VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT

on

MACHINE LEARNING

Submitted by

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in partial fulfillment for the award of the degree of

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in

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CERTIFICATE

This is to certify that the Lab work entitled "Machine Learning Lab" carried out by **Shweta Patil(1BM19CS156),** who is a 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 with respect to **Machine Learning - (20CS6PCMAL)** work prescribed for the said degree.

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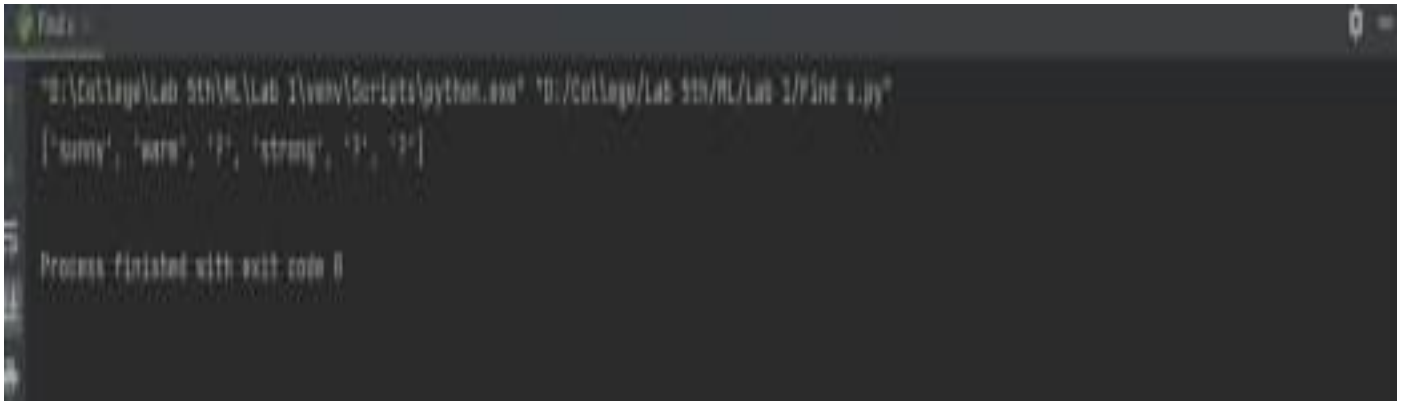
Experiment Title	Page No.
Find-S	4-5
Candidate Elimination	6-7
Decision tree based on ID3	8-10
Naive Bayesian Classifier	11-12
Linear Regression	13-14

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples.

CODE:

```
import csv
a = []
with open('/kaggle/input/dataset/data.csv','r') as csvfile:
 for row in csv.reader(csvfile):
 a.append(row)
 print(a)
 print("\n The total number of training instances are : ",len(a))
num_attribute = len(a[0])-1
print("\n The initial hypothesis is : ")
hypothesis = ['0']*num_attribute
print(hypothesis)
for i in range(0, len(a)):
 if a[i][num_attribute] == 'yes':
```



```
for j in range(0, num_attribute):
    if hypothesis[j] == '0' or hypothesis[j] == a[i][j]:
     hypothesis[j] = a[i][j]
    else:
    hypothesis[j] = '?'
    print("\n The hypothesis for the training instance {} is :\n" .format(i+1),hypothesis)
  print("\n The Maximally specific hypothesis for the training instances is :")
  print(hypothesis)
```


OUTPUT:

```
 The total number of training instances are :  5

 The initial hypothesis is :
['0', '0', '0', '0', '0', '0']

 The hypothesis for the training instance 1 is :
['0', '0', '0', '0', '0', '0']

 The hypothesis for the training instance 2 is :
['sunny', 'warm', 'normal', 'strong', 'warm', 'same']

 The hypothesis for the training instance 3 is :
['sunny', 'warm', '?', 'strong', 'warm', 'same']

 The hypothesis for the training instance 4 is :
['sunny', 'warm', '?', 'strong', 'warm', 'same']

 The hypothesis for the training instance 5 is :
['sunny', 'warm', '?', 'strong', '?', '?']

 The Maximally specific hypothesis for the training instances is :
['sunny', 'warm', '?', 'strong', '?', '?']
```


2. For a given set of training data examples stored in a .CSV file, implement and demonstrate

the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

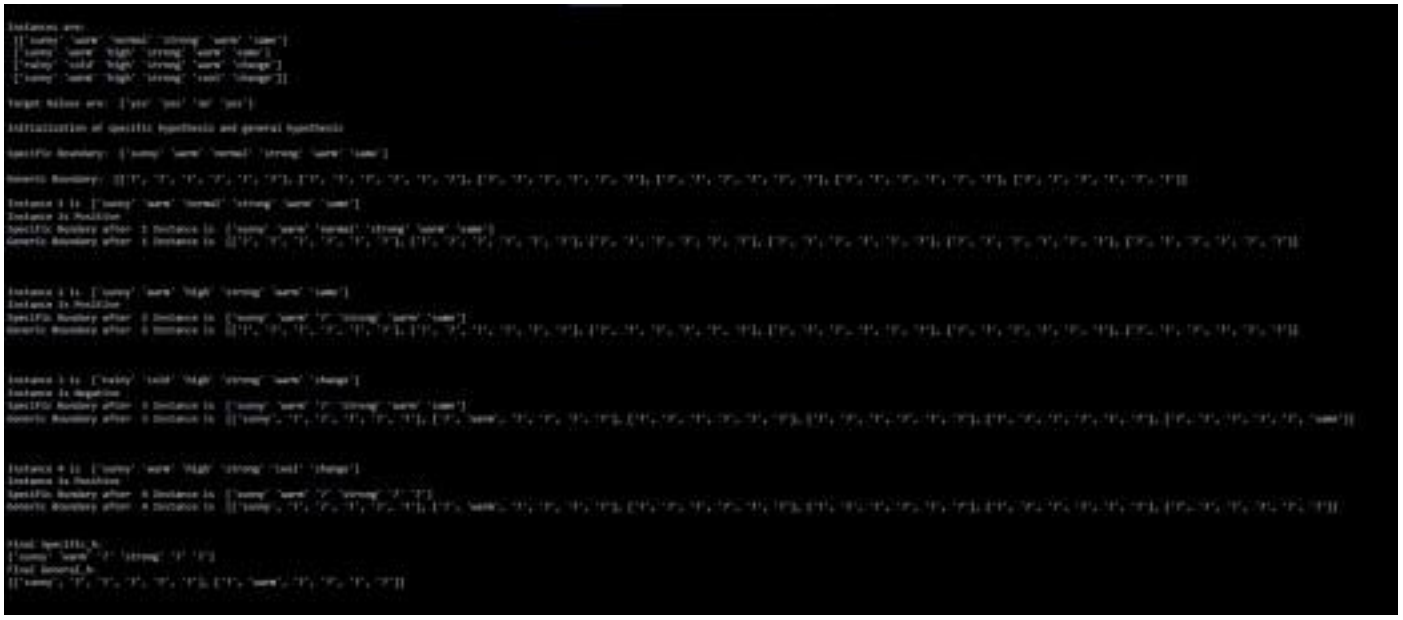
CODE:

```
import numpy as np
import pandas as pd

data = pd.read_csv('/kaggle/input/dataset/data.csv')
concepts = np.array(data.iloc[:,0:-1])
print(concepts)
target = np.array(data.iloc[:,-1])
print(target)
def learn(concepts, target):
 specific_h = concepts[0].copy()
 print("Initialization of specific_h and general_h")
 print(specific_h)
 general_h = [["?" for i in range(len(specific_h))] for i in range(len(specific_h))]
print(general_h)
 for i, h in enumerate(concepts):
 print("For Loop Starts")
 if target[i] == "yes":
 print("If instance is Positive ")
 for x in range(len(specific_h)):
 if h[x]!= specific_h[x]:
 specific_h[x] ='?'
 general_h[x][x] ='?'

 if target[i] == "no":
 print("If instance is Negative ")
 for x in range(len(specific_h)):
 if h[x]!= specific_h[x]:
 general_h[x][x] = specific_h[x]
 else:
 general_h[x][x] = '?'

 print("Steps of Candidate Elimination Algorithm",i+1)
 print(specific_h)
 print(general_h)
 print("\n")
 print("\n")

 indices = [i for i, val in enumerate(general_h) if val == ['?', '?', '?', '?', '?', '?']]
 for i in indices:
 general_h.remove(['?', '?', '?', '?', '?', '?'])
```



```
 return specific_h, general_h

s_final, g_final = learn(concepts, target)

print("Final Specific_h:", s_final, sep="\n")
print("Final General_h:", g_final, sep="\n")
```

OUTPUT :



3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

CODE:

```
import math
import csv
def load_csv(filename):
 lines=csv.reader(open(filename,"r"));
 dataset = list(lines)
 headers = dataset.pop(0)
 return dataset,headers

class Node:
 def __init_(self,attribute):
 self.attribute=attribute
 self.children=[]
 self.answer=""
```

```
defsubtables(data,col,delete):
 dic={}
 coldata=[row[col] for row indata]
 attr=list(set(coldata))

 counts=[0]*len(attr)
 r=len(data)
 c=len(data[0])
 forxinrange(len(attr)):
 for y in range(r):
 if data[y][col]==attr[x]:
 counts[x]+=1

 for x in range(len(attr)):
 dic[attr[x]]=[[0 for i in range(c)]forjinrange(counts[x])]
 pos=0
 foryinrange(r):
 if data[y][col]==attr[x]:
 if delete:
 del data[y][col]
 dic[attr[x]][pos]=data[y]
 pos+=1
 returnattr,dic

defentropy(S):
 attr=list(set(S))
 iflen(attr)==1:
```



```
 return0

 counts=[0,0]
 foriinrange(2):
 counts[i]=sum([1forxinSifattr[i]==x])/(len(S)*1.0)
 sums=0
 forcntincounts:
 sums+=-1*cnt*math.log(cnt,2)
 returnsums

defcompute_gain(data,col):
 attr,dic= subtables(data,col,delete=False)

 total_size=len(data)
 entropies=[0]*len(attr)
 ratio=[0]*len(attr)

 total_entropy=entropy([row[-1]forrowindata])
forxinrange(len(attr)):
ratio[x]=len(dic[attr[x]])/(total_size*1.0)
entropies[x]=entropy([row[-1]forrowindic[attr[x]]])
total_entropy-=ratio[x]*entropies[x]
returntotal_entropy

defbuild_tree(data,features):
 lastcol=[row[-1] for row in data]
 if(len(set(lastcol)))==1:
```

```
node=Node("")
node.answer=lastcol[0]
return node

n=len(data[0])-1
gains=[0]*n
for col in range(n):
gains[col]=compute_gain(data,col)
split=gains.index(max(gains))
node=Node(features[split])
fea= features[:split]+features[split+1:]


attr,dic=subtables(data,split,delete=True)

forx in range(len(attr)):
child=build_tree(dic[attr[x]],fea)
node.children.append((attr[x],child))
return node

def print_tree(node,level):
if node.answer!="":
print(" "*level,node.answer)
return

print(" "*level,node.attribute)
for value,n in node.children:
```



```
    print(" "*(level+1)," └─",value)
    print_tree(n,level+2)


'"Main program"'
dataset,features=load_csv("/kaggle/input/train/ids_train.csv")
node1=build_tree(dataset,features)

print("The decision tree for the dataset using ID3 algorithm is :\n")
print_tree(node1,0)
```

OUTPUT:

```
The decision tree for the dataset using ID3 algorithm is :

 Outlook
    └─ Rain
      Wind
         └─ Weak
           Yes
         └─ Strong
           No
    └─ Sunny
      Humidity
         └─ Normal
           Yes
         └─ High
           No
    └─ Overcast
      Yes
```


4. Write a program to implement the naive Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

CODE:

```
import pandas as pd

from sklearn.model_selection import train_test_split

from sklearn.naive_bayes import GaussianNB

from sklearn import metrics


df = pd.read_csv("/kaggle/input/diabetes/diabetes.csv")

feature_col_names = ['num_preg', 'glucose_conc', 'diastolic_bp', 'thickness', 'insulin', 'bmi',

'diab_pred', 'age'] predicted_class_names = ['diabetes']


X = df[feature_col_names].values

y = df[predicted_class_names].values

print(df.head)

xtrain,xtest,ytrain,ytest=train_test_split(X,y,test_size=0.40)


print ('\n The total number of Training Data :',ytrain.shape)

print ('\n The total number of Test Data :',ytest.shape)
clf = GaussianNB().fit(xtrain,ytrain.ravel())

predicted = clf.predict(xtest)
```

```
predictTestData= clf.predict([[6,148,72,35,0,33.6,0.627,50]])

print('\n Confusion matrix')
```



```
print(metrics.confusion_matrix(ytest,predicted))
print('\n Accuracy of the classifier is',metrics.accuracy_score(ytest,predicted))
print('\n The value of Precision', metrics.precision_score(ytest,predicted))
print('\n The value of Recall', metrics.recall_score(ytest,predicted))
print("Predicted Value for individual Test Data:", predictTestData)
```

OUTPUT:

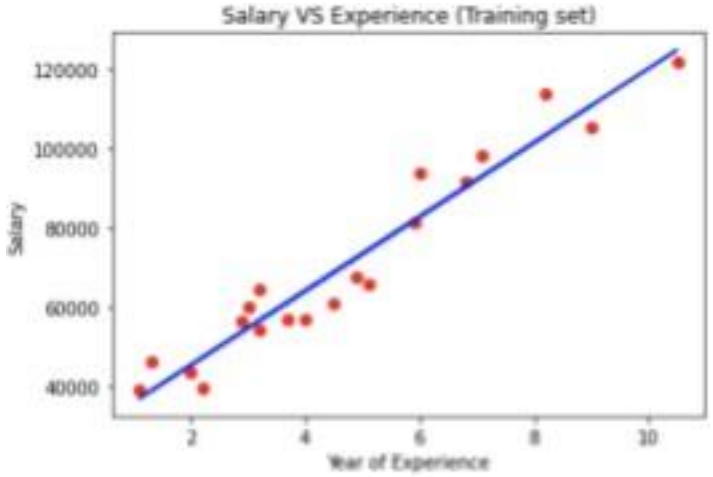
```
[145 rows x 9 columns]>

 The total number of Training Data : (87, 1)

 The total number of Test Data : (58, 1)

 Confusion matrix
[[31  7]
 [10 10]]

 Accuracy of the classifier is 0.7068965517241379

 The value of Precision 0.5882352941176471

 The value of Recall 0.5
Predicted Value for individual Test Data: [1]
```

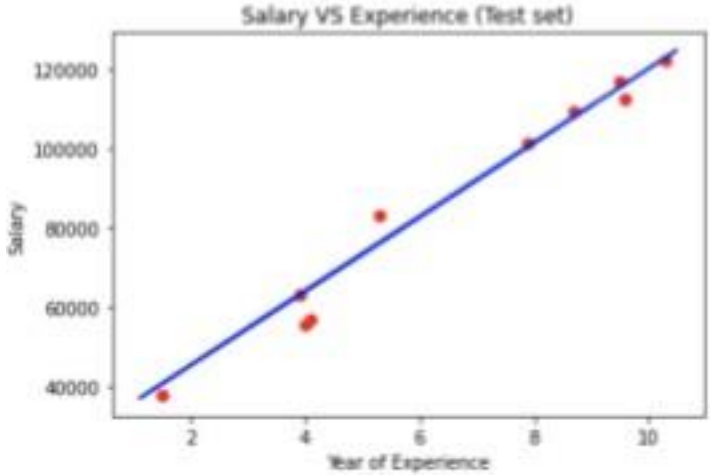

5. Implement the Linear Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

CODE:

```
import numpy as np

import matplotlib.pyplot as plt

import pandas as pd


# Importing the dataset

dataset = pd.read_csv('/kaggle/input/years-of-experience-and-salary/Years Experience and Salary.csv')

X = dataset.iloc[:, :-1].values #get a copy of dataset exclude last column

y = dataset.iloc[:, 1].values #get array of dataset in column 1st


# Splitting the dataset into the Training set and Test set
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=1/3, random_state=0)


# Fitting Simple Linear Regression to the Training set

from sklearn.linear_model import LinearRegression

regressor = LinearRegression()

regressor.fit(X_train, y_train)


# Predicting the Test set results

y_pred = regressor.predict(X_test)


# Visualizing the Training set results

viz_train = plt
```

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

# Visualizing the Test set results
viz_test = plt
viz_test.scatter(X_test, y_test, color='red')
viz_test.plot(X_train, regressor.predict(X_train), color='blue')
viz_test.title('Salary VS Experience (Test set)')
viz_test.xlabel('Year of Experience')
viz_test.ylabel('Salary')
viz_test.show()
```


Salary VS Experience (Training set)
120000
100000
80000
60000
40000
Salary
2
4
6
8
10
Year of Experience


Salary VS Experience (Test set)
120000
100000
80000
60000
40000
Salary
2
4
6
8
10
Year of Experience

OUTPUT: 15