MACHINE LEARNING
LAB CYCLE: 1

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EXPERIMENT: 1.1

PROBLEM:

Implement a program to take user input for age and check eligibility for voting using if-else.

AIM:

To develop a Python program that accepts age as user input and checks voting eligibility using an if-else statement.

ALGORITHM:

```
Aglorithm CheckEligibility(limit)
{
  read(limit);
  for  i := 1 to limit do
  {
     read (age);
     if (age<18) then
       print(" you are eligible ");
       i := i + 1;
     else
       print (" you are not eligible ");
       i := i + 1;
  }
}
```

RESULT:

The program successfully takes user input for age to check voting eligibility.

SOURCE CODE:

Check Voting Eligibility:

```
limit = int(input("Enter a limit "))
for i in range(limit):
    age = int(input("Enter your age "))
    if(age>18):
        print(" you are eligible ")
    else:
        print(" you are not eligible ")
```

OUTPUT:

```
PS C:\Users\shalu\Desktop\ML\ML-Python> & C:/Users/shalu/AppData/Local/Programs/Python/Python310/python.exe "c:/Users/shalu/Desktop/ML/ML-Python/Python/lab 01-2.py"
Enter a limit 3
Enter your age 38
 you are eligible
Enter your age 23
 you are eligible
Enter your age 12
 you are not eligible
```

EXPERIMENT: 1.2

PROBLEM:

Implement a program to print the first 10 numbers using a for loop and a while loop.

AIM:

To develop a Python program that prints the first 10 natural numbers using a for loop and while loop.

ALGORITHM:

```
Algorithm PrintNumbers()
{
  print (“While Loop”);
  j := 1;
  while j<=10 do
  {
     print (“j”);
     j := j+1;
  }
  print (“For Loop”);
  for i := 1 to 10 do
  {
     print (“i”);
  }
```

RESULT:

The program successfully displays the first 10 numbers using both for loop and while loop methods.

SOURCE CODE:

```
print("while loop")
j=1
while(j<=10):
print(j ,end = " ")
j+=1
print("\n for loop")
for i in range (1,11):
print(i , end = " ")
```

OUTPUT:

```
PS C:\Users\shalu\Desktop\ML\ML-Python> & C:/Users/shalu/AppData/Local/Programs/Python/Python310/python.exe "c:/Users/shalu/Desktop/ML/ML-Python/Python/lab 01-1.py"
 While Loop
1 2 3 4 5 6 7 8 9 10
 For Loop
1 2 3 4 5 6 7 8 9 10
```

EXPERIMENT: 2

PROBLEM:

Write a Python function to compute factorial recursively and non-recursively.

AIM:

To write a Python program to compute the factorial of a given number using both recursive and non-recursive functions.

ALGORITHM:

```
Algorithm FactRecursion(num)
{
  function fact(num);
  {
     if (num = 0 or num = 1) then
       return 1;
     else
       return num * fact (num - 1);
     read (num);
     print (" factorial ", fact (num));
     }
}

Algorithm FactNonRecursion(num)
{
  read (num);
  fact := 1;
  while num != 0 do
  {
     fact := fact*num;
     num := num-1;
  }
  print (“factorial”, fact)
}
```

RESULT:

The program correctly computes the factorial of a number using non recursive and method.

SOURCE CODE:

//Recursion

```
def fact (num):
   if num == 0 or num ==1:
      return 1
   else:
      return num * fact(num -1)

num = int(input(" enter the no  "))
print(" factorial " + str (fact(num)))
```

//Non - Recursion

```
num=int(input("enter the no  "))
fact=1
while(num!=0):
   fact=fact*num
   num-=1

print("factorial  "+str(fact))
```

OUTPUT:

```
PS C:\Users\shalu\Desktop\ML\ML-Python> & C:/Users/shalu/AppData/Local/Programs/Python/Python310/python.exe "c:/Users/shalu/Desktop/ML/ML-Python/Python/lab 02-1.py"
 enter the no  5
 recursion 120
enter the no  5
factorial  120
```

EXPERIMENT: 3

PROBLEM:

Implement the following:
- Read from a text file.
- Write processed output to a new file.

AIM:

To develop a Python program that:
- Reads data from a text file.
- Processes the contents and writes the output to a new text file.

ALGORITHM:

```
Algorithm FileRead()
{
  open “inp.txt” in write mode;
  write “Helooo Hiiii” into file;
  close inp.txt;

  open “inp.txt” in read mode;
  print (read contents of file);
  close inp.txt;
}

Algorithm FileAppend()
{
  open “inp.txt” in read mode;
  open “out.txt” in write mode;
  read contents of “inp.txt” and write into “out.txt”;
  close “inp.txt”;
  close “out.txt”;

  open “out.txt” in append mode;
  for i := 1 to 24 do
  {
     num := convert i to string
     write num into “out.txt”
  }
  close “out.txt”;
}
```

RESULT:

The program successfully reads data from a specified text file and writes the processed content into a new output file.

SOURCE CODE:

File Read:

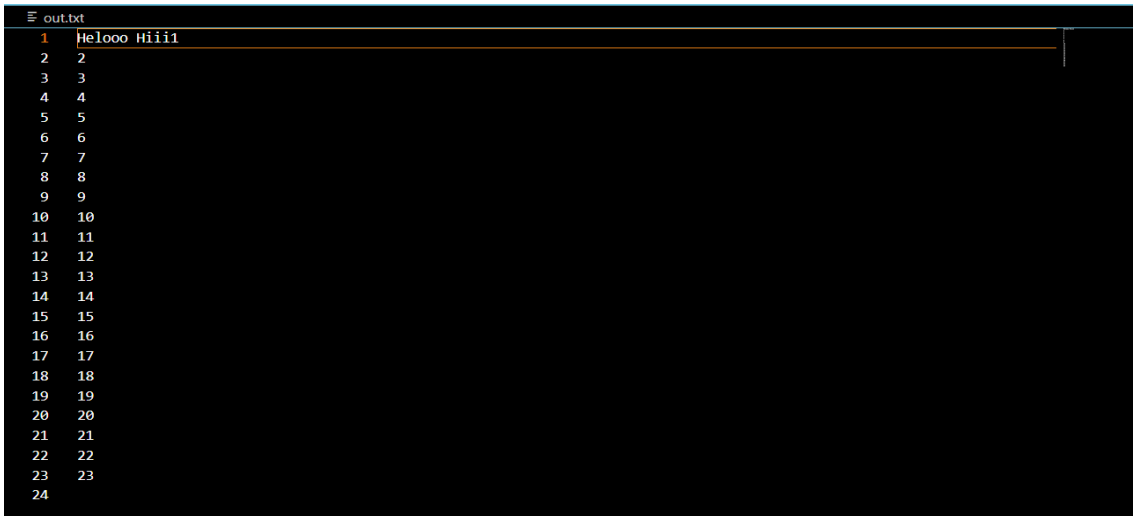
```
file = open("out.txt","w")
file.write("Helooo Hiii")
file.close()

file = open("out.txt")
print(file.read())
file.close()
```

File Append:

```
file=open("inp.txt","r")
file2=open("out.txt", "w")
file2.write(file.read() + "\n")
file.close()
file2.close()
file = open("out.txt", "a")
for i in range(1, 24):
   num=str(i)+"\n"
   file.write(num)
file.close()
```

OUTPUT:



EXPERIMENT: 4

PROBLEM:

Implement a class Person with attributes name and age. Include a method to display the details.

AIM:

To write a Python program to implement a class Person with attributes name and age, and to display the details of the person using a class method.

ALGORITHM:

```
Algorithm ClassData(n,Datas)
{
  define class Data with attributes:
     name (string);
     age  (integer, default = 22);

  read (n);

  Datas := [];

  while n != 0 do
  {
     p1 := Data();
     p1.name := read (name);
     p1.age := read (age);
     append p1 to Datas;
     n := n-1;
  }
  for i := 1 to length(Datas) do
  {
     print ("No: ", i);
     print ("Name: ", Datas[i].name);
     print ("Age: ", Datas[i].age);
  }
}
```

RESULT:

The program defines a Person class with name and age attributes and includes a method to display these details correctly.

SOURCE CODE:

```
class Data:
    name = ""
    age = 22

n = int(input ("How many data do you want to store:"))

Datas = []

while n != 0:
    p1 = Data()
    p1.name = input("enter your name")
    p1.age = int(input("enter your age"))
    Datas.append(p1)
    n -= 1

for i,data in enumerate(Datas,1):
    print(f"\n No:{i} \n Name:{data.name} \n Age:{data.age}\n")
```

OUTPUT:

```
PS C:\Users\shalu\Desktop\ML\ML-Python> & C:/Users/shalu/AppData/Local/Programs/Python/Python310/python.exe "c:/Users/shalu/Desktop/ML/ML-Python/Python/lab 04.py"
How many data do you want to store:
3

enter your name
Jack

 enter your age
18

enter your name
Maryam

 enter your age
20

enter your name
Ram

 enter your age
19

 No:1
 Name:Jack
 Age:18


 No:2
 Name:Maryam
 Age:20


 No:3
 Name:Ram
 Age:19
```

EXPERIMENT: 5

PROBLEM:

Write a Python program to handle division by zero using try-except block.

AIM:

To write a Python program that performs division of two numbers and handles the division by zero error using a try-except block.

ALGORITHM:

```
Algorithm DivisionByZero()
{
  read (num);
  read (den);
  try
  {
     result := num / den;
     print("Result : ", num, "/", den, " = ", result);
  }
  catch (ZeroDivisionError)
  {
     print("Divison by 0 not possible");
  }
}
```

RESULT:

The program effectively handles a division-by-zero error using a try-except block, preventing the program from crashing

SOURCE CODE:

```
num = int(input("Enter a numerator  "))
den = int(input("Enter a denominator  "))
try:
   result = num / den
   print(f"Result : {num} / {den} = {result} ")
except ZeroDivisionError:
   print("Divison by 0 not possible")
```

OUTPUT:

```
PS C:\Users\shalu\Desktop\ML\ML-Python> & C:/Users/shalu/AppData/Local/Programs/Python/Python310/python.exe "c:/Users/shalu/Desktop/ML/ML-Python/Python/lab 05.py"
Enter a numerator  35
Enter a denominator  7
Result : 35 / 7 = 5.0
PS C:\Users\shalu\Desktop\ML\ML-Python> & C:/Users/shalu/AppData/Local/Programs/Python/Python310/python.exe "c:/Users/shalu/Desktop/ML/ML-Python/Python/lab 05.py"
Enter a numerator  30
Enter a denominator  0
Divison by 0 not possible
```

EXPERIMENT: 6

PROBLEM:

Implement the following:
- Create a NumPy array.
- Perform element-wise addition, multiplication.
- Compute mean, variance, standard deviation.

AIM:

To develop a Python program that creates a NumPy array, performs element-wise addition and multiplication, and computes the mean, variance, and standard deviation of the array elements.

ALGORITHM:

```
Algorithm NumpyArray(arr1,arr2,add,mul,mean,var,sd)
{
  Import numpy library;

  read arr1;
  read arr2;

  print("Array 1:", arr1);
  print("Array 2:", arr2);

  add := arr1 + arr2;
  print("Addition:", add);

  mul := arr1 * arr2;
  print("Multiplication:", mul);

  mean = mean(arr1);
  var = var(arr1);
  sd = std(arr1);

  print("Mean of arr1:", mean);
  print("Variance of arr1:", var);
  print("Standard Deviation of arr1:", sd);
}
```

RESULT:

The program successfully performs element-wise addition and multiplication on a NumPy array, and correctly computes its mean, variance, and standard deviation.

SOURCE CODE:

```
import numpy as np

arr1 = np.array(list(map(int, input("\nEnter elements of Array 1 \n").split())))

arr2 = np.array(list(map(int, input("\nEnter elements of Array 2\n ").split())))

print("\nArray 1:", arr1)
print("\nArray 2:", arr2)

add = arr1 + arr2
print("\nAddition:", add)

mul = arr1 * arr2
print("\nMultiplication:", mul)

mean = np.mean(arr1)
var = np.var(arr1)
sd = np.std(arr1)

print("\nMean of arr1:", mean)
print("\nVariance of arr1:", var)
print("\nStandard Deviation of arr1:", sd)
```

OUTPUT:

```
PS C:\Users\shalu\Desktop\ML\ML-Python> & C:/Users/shalu/AppData/Local/Programs/Python/Python310/python.exe

 Enter elements of Array 1
 1 2 3 4

 Enter elements of Array 2
  3 4 5 6

 Array 1: [1 2 3 4]

 Array 2: [3 4 5 6]

 Addition: [ 4  6  8 10]

 Multiplication: [ 3  8 15 24]

 Mean of arr1: 2.5

 Variance of arr1: 1.25

 Standard Deviation of arr1: 1.118033988749895
```

EXPERIMENT: 7

PROBLEM:

Use NumPy to:
- Create matrices.
- Perform matrix multiplication, transpose, determinant, inverse (if exists).

AIM:

To write a Python program using NumPy to create matrices and perform various matrix operations such as multiplication, transpose, determinant, and inverse (if it exists).

ALGORITHM:

```
Algorithm MatrixOperations(rowsa,colsa,rowsb,colsb,A,B)
{
  Import numpy library;
  read (rowsa);
  read (colsa);
  read (rowsb);
  read (colsb);
  print("Enter elements of Matrix A ",rowsa,"x",colsa);
  A := [];
  for i  := 1 to rowsa do
  {
     read (row);
     append row to A;
  }
  A := convert A to numpy array;

  for i  := 1 to rowsb do
  {
     read (row);
     append row to B;
  }
  B := convert B to numpy array;
  print("Matrix A:", A);
  print("Matrix B:", B);

  if A.shape == B.shape then
     D := A+B;
     print("A + B:", D);
  else
     print("Matrix addition not possible (different dimensions)");

  if colsa = rowsb then
     C :=  A x B;
     print("A x B:", C);
```

```
  else
    print("Matrix multiplication not possible (columns of A != rows of B)");

  print("Transpose of A:", Transpose(A));

  if rowsa = colsa then
    detA := Determinant(A);
    print("Determinant of A:", detA);

    if detA != 0 then
      invA := Inverse(A);
      print("Inverse of A:", invA);
    else
      print("Matrix A is singular, no inverse exists");

  else
      print("Determinant and Inverse are not defined for non-square matrices");
}
```

RESULT:

The program successfully uses NumPy to create matrices and perform essential matrix operations like multiplication, transpose, determinant, and inverse.

SOURCE CODE:

```
import numpy as np

rowsa = int(input("Enter number of rows A: "))
colsa = int(input("Enter number of columns A: "))

rowsb = int(input("Enter number of rows B: "))
colsb = int(input("Enter number of columns B: "))

print(f"Enter elements of Matrix A ({rowsa}x{colsa}):")
A = []
for i in range(rowsa):
    row = list(map(int, input().split()))
    A.append(row)
A = np.array(A)

print(f"Enter elements of Matrix B ({rowsb}x{colsb}):")
B = []
for i in range(rowsb):
    row = list(map(int, input().split()))
    B.append(row)
B = np.array(B)
print("\nMatrix A:\n", A)
print("Matrix B:\n", B)
if A.shape == B.shape:
    D = A + B
    print("\nA + B:\n", D)
else:
    print("\nMatrix addition not possible (different dimensions)")

if A.shape[1] == B.shape[0]:
    C = np.dot(A, B)
    print("\nA x B:\n", C)
else:
    print("\nMatrix multiplication not possible (columns of A != rows of B)")

print("\nTranspose of A:\n", A.T)

if A.shape[0] == A.shape[1]:
    detA = np.linalg.det(A)
    print("\nDeterminant of A:", detA)

    if detA != 0:
        invA = np.linalg.inv(A)
        print("\nInverse of A:\n", invA)
    else:
```

```
        print("\nMatrix A is singular, no inverse exists")
else:
    print("\nDeterminant and Inverse are not defined for non-square matrices")
```

OUTPUT:

```
PS C:\Users\shalu\Desktop\ML\ML-Python> & C:/Users/shalu/AppData/Local/Programs/Python/Python310/python.exe "c:/Users/shalu/Desktop/ML/ML-Python/Python/lab 07.py"
Enter number of rows A: 2
Enter number of columns A: 3
Enter number of rows B: 3
Enter number of columns B: 2
Enter elements of Matrix A (2x3):
1 2 3
1 4 5
Enter elements of Matrix B (3x2):
3 4
5 6
7 8

Matrix A:
 [[1 2 3]
 [1 4 5]]
Matrix B:
 [[3 4]
 [5 6]
 [7 8]]

Matrix addition not possible (different dimensions)

A x B:
 [[34 40]
 [58 68]]

Transpose of A:
 [[1 1]
 [2 4]
 [3 5]]

Determinant and Inverse are not defined for non-square matrices
```

EXPERIMENT: 8

PROBLEM:

Load a CSV file using Pandas.
- Display head and tail of the dataset.
- Compute basic statistics: mean, median, mode.
- Handle missing values.

AIM:

To develop a Python program using Pandas to:
- Load a dataset from a CSV file.
- Display the first few (head) and last few (tail) records of the dataset.
- Compute basic statistical measures such as mean, median, and mode.
- Identify and handle missing values in the dataset.

ALGORITHM:

```
Algorithm DataLoading()
{
  Import pandas library;

  read CSV file into data;
  print("Head :", head(data));
  print("Tail :", tail(data));

  mean_sal := compute mean of Salary;
  median_sal := compute median of Salary;
  mode_sal := compute mode of Salary;

  print("Mean of Salary :", mean_sal);
  print("Median of Salary :", median_sal);
  print("Mode of Salary :", mode_sal);
}
```

RESULT:

Using the Pandas library, the CSV dataset was loaded and analysed. Several key operations were performed to retrieve and prepare the data for further analysis.

SOURCE CODE:

```
import pandas as pd

data = pd.read_csv(r"C:\Users\shalu\Desktop\ML\ML-Python\Python\Salary_dataset.csv")

print("Head :\n", data.head())
print("\n")
print("Tail :\n", data.tail())
print("\n")

mean_sal=data['Salary'].mean()
median_sal=data['Salary'].median()
mode_sal=data['Salary'].mode()

print("Mean of Salary :\n",mean_sal)
print("\n")
print("Median of Salary :\n",median_sal)
print("\n")
print("Mode of Salary :\n",mode_sal)
print("\n")
```

OUTPUT:

```
PS C:\Users\shalu\Desktop\ML\ML-Python> & C:/Users/shalu/AppData/Local/Programs/Python/Python310/python.exe "c:/Users/shalu/Desktop/ML/ML-Python/Python/lab 08.py"
Head :
    No  YearsExperience   Salary
0   0             1.2  39344.0
1   1             1.4  46206.0
2   2             1.6  37732.0
3   3             2.1  43526.0
4   4             2.3  39892.0


Tail :
     No  YearsExperience    Salary
25  25             9.1  105583.0
26  26             9.6  116970.0
27  27             9.7  112636.0
28  28            10.4  122392.0
29  29            10.6  121873.0


Mean of Salary :
 73907.1


Median of Salary :
 62779.0


Mode of Salary :
 0    39344.0
Name: Salary, dtype: float64
```

EXPERIMENT: 9

PROBLEM:

Plot the graphs using matplotlib.
- Plot a simple line graph of y = x^2.
- Plot bar charts and histograms.

AIM:

To develop a Python program using Matplotlib to plot graphs:
- A simple line graph of y = x^2.
- Bar charts and histograms.

ALGORITHM:

```
Algorithm GraphPlots()
{
   Import pandas, numpy, matplotlib.pyplot libraries;
   data := read_csv("Salary_Dataset.csv");
   fig, (x1, x2, x3) := subplots(1, 3, figsize=(18, 6));
   x := linspace(-5, 5, 50);
   y := x²;
   plot(x1, x, x², color := "blue");
   set title(x1, "y = x²");
   set xlabel(x1, "x");
   set ylabel(x1, "y");
   group data by "Job Roles";
   compute sum of "Salaries Reported" for each role;
   sort values in descending order;
   plot bar chart (roles, salaries) on subplot x2;
   set title = "Number of Salaries Reported by Job Role";
   set xlabel = "Job Role";
   set ylabel = "Number of Salaries Reported";
   rotate x-axis labels by 45°;
   take "Salary" column from data;
   plot histogram with 15 bins, purple color, edge color black on subplot x3;
   set title = "Salary Distribution";
   set xlabel = "Salary", ylabel = "Frequency";
   enable y-axis gridlines;
   tight_layout();
   show();
}
```

RESULT:

The program successfully generates a line graph for y=x2, a bar chart, and a histogram of a given dataset using the Matplotlib library.

SOURCE CODE:

```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np

data = pd.read_csv(r"C:\Users\shalu\Desktop\ML\ML-Python\Python\Salary_Dataset.csv")

fig, (x1, x2, x3) = plt.subplots(1, 3, figsize=(18, 6))

# Line graph: y = x²
x = np.linspace(-5, 5, 50)
x1.plot(x, x**2, 'b-')
x1.set_title('y = x²')
x1.set_xlabel("x")
x1.set_ylabel("y")
x1.grid(True)

# Bar chart: Number of Salaries Reported by Job Role
salaries_reported_by_role = data.groupby("Job Roles")["Salaries
Reported"].sum().sort_values(ascending=False)
x2.bar(salaries_reported_by_role.index, salaries_reported_by_role.values, color="skyblue",
edgecolor="black")
x2.set_title("Number of Salaries Reported by Job Role")
x2.set_xlabel("Job Role")
x2.set_ylabel("Number of Salaries Reported")
x2.tick_params(axis="x", rotation=45)

# Histogram: Salary distribution
x3.hist(data['Salary'], bins=15, alpha=0.7, color='purple', edgecolor="black")
x3.set_title('Salary Distribution')
x3.set_xlabel("Salary")
x3.set_ylabel("Frequency")
x3.grid(axis="y", linestyle="--", alpha=0.7)

plt.tight_layout()
plt.show()
```

OUTPUT:

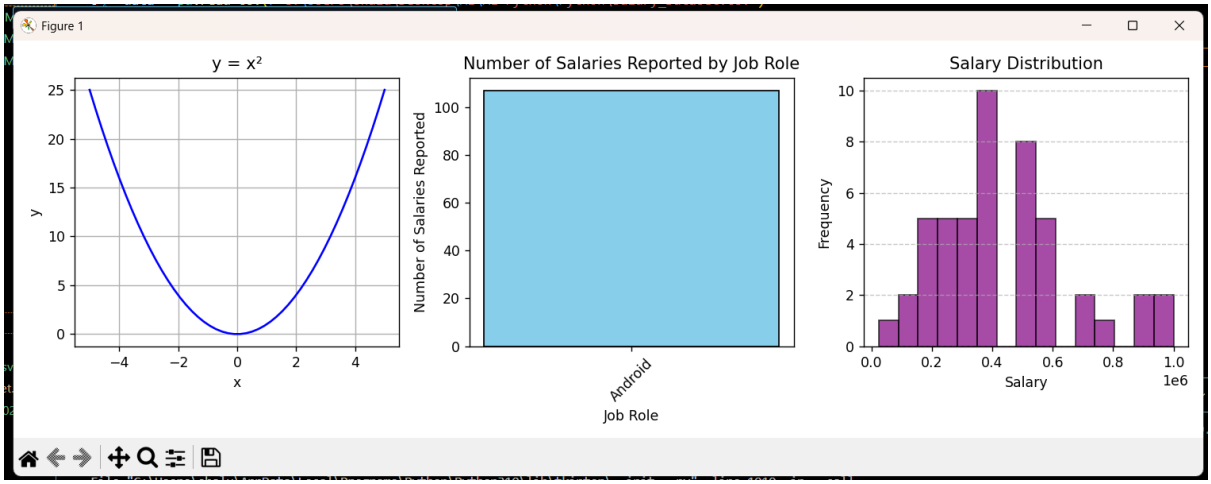


Figure 1
y = x²
y
x
Number of Salaries Reported by Job Role
Number of Salaries Reported
Android
Job Role
Salary Distribution
Frequency
Salary
1e6

EXPERIMENT: 10

PROBLEM:

Visualize:
- Plot a scatter plot of two features from the Iris dataset.
- Use color to indicate different classes.

AIM:

To write a Python program to visualize the Iris dataset by plotting a scatter plot of two features, using different colors to represent the classes.

ALGORITHM:

```
Algorithm VisualizeIris()
{
  Import seaborn, pandas, matplotlib.pyplot libraries;
  iris := read_csv("iris.csv");
  scatterplot(
     x := 'sepal_length',
     y := 'sepal_width',
     hue := 'species',
     data := iris,
     palette := 'tab10',
  );
  title := "Sepal Length vs Sepal Width (by Species))";
  xlabel := "Sepal Length";
  ylabel := "Sepal Width";
  legend(title := "Species");
  tight_layout();
  show();
}
```

RESULT:

To visualize relationships between features of the Iris dataset using scatter plots.

SOURCE CODE:

```
import seaborn as sns
import pandas as pd
import matplotlib.pyplot as plt

file_path = r'C:\Users\shalu\Desktop\ML\ML-Python\Python 1\iris.csv'
iris = pd.read_csv(file_path)

plt.figure(figsize=(10,6))
sns.scatterplot(
    x='sepal_length',
    y='sepal_width',
    hue='species',
    data=iris,
    palette='tab10',
    s=80,
    alpha=0.7
)

plt.title("Sepal Length vs Sepal Width (by Species)")
plt.xlabel("Sepal Length")
plt.ylabel("Sepal Width")
plt.legend(title='Species', bbox_to_anchor=(1.05, 1), loc='upper left')
plt.tight_layout()
plt.show()
```

OUTPUT: