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Git Link: mxb07130/MachineLearning_Assignments: Machine Learning Assignments (github.com)

Machine Learning Assignment 1

Question 1:

The following is a list of 10 students ages:

ages = [19, 22, 19, 24, 20, 25, 26, 24, 25, 24]

- Sort the list and find the min and max age
- Add the min age and the max age again to the list
- Find the median age (one middle item or two middle items divided by two)
- Find the average age (sum of all items divided by their number)
- Find the range of the ages (max minus min)

Program:

```python
import statistics
ages=[19,22,19,24,20,25,26,24,25,24]
#sorting the list and showing min and max values
sortedlist = ages.sort()
print(ages)
print(min(ages))
print(max(ages))
#adding min and max values to list
minvalue=min(ages)
maxvalue=max(ages)
ages.append(minvalue)
ages.append(maxvalue)
print(ages)
#Finding median by importing statistics package
median=statistics.median(ages)
print(median)
#Finding average using for loop
length=len(ages)
a=0
for i in ages:
    a+=i
print(a/length)
#Range value
ranges=maxvalue-minvalue
print(ranges
```

Output:

```
PS C:\Users\manoj\SUBJECTS\Machine Learning\Assignments\Assignment_1>  c:; cd 'c:\Users\manoj\SUBJECTS\Machine Learning\Assignment
s\Assignment_1'; & 'C:\Users\manoj\AppData\Local\Programs\Python\Python310\python.exe' 'c:\Users\manoj\.vscode\extensions\ms-pytho
n.python-2022.14.0\pythonFiles\lib\python\debugpy\adapter/../..\debugpy\launcher' '53039' '--' 'c:\Users\manoj\SUBJECTS\Machine Le
arning\Assignments\Assignment_1\Question1.py'
Sorted List:  [19, 19, 20, 22, 24, 24, 24, 25, 25, 26]
Minimum Value:  19
Maximum Value:  26
Modified List:  [19, 19, 20, 22, 24, 24, 24, 25, 25, 26, 19, 26]
Median:  24.0
Average:  22.75
Range:  7
```

Explantion:

- **Sorting the list using SORT() function and printing the updated list ages**
- **Finding the min and max value from the list ages using MIN(),MAX() functions and storing it in minimum and maximum and then printing both the values**
- **Adding the minimum and maximum to the list ages again using the append function**
- **Finding the median sum length average using the math functions**
- **Calculated the range by finding the difference between maximum and minimum values from list and sorting and printing the range**

Question 2:

- Create an empty dictionary called dog
- Add name, color, breed, legs, age to the dog dictionary
- Create a student dictionary and add first_name, last_name, gender, age, marital status, skills, country, city and address as keys for the dictionary
- Get the length of the student dictionary
- Get the value of skills and check the data type, it should be a list
- Modify the skills values by adding one or two skills
- Get the dictionary keys as a list
- Get the dictionary values as a list

Program :

```python
dog={}
#updated dog dictionary
dog={"name":"cherry","color":"red","breed":"pug","legs":"short","age":5}
#creating student dictionary
student={"first_name":"manoj","last_name":"kumar","gender":"male","age":23,"martia
l
status":"single","skills":["java","c","python"],"country":"usa","city":"kansas","a
ddress":"1004"}
#length
print("Length:",len(student))
#values of skills
print("Skills:",student["skills"])
#modify
student["skills"].append("c sharp")
print("Modified Skills:",student["skills"])
#printing keys
print("Keys:",student.keys())
```

```
#printing values
print("Values:",student.values())
```

Output:

```
PS C:\Users\manoj\SUBJECTS\Machine Learning\Assignments\Assignment_1>  c:; cd 'c:\Users\manoj\SUBJECTS\Machine Learning\Assignment
s\Assignment_1'; & 'C:\Users\manoj\AppData\Local\Programs\Python\Python310\python.exe' 'c:\Users\manoj\.vscode\extensions\ms-pytho
n.python-2022.14.0\pythonFiles\lib\python\debugpy\adapter/../..\debugpy\launcher' '53385' '--' 'c:\Users\manoj\SUBJECTS\Machine Le
arning\Assignments\Assignment_1\Question2.py'
Length: 9
Skills: ['java', 'c', 'python']
Modified Skills: ['java', 'c', 'python', 'c sharp']
Keys: dict_keys(['first_name', 'last_name', 'gender', 'age', 'martial status', 'skills', 'country', 'city', 'address'])
Values: dict_values(['manoj', 'kumar', 'male', 23, 'single', ['java', 'c', 'python', 'c sharp'], 'usa', 'kansas', '1004'])
```

Explanation:

- **Creating an empty dictionary dog and updating the values in the dictionary**
- **Calculating the length of the student dictionary using len function**
- **Modifying the skills value by using the extend() function**
- **Printing the keys in the student dictionary using the functions keys() and values()**

Question 3:

- Create a tuple containing names of your sisters and your brothers (imaginary siblings are fine)
- Join brothers and sisters tuples and assign it to siblings
- How many siblings do you have?
- Modify the siblings tuple and add the name of your father and mother and assign it to family_member

Program:

```
# tuple with names of sisters and brothers
sisters = ("Kavya", "Ramya", "lavanya", "Sirisha", "Sravanthi")
brothers = ("Manoj", "Narendra", "Sravan")
print(sisters)
print(brothers)
# joining brothers and sisters
siblings= sisters + brothers
print(siblings)
#count of siblings
count_siblings= len(siblings)
print(count_siblings)
#appending father and mother
mother = "Latha"
father= "Krishna_Mohan"
family_members = list(siblings)
family_members.append(father)
```

```python
family_members.append(mother)
print(family_members)
```

Output:

```
PS C:\Users\manoj\SUBJECTS\Machine Learning\Assignments\Assignment_1> c:; cd 'c:\Users\manoj\SUBJECTS\Machine Learning\Assignment
s\Assignment_1'; & 'C:\Users\manoj\AppData\Local\Programs\Python\Python310\python.exe' 'c:\Users\manoj\.vscode\extensions\ms-pytho
n.python-2022.14.0\pythonFiles\lib\python\debugpy\adapter\../..\debugpy\launcher' '53474' '--' 'c:\Users\manoj\SUBJECTS\Machine Le
arning\Assignments\Assignment_1\Question3.py'
('Kavya', 'Ramya', 'lavanya', 'Sirisha', 'Sravanthi')
('Manoj', 'Narendra', 'Sravan')
('Kavya', 'Ramya', 'lavanya', 'Sirisha', 'Sravanthi', 'Manoj', 'Narendra', 'Sravan')
8
['Kavya', 'Ramya', 'lavanya', 'Sirisha', 'Sravanthi', 'Manoj', 'Narendra', 'Sravan', 'Krishna_Mohan', 'Latha']
```

Explanation:

- **Create tuples with values assigned**
- **Creating a tuple for brothers and sisters**
- **Joining both the tuples and result it as siblings tuple**
- **Count the number of siblings using len() function that gives the length of tuple**
- **Assign the values of mother and father**
- **Append the father and mother list to the family members list using append()**
- **Convert the list intlo family members tuple**

Question 4:

it companies = ('Facebook', 'Google', 'Microsoft', 'Apple', 'IBM', 'Oracle',

'Amazon'} A = {19, 22, 24, 20, 25, 26}

B = (19, 22, 20, 25, 26, 24, 28, 27}

age = [22, 19, 24, 25, 26, 24, 25, 24]

- Find the length of the set it companies
- Add 'Twitter' to it_companies
- Insert multiple IT companies at once to the set it companies
- Remove one of the companies from the set it companies
- What is the difference between remove and discard
- Join A and B
- Find A intersection B
- Is A subset of B
- Are A and B disjoint sets
- Join A with B and B with A
- What is the symmetric difference between A and B
- Delete the sets completely
- Convert the ages to a set and compare the length of the list and the set.

Program:

```python
it_companies = {'Facebook', 'Google', 'Microsoft', 'Apple', 'IBM', 'Oracle',
'Amazon'}
A = {19, 22, 24, 20, 25, 26}
B = {19, 22, 20, 25, 26, 24, 28, 27}
age = [22, 19, 24, 25, 26, 24, 25, 24]
#Find the length of the set it_companies
print("The length of set is:", len(it_companies))
#Add 'Twitter' to it_companies
it_companies.add("Twitter")
print(it_companies)
#Insert multiple IT companies at once to the set it_companies
multiple_ITcompanies= ["Tesla","Samsung", "Deloitte", "Meta"]
it_companies.update(multiple_ITcompanies)
print(it_companies)
#Remove one of the companies from the set it_companies
it_companies.remove("Samsung")
print(it_companies)
#Join A and B
C = A.union(B)
print(C)
#Find A intersection B
D = A.intersection(B)
print(D)
#Is A subset of B
E = A.issubset(B)
print(E)
#Are A and B disjoint sets
F = A.isdisjoint(B)
print(F)
#Join A with B and B with A
G = B.union(A)
print(C,G)
#What is the symmetric difference between A and B
H = A.symmetric_difference(B)
print(H)
#Delete the sets completely
del A,B
#Convert the ages to a set and compare the length of the list and the set
I= set(age)
print(len(I))
```

Output:

```
PS C:\Users\manoj\SUBJECTS\Machine Learning\Assignments\Assignment_1> c:; cd 'c:\Users\manoj\SUBJECTS\Machine Learning\Assignment
s\Assignment_1'; & 'C:\Users\manoj\AppData\Local\Programs\Python\Python310\python.exe' 'c:\Users\manoj\.vscode\extensions\ms-pytho
n.python-2022.14.0\pythonFiles\lib\python\debugpy\adapter/../..\debugpy\launcher' '53795' '--' 'c:\Users\manoj\SUBJECTS\Machine Le
arning\Assignments\Assignment_1\Question4.py'
The length of set is: 7
{'Apple', 'Facebook', 'Twitter', 'Oracle', 'Microsoft', 'IBM', 'Google', 'Amazon'}
{'Oracle', 'Tesla', 'Deloitte', 'IBM', 'Amazon', 'Meta', 'Microsoft', 'Twitter', 'Apple', 'Facebook', 'Samsung', 'Google'}
{'Oracle', 'Tesla', 'Deloitte', 'IBM', 'Amazon', 'Meta', 'Microsoft', 'Twitter', 'Apple', 'Facebook', 'Google'}
{19, 20, 22, 24, 25, 26, 27, 28}
{19, 20, 22, 24, 25, 26}
True
False
{19, 20, 22, 24, 25, 26, 27, 28} {19, 20, 22, 24, 25, 26, 27, 28}
{27, 28}
5
```

Explanation:

- **Find the length of the it_companies list using len() function and printing the result**
- **Modifying an elemnt in the it_companies using append()**
- **Inserting multiple companies using the update() function**
- **Removing an IT company from the list using the remove() function**
- **Joining A and B list using the union() function**
- **Intersection of A list with B and printing the intersection list**
- **Found if A is a subset of B using the is.subset() function**
- **Foind if A and B are disjoint sets using is.disjoint() function**
- **Found the symmetric_difference between A and B using the symmetric_difference() function**
- **Deleting the sets completely**
- **Converting the agest into a set using set() function and computing the length of the list and set using len function which gives a result**
-

Question 5:

The radius of a circle is 30 meters.

- Calculate the area of a circle and assign the value to a variable name of area of circle
- Calculate the circumference of a circle and assign the value to a variable name of _circum_of_circle_
- Take radius as user input and calculate the area.

Program:

```
radius = 30
pi=3.14
#area of a circle
area_of_circle = pi*radius*radius
print("area of the circle is", area_of_circle)
#circumference of a circle
circum_of_cirlce = 2*pi*radius
print("circumference of the circle is", circum_of_cirlce)
#calculating area with radius as input
radius = float(input ("Enter the radius of the circle : "))
area= pi*radius*radius
```

```
print ("The area of the circle is", area)
```
Output:

```
PS C:\Users\manoj\SUBJECTS\Machine Learning\Assignments\Assignment_1>  c:; cd 'c:\Users\manoj\SUBJECTS\Machine Learning\Assignment
s\Assignment_1'; & 'C:\Users\manoj\AppData\Local\Programs\Python\Python310\python.exe' 'c:\Users\manoj\.vscode\extensions\ms-pytho
n.python-2022.14.0\pythonFiles\lib\python\debugpy\adapter/../..\debugpy\launcher' '53983' '--' 'c:\Users\manoj\SUBJECTS\Machine Le
arning\Assignments\Assignment_1\Question5.py'
area of the circle is 2826.0
circumference of the circle is 188.4
Enter the radius of the circle : 50
The area of the circle is 7850.0
```

Explanation:

- **Calculated the area and circumference of the circle using the formula and randomly taking an input value for the radius and took an input for radius and calculated the area of the circle**

Question 6:

"I am a teacher and I love to inspire and teach people"

- How many unique words have been used in the sentence? Use the split methods and set to get the unique words.

Program:

```
#printing unique words

input1 =  "I am a teacher and I love to inspire and teach people"
strsplit=set(input1.split(" "))
print(strsplit)
```

Output:

```
PS C:\Users\manoj\SUBJECTS\Machine Learning\Assignments\Assignment_1>  c:; cd 'c:\Users\manoj\SUBJECTS\Machine Learning\Assignment
s\Assignment_1'; & 'C:\Users\manoj\AppData\Local\Programs\Python\Python310\python.exe' 'c:\Users\manoj\.vscode\extensions\ms-pytho
n.python-2022.14.0\pythonFiles\lib\python\debugpy\adapter/../..\debugpy\launcher' '54100' '--' 'c:\Users\manoj\SUBJECTS\Machine Le
arning\Assignments\Assignment_1\Question6.py'
{'a', 'I', 'teach', 'am', 'teacher', 'and', 'to', 'people', 'inspire', 'love'}
```

Explanation:

- **Printing the unique words from the given sentence using set and split function where split function splits the string into the unique words**

Question 7:

Use a tab escape sequence to get the following lines.

Name   Age   Country City

Asabeneh 250   Finland

Helsinki

Program:

```
#printing the sequence using escape tab

print("Name\t\tAge\t\tCountry\t\tCity\nAsabeneh\t250\t\tFinland\t\tHelsinki")
```

Output:

```
PS C:\Users\manoj\SUBJECTS\Machine Learning\Assignments\Assignment_1> c:; cd 'c:\Users\manoj\SUBJECTS\Machine Learning\Assignment
s\Assignment_1'; & 'C:\Users\manoj\AppData\Local\Programs\Python\Python310\python.exe' 'c:\Users\manoj\.vscode\extensions\ms-pytho
n.python-2022.14.0\pythonFiles\lib\python\debugpy\adapter/../..\debugpy\launcher' '54202' '--' 'c:\Users\manoj\SUBJECTS\Machine Le
arning\Assignments\Assignment_1\Question7.py'
Name          Age          Country        City
Asabeneh      250          Finland        Helsinki
```

Explanation:

- **Created a pattern using \n which is for newline and \t for tabspace**

Question 8:

Use the string formatting method to display the following:

radius = 10

area = 3.14 * radius ** 2

"The area of a circle with radius 10 is 314 meters square."

Program:

```
radius = 10
area = 3.14 * radius ** 2

# printing by string formatting method
print("Area of a circle with the given radius {} is {} Sq.
Meters".format(radius,int(area)))
```

Output:

```
PS C:\Users\manoj\SUBJECTS\Machine Learning\Assignments\Assignment_1> c:; cd 'c:\Users\manoj\SUBJECTS\Machine Learning\Assignment
s\Assignment_1'; & 'C:\Users\manoj\AppData\Local\Programs\Python\Python310\python.exe' 'c:\Users\manoj\.vscode\extensions\ms-pytho
n.python-2022.14.0\pythonFiles\lib\python\debugpy\adapter/../..\debugpy\launcher' '54307' '--' 'c:\Users\manoj\SUBJECTS\Machine Le
arning\Assignments\Assignment_1\Question8.py'
Area of a circle with the given radius 10 is 314 Sq. Meters
```

Explanation:

- **Used the string formatting methods to calculate the area of the circle**

Question 9:

Write a program, which reads weights (lbs.) of N students into a list and convert these weights to kilograms in a separate list using Loop. N: No of students (Read input from user)

Ex: L1: [150, 155, 145, 148]

Output: [68.03, 70.3, 65.77, 67.13]

Program:

```python
import math
# Taking the integer value as input
students = int(input("Enter the count of all the students: "))
list=[]
list1=[]
# Taking all inputs into list

for i in range(students):
    list.append(int(input()))

# coverting lbs into kgs by using math.floor
for m in list:
    x=(math.floor((m/2.2046) * 100 ))/ 100;
    list1.append(x)

print("Weights in kg is:", list1)
```

Output:

```
PS C:\Users\manoj\SUBJECTS\Machine Learning\Assignments\Assignment_1>  c:; cd 'c:\Users\manoj\SUBJECTS\Machine Learning\Assignment
s\Assignment_1'; & 'C:\Users\manoj\AppData\Local\Programs\Python\Python310\python.exe' 'c:\Users\manoj\.vscode\extensions\ms-pytho
n.python-2022.14.0\pythonFiles\lib\python\debugpy\adapter/../..\debugpy\launcher' '54378' '--' 'c:\Users\manoj\SUBJECTS\Machine Le
arning\Assignments\Assignment_1\Question9.py'
Enter the count of all the students: 4
150
155
145
148
Weights in kg is: [68.03, 70.3, 65.77, 67.13]
```

Explanation:

- **Converted from lbs to kgs we are giving a formula where lbs is divided by the value 2.2046**

and multiply and divide with 100 for number formatting and applying them to all the list values

Question 10:

The diagram below shows a dataset with 2 classes and 8 data points, each with only one feature value, labeled f. Note that there are two data points with the same feature value of 6. These are shown as two x's one above the other.
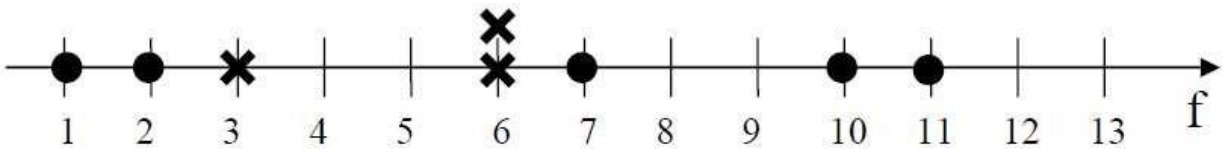
1. Divide this data equally into two parts. Use first part as training and second part as testing. Using KNN classifier, for K=3, what would be the predicted outputs for the test samples? Show how you arrived at your answer.
2. Compute the confusion matrix for this and calculate accuracy, sensitivity and specificity values.

Program:

```python
import numpy as np   #importing important python libraries
import matplotlib.pyplot as plt
import pandas as pd
path=r"C:\Users\manoj\SUBJECTS\Machine
Learning\Assignments\Assignment_1\dataset .csv"
data=pd.read_csv(path)#reading the dataset
print(data)
ab= data['Feature'].values
bc= data['Class'].values
print(ab,bc)
#dividing data equally into training and testing data
from sklearn.model_selection import train_test_split
features_tr, features_te, label_tr, label_te= train_test_split(ab, bc,
random_state=0, train_size= 0.5 )
#reshaping the data feature and labes into 2D array
features_tr = np.array(features_tr).reshape(-1,1)
features_te = np.array(features_te).reshape(-1,1)
#Normalizing data
from sklearn.preprocessing import StandardScaler
normalization= StandardScaler()
features_tr= normalization.fit_transform(features_tr)
features_te= normalization.transform(features_te)
#fiting the training data into classifier model
from sklearn.neighbors import KNeighborsClassifier
model= KNeighborsClassifier(n_neighbors=3 )
model.fit(features_tr, label_tr)
#Predicting the test set result
```
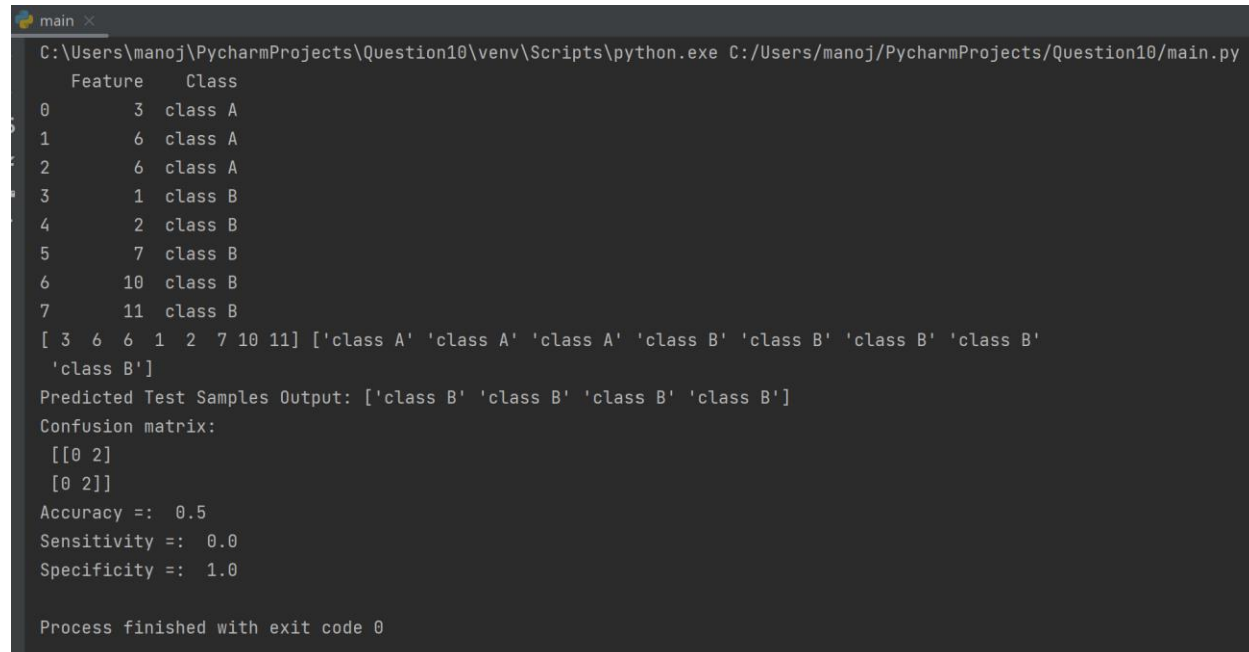
```
predict_class= model.predict(features_te)
print("Predicted Test Samples Output:",predict_class)

#creating a confusion matrix
from sklearn.metrics import confusion_matrix
model_evaluation= confusion_matrix(label_te, predict_class)
print("Confusion matrix:\n",model_evaluation)
#finding model accuracy
count=sum(sum(model_evaluation))
accuracy=(model_evaluation[0,0]+model_evaluation[1,1])/count
print ('Accuracy =: ', accuracy)
# finding model sensitivity
sense = model_evaluation[0,0]/(model_evaluation[0,0]+model_evaluation[0,1])
print('Sensitivity =: ', sense )
#finding model specificity
speci = model_evaluation[1,1]/(model_evaluation[1,0]+model_evaluation[1,1])
print('Specificity =: ', speci)
```

Output:

```
main ×
C:\Users\manoj\PycharmProjects\Question10\venv\Scripts\python.exe C:/Users/manoj/PycharmProjects/Question10/main.py
    Feature    Class
0        3  class A
1        6  class A
2        6  class A
3        1  class B
4        2  class B
5        7  class B
6       10  class B
7       11  class B
[ 3  6  6  1  2  7 10 11] ['class A' 'class A' 'class A' 'class B' 'class B' 'class B' 'class B'
 'class B']
Predicted Test Samples Output: ['class B' 'class B' 'class B' 'class B']
Confusion matrix:
 [[0 2]
 [0 2]]
Accuracy =:  0.5
Sensitivity =:  0.0
Specificity =:  1.0

Process finished with exit code 0
```

Explanation:

- **Importing the libraries numpy and matplotlib**
- **Reading the dataset by giving the path**
- **Divide dataset into train and test**
- **Fit the training dataset into the model classifier**
- **And then predict the test set result**
- **Create a model accuracy and find it**
- **Find the sensitivity and specificity**