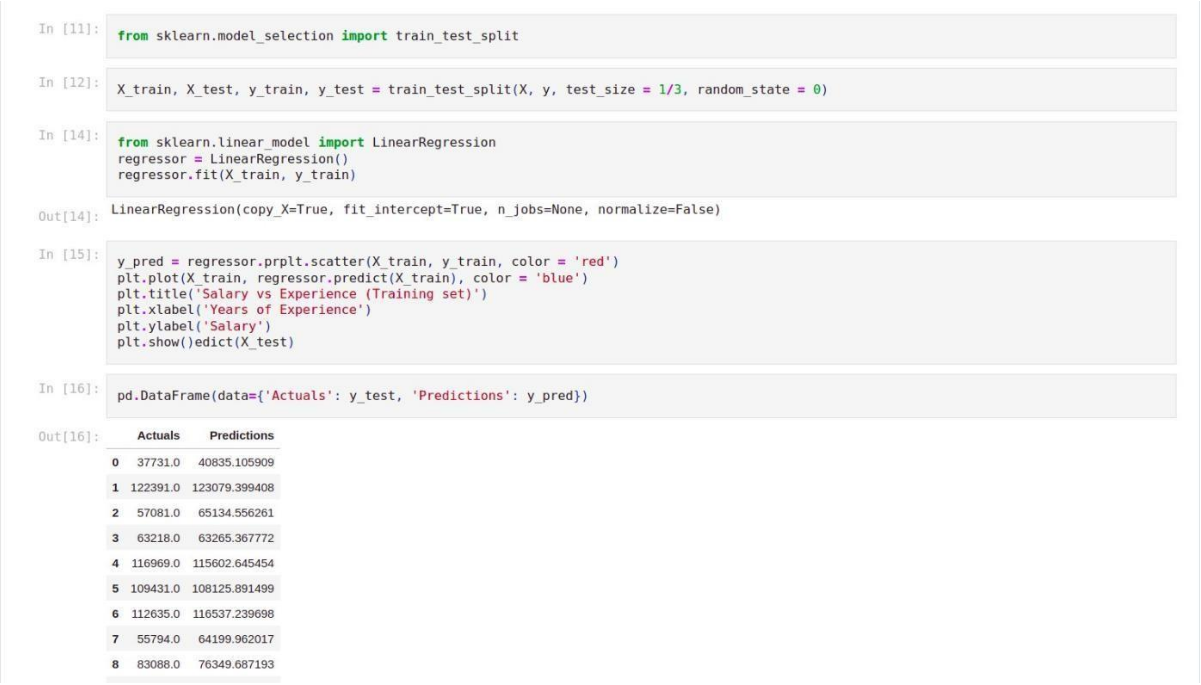
```
In [19]: X = dataset.iloc[:, :-1].values
         print(X)

<class 'numpy.ndarray'>
```

```
In [6]:  y = dataset.iloc[:, -1].values
```

```
In [10]: dataset.head()
```

Out[10]:

|  | YearsExperience | Salary |
|---|---|---|
| **0** | 1.1 | 39343.0 |
| **1** | 1.3 | 46205.0 |
| **2** | 1.5 | 37731.0 |
| **3** | 2.0 | 43525.0 |
| **4** | 2.2 | 39891.0 |



```
In [11]: from sklearn.model_selection import train_test_split
```

```
In [12]: X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 1/3, random_state = 0)
```

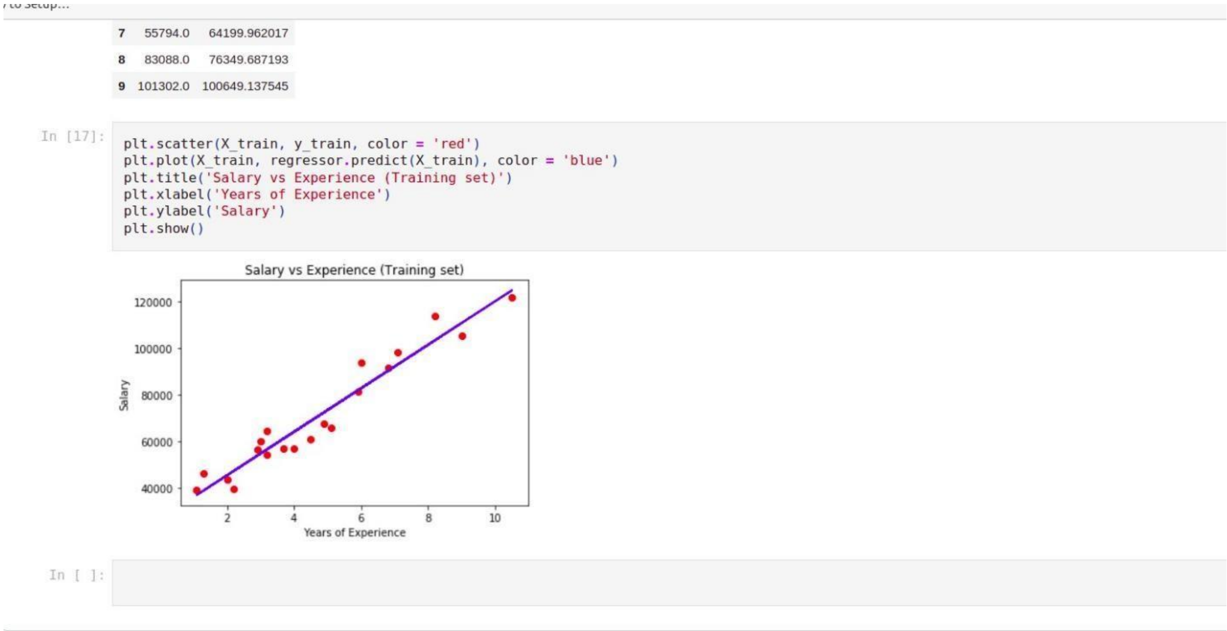
```
In [14]: from sklearn.linear_model import LinearRegression
         regressor = LinearRegression()
         regressor.fit(X_train, y_train)

Out[14]: LinearRegression(copy_X=True, fit_intercept=True, n_jobs=None, normalize=False)
```

```
In [15]: y_pred = regressor.prplt.scatter(X_train, y_train, color = 'red')
         plt.plot(X_train, regressor.predict(X_train), color = 'blue')
         plt.title('Salary vs Experience (Training set)')
         plt.xlabel('Years of Experience')
         plt.ylabel('Salary')
         plt.show()edict(X_test)
```

```
In [16]: pd.DataFrame(data={'Actuals': y_test, 'Predictions': y_pred})
```

Out[16]:

|  | Actuals | Predictions |
|---|---|---|
| **0** | 37731.0 | 40835.105909 |
| **1** | 122391.0 | 123079.399408 |
| **2** | 57081.0 | 65134.556261 |
| **3** | 63218.0 | 63265.367772 |
| **4** | 116969.0 | 115602.645454 |
| **5** | 109431.0 | 108125.891499 |
| **6** | 112635.0 | 116537.239698 |
| **7** | 55794.0 | 64199.962017 |
| **8** | 83088.0 | 76349.687193 |



to setup...

| | | |
|---|---|---|
| **7** | 55794.0 | 64199.962017 |
| **8** | 83088.0 | 76349.687193 |
| **9** | 101302.0 | 100649.137545 |

In [17]:

```
plt.scatter(X_train, y_train, color = 'red')
plt.plot(X_train, regressor.predict(X_train), color = 'blue')
plt.title('Salary vs Experience (Training set)')
plt.xlabel('Years of Experience')
plt.ylabel('Salary')
plt.show()
```

In [ ]: