DATA SCIENCE WITH PYTHON

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LAB -01

Python Basics: Your first program,Types Expressions and Variables string Operations.

Code:

```
name="chamu"
print(name)

num1=5
num2=2.0
num3=3+2j
print(type(num1),type(num2),type(num3))

lang=['swift','c++','python']
print(lang)
print(lang[1])
print(type(lang))
tuple=('chamu',2,4.5)
print(type(tuple))
 set={1,1,2,2,3,4,4}
print(set)
print(type(set))
 set1=(1,2,3,5,6,7)
print(set.union(set1))
print(set.intersection(set1))
print(set.difference(set1))
print(set.issubset(set1))
print(set.symmetric_difference(set1))
print(set.issuperset(set1))
print(set.isdisjoint(set1))
 dict={1:'chamu',"nepal":"kammam",3:'tomato'}
print(type(dict))
print(dict.keys())
print(dict.items())
print(dict.values())
print(dict["nepal"])

#python list methods
 a=['apple' ,5.5, 6]
 a.append("Orange")
print(a)
x=a.count(6)
print(x)
 a.extend(['volvo'])
print(a)
 a.append(['volvo'])
print(a)
 a.insert(1,"kiran")
print(a)
z=a.remove(6)
print(z)
y=a.pop(2)
print(y)
 a.reverse()
print(a)
lava=[1,2,3]
kush=lava.copy()
print("copy of a list:",kush)
print("clear of list:",lava.clear())
print("######String Methods:######")
txt="string methods begin from here."
print("capatalize the first word:",txt.capitalize())
p=txt.casefold()
print(p)
 q=txt.center(40)
print("It returns a centered string:",q)
r=txt.count("string")
print("count the particular word:",r)
t=txt.endswith('s')
print("Ends with:",t)
print("Encode:",txt.encode())
 s="H\te\tl\tl\to"
print(s)
print("Expandtabs:",s.expandtabs())
 a,b,c=5,3.3,'Anusha'
print("Asssgning different values to different variables:", a,b,c)
 a=b=c="Anusha"
print("SAme value assisgned to different variables:",a,b,c)
rge=range(2,22,2)
 for n in age:
     print(n)

num=5
Num=55
print(num,Num)
```

Output:

```
chamu
<class 'int'> <class 'float'> <class 'complex'>
 ['swift', 'c++', 'python']
 c++
<class 'list'>
<class 'tuple'>
 {1, 2, 3, 4}
<class 'set'>
 {1, 2, 3, 4, 5, 6, 7}
 {1, 2, 3}
 {4}
False
```

```
 {4, 5, 6, 7}
False
False
<class 'dict'>
 dict_keys([1, 'nepal', 3])
 dict_items([(1, 'chamu'), ('nepal', 'kamam'), (3, 'tomato')])
 dict_values(['Yamuna', 'kamam', 'tomato'])

 ['apple', 5.5, 6, 'Orange']
  1
 ['apple', 5.5, 6, 'Orange', 'volvo']
 ['apple', 5.5, 6, 'Orange', 'volvo', ['volvo']]
 ['apple', 'kiran', 5.5, 6, 'Orange', 'volvo', ['volvo']]
None
 5.5
 [['volvo'], 'volvo', 'Orange', 'kiran', 'apple']
 copy of a list: [1, 2, 3]
 clear of list: None
######String Methods:######
 capatalize the first word: String methods begin from
 here. string methods begin from here.
It returns a centered string: string methods begin from here.
 count the particular word: 1
Ends with: False
Encode: b'string methods begin from here.'
H e l l o
Expandtabs: H e l l o
Asssgning different values to different variables: 5 3.3 Yamuna
 SAme value assisgned to different variables: Yamuna Yamuna
Yamuna
2
4
 6
 8
  10
  12
  14
  16
  18
20
 5 55
```

LAB - 02

Python Data Structures: Lists and Tuples Sets, and Dictionaries

Code:

```
site_name = 'programiz.pro'
print(site_name)
site_name = 'programiz.pro'
print(site_name)
site_name = 'apple.com'
print(site_name)
a, b, c = 5, 3.2, 'Hello'
print(a)
print(b)
print(c)
site1 = site2  = 'programiz.com'
print(site1)
print(site2)
string1="python programming"
print(string1)
string2='python programming'
print(string2)
name="python"
print(name)
message="i love python"
print(message)
great="hello"
print(great[1])
print(great[-4])
print(great[1:4])
print(great[:4])
Message='Hola Amigos'
#Message[0]='H'
print(Message)
Message='Hello friends'
print(Message)
Message="""Never gona give you up Never gona give you down"""
print(Message)
str1="hello world"
str2=" i love python"
str3="hello world"
print(str1==str2)
print(str1==str3)
greet="hello"
name="jack"
result=greet+name
print(result)
```

```
for letter in greet:
  print(letter)
print(len(greet))
print('a' in 'program')
print('at' not in 'battle')
num=[1,2,5]
print(num)
lan=["python","swift","c++"]
print(lan[0])
print(lan[2])
print(lan[-1])
print(lan[-3])
my_list=['p','r','o','g','m','i','z']
print(my_list[2:5])
print(my_list[5:])
print(my_list[:])
num.append(32)
print(num)
num.insert(1,35)
print(num)
numbers=[4,5,6]
num.extend(numbers)
print(num)
languages=['python','swit','c']
languages[2]='c'
print(languages)
del languages[1]
print(languages)
del languages[-1]
print(languages)
languages.remove('python')
print(languages)
language=['python','swit','c']
print('c' in language)
print('python' in language)
print(len(language))
numbers=[number*number for number in range(1,6)]
print(numbers)
my_tuple=()
print(my_tuple)
my_tuple=(1,2,3)
print(my_tuple)
my_tuple=(1,"hello",3.4)
print(my_tuple)
my_tuple=("mouse",[8,4,6],(1,2,3))
print(my_tuple)
var1=("hello")
```

```
print(type(var1))
var2=("hello",)
print(type(var2))
letters=('p','r','o','g','m','i','z')
print(letters[-1])
print(letters[-3])
my_tuple=('p','r','o','g','m','i','z')
print(my_tuple[1:4])
print(my_tuple[:-7])
print(my_tuple[7:])
print(my_tuple[:])
print(my_tuple.count('p'))
print(my_tuple.index('i'))
capital_city={"nepal":"kathmandu","england":"london"}
print("initial dictionary:",capital_city)
capital_city["japan"]="tokyo"
print("updated dictionary:",capital_city)
student_id = {111: "Eric", 112: "Kyle", 113: "Butters"}
print("Initial Dictionary: ", student_id)
student_id[112] = "Stan"
print("Updated Dictionary: ", student_id)
student_id = {111: "Eric", 112: "Kyle", 113: "Butters"}
print(student_id[111])
print(student_id[113])
squares = {1: 1, 3: 9, 5: 25, 7: 49, 9: 81}
print(1 in squares)
print(2 not in squares)
print(49 in squares)
squares = {1: 1, 3: 9, 5: 25, 7: 49, 9: 81}
for i in squares:
  print(squares[i])
A= {1, 3, 5}
B= {0, 2, 4}
print('Union using |:', A | B)
print('Union using union():', A.union(B))
print('Intersection using &:', A & B)
print('Intersection using intersection():', A.intersection(B))
print('Difference using &:', A - B)
print('Difference using difference():', A.difference(B))
print('using ^:', A ^ B)
print('using symmetric_difference():', A.symmetric_difference(B))
if A == B:
  print('Set A and Set B are equal')
else:
  print('Set A and Set B are not equal')
"""greet="Hello",name="Jack"
result = greet+name
```

```
print(result)"""
numbers = [1, 2, 5]
print(numbers)
prime_numbers = [2, 3, 5]
print("List1:", prime_numbers)
even_numbers = [4, 6, 8]
print("List2:", even_numbers)
prime_numbers.extend(even_numbers)
print("List after append:", prime_numbers)
```

OUTPUT:-

```
programiz.pro
programiz.pro
apple.com
5
3.2
Hello
programiz.com
programiz.com
python programming
python programming
python
i love python
e
e
ell
hell
Hola Amigos
Hello friends
Never gona give you up Never gona give you down
False
True
hellojack
h
e
l
l
o
5
True
False
[1, 2, 5]
python
c++
c++
python
['o', 'g', 'm']
```

```
['i', 'z']
['p', 'r', 'o', 'g', 'm', 'i', 'z']
[1, 2, 5, 32]
[1, 35, 2, 5, 32]
[1, 35, 2, 5, 32, 4, 5, 6]
['python', 'swit', 'c']
['python', 'c']
['python']
[]
True
True
3
[1, 4, 9, 16, 25]
()
(1, 2, 3)
(1, 'hello', 3.4)
('mouse', [8, 4, 6], (1, 2, 3))
<class 'str'>
<class 'tuple'>
z
m
('r', 'o', 'g')
()
()
('p', 'r', 'o', 'g', 'm', 'i', 'z')
1
5
initial dictionary: {'nepal': 'kathmandu', 'england': 'london'}
updated dictionary: {'nepal': 'kathmandu', 'england': 'london', 'japan': 'tokyo'}
Initial Dictionary:  {111: 'Eric', 112: 'Kyle', 113: 'Butters'}
Updated Dictionary:  {111: 'Eric', 112: 'Stan', 113: 'Butters'}
Eric
Butters
True
True
False
1
9
25
49
81
Union using |: {0, 1, 2, 3, 4, 5}
Union using union(): {0, 1, 2, 3, 4, 5}
Intersection using &: set()
Intersection using intersection(): set()
Difference using &: {1, 3, 5}
Difference using difference(): {1, 3, 5}
```

```
using ^: {0, 1, 2, 3, 4, 5}
using symmetric_difference(): {0, 1, 2, 3, 4, 5}
Set A and Set B are not equal
[1, 2, 5]
List1: [2, 3, 5]
List2: [4, 6, 8]
List after append: [2, 3, 5, 4, 6, 8]
```

LAB- 03

Python Programming Fundamentals: Conditions and Branching Loops, Functions,Objects and Classes

if-else

```
number=int(input("Enter a Number:"))
if number>10:
   print('Number is greater than 10')
 else:
   print('Number is less than 10')
```

Output:

```
Enter a number:11
Number is greater than 10
```

If-elif-else

```
num=int(input('Enter a Number:'))
if num>0:
   print('Positive Number')
 elif num<0:
   print('Negative Number')
 else:
   print('Positive Number')
print('This statement is always executed')
```

Output:

```
Enter a number:10
Positive Number
```

nested-if

```
num=int(input('Enter a Number:'))
if(num>=0):
    if num==0:
        print('Number is 0')
    else:
        print('Number is positive')
else:
    print('Number is Negative')
```

output:

```
Enter a Number:15
Number is positive
```

short-hand-if

```
a=10;
b=20;
if a<b: print('This is if')
```

Output:

```
This is if
```

shorthand-if-else

```
a=30;
b=20;
print('This is if') if a<b else print('this is else')'''
```

Output:

```
This is else
```

for-loop

```
lang=['swift','c','python','c++']
for x in lang:
    print(x)
```

range function

```
a=range(6)
for x in a:
    print(x)

a=range(1,6)
for x in a:
    print(x)

a=range(2,22,2)
for x in a:
    print(x)
for i in range(1,1001):
    for j in range (1,11):
        print(i*j,end=" ")
    print()
```

for loops with else

```
digits=[0,1,2]
for i in digits:
    print(i)
else:
    print("No items left.")
```

while loop

```
i=1
n=5
while i<=n:
    print(i)
    i=i+1
```

Python oops Concept

python inheritence

```
class Animal:
  def speak(self):
    print("Animal Speaking")
class Dog(Animal):
  def bark(self):
    print("dog barking")
class DogChild(Dog):
  def eat(self):
     print("Eating bread...")
d=DogChild()
d.speak()
d.bark()
d.eat()
```

Output:

```
Dog Barking
Animal Speaking
Eating Bread
```

Method overriding

```
'class Animal:
  def speak(self):
print("Speaking")
class Dog(Animal):
  def speak(self):
    print("Not Speaking")
```

```
class Cat(Dog):
  def speak(self):
   print("Is this a cat")
d=Cat()
d.speak()
```

Output:

```
Speaking
Not Speaking
Is this a cat
```

Data Abstraction

```
class Employee:
 __count=0;
  def __init__(self):
    Employee.__count=Employee.__count+1

  def display(self):
    print("The number of Employees",Employee.__count)
emp=Employee()
try:
 print(emp.__count)
finally:
  emp.display()
```

Output:

```
Number of Employees:3
```

Abstract Method

```
from abc import ABC, abstractmethod
class Car(ABC):
    def mileage(self):
        pass

class Tesla(Car):
    def mileage(self):
        print("The mileage is 30kmph")
class Suzuki(Car):
    def mileage(self):
        print("The mileage is 25kmph ")
class Duster(Car):
     def mileage(self):
          print("The mileage is 24kmph ")
```

```
class Renault(Car):
    def mileage(self):
        print("The mileage is 27kmph ")

# Driver code
t= Tesla ()
t.mileage()

r = Renault()
r.mileage()

s = Suzuki()
s.mileage()
d = Duster()
d.mileage()
```

Output

```
The mileage is 30kmph
The mileage is 25kmph
The mileage is 24kmph
The mileage is 27kmph
```

LAB - 04

Working with python in data: Reading files with python,Writing Files with open,Loading with pandas

```
# 1.create a dataframe from the list

import pandas as pd
friuts=['mango','papaya','grapes','pine-apple','banana','apple']
print(pd.DataFrame(friuts))
print("\n\n")

# list of strings
lst = ['first', 'second', 'third', 'four',
                    'five', 'six', 'eight']

# Calling DataFrame constructor on list
df = pd.DataFrame(lst)
print(df)
print("\n\n\n")

# 2. Dataframe using list with index and column names
import pandas as pd
name=['yammu','chamu','sandy','sowji',ram','sri']
 df=pd.DataFrame(name,index=[101,102,103,104,105,106],columns=['Names'])
print(df)
print("\n\n")

import pandas as pd

# list of strings
lst = ['one', 'is', 'always', 'greater', 'then', 'two', 'three']

# Calling DataFrame constructor on list
# with indices and columns specified
 df = pd.DataFrame(lst, index =['a', 'b', 'c', 'd', 'e', 'f',
                                                'g'], columns =['Names'])
print(df)
print("\n\n\n")
#3 Using zip() for zipping two lists
name=['raji','devi','vaishu','yammu','chamu','annita']
rol=['a', 'b', 'c', 'd', 'e', 'f', 'g']
 df=pd.DataFrame(list(zip(name,rol)),columns=['Name','Rol'])
print(df)
print("\n\n")


# list of strings
lst = ['one', 'is', 'always', 'greater', 'then', 'two', 'three']

# list of int
lst2 = [11, 22, 33, 44, 55, 66, 77]

# Calling DataFrame constructor after zipping
# both lists, with columns specified
 df = pd.DataFrame(list(zip(lst, lst2)),
                                      columns =['Name', 'val'])
print(df)
print("\n\n\n")
```

```
#4 Creating DataFrame using multi-dimensional list
name=[['raji',20],['sandy',20],['madhu',20],['vaishu',19],['devi',20]]
 df=pd.DataFrame(name,columns=['Name','Age'])
print(df)
print("\n\n")

# List1
lst = [['cherry', 5], ['puppy', 3],
            ['sweety', 6], ['honey', 2]]

 df = pd.DataFrame(lst, columns =['Name', 'Age'])
print(df)
print("\n\n\n")


#5 Using multi-dimensional list with column name and dtype specified.
 cakes=[['1','Vanilla cupcakes',50],['2','Chocolate cupcakes',60],['3','Banana cake',30],['4','walnut
 cake',40],['5',' coconut cake',25]]
 df=pd.DataFrame(cakes,columns=['cake place','cake Name','price'])
print(df)
print("\n\n")



# List1
lst = [['cherry', 'gadu',5 ], ['puppy', 'gadu', 3],
            ['sweety', 'papa', 6], ['honey', 'papa', 6]]

 df = pd.DataFrame(lst, columns =['FName', 'LName', 'Age'])
print(df)
print("\n\n\n")

#6 Using lists in dictionary to create dataframe
movies=['Akkada Ammayi Ikkada Abbayi','bheemla nayak','Thammudu','Gabbar
 Singh','Kushi','Tholi Prema']
place=['1', '27', '5', '9', '7', '4']
 dic={'Movies':movies,'Place':place}
 df=pd.DataFrame(dic)
print(df)
print("\n\n")
```

```
# list of name, degree, score
name = ["ram", "vaishu", "devi", "yamuna"]
 deg = ["puc", "puc", "puc", "puc"]
 scr = [9.02, 9.8, 8.8, 9.0]
print("\n\n")
# dictionary of lists
 dict = {'name': name,
        'degree': deg,
        'score': scr}

 df = pd.DataFrame(dict)
print(dict)

print(df)
print("\n\n\n")
 df=pd.read_csv('C:\\Users\\Chameswari\\Desktop\\image\\grade.csv',index_col=("Na
 me")) f=df.loc["Yamuna"]
 s=df.loc["Ambica"]
 a=df["At-02"]
print(f ,"\n\n\n",s)
print("\n\n")
print(a)
print("\n")
 sf=df.iloc[3]
print(sf)
print("\n\n")

#iteration over rows and columns

# dictionary of lists
 dict = {'name':["Adinarayana", "Lakshmi", "Srinu", "Rajeswari"],
        'degree': ["10th", "no", "MCA", "BTECH"],
        'score':[100, 80, 98, 95]}

 df=pd.DataFrame(dict)
 for i,j in df.iterrows():
    print(i,j)
    print()
print("\n\n\n")
```

```
# dictionary of lists
dict = {'name':["Adinarayana", "Lakshmi", "Srinu", "Rajeswari"],
        'degree': ["10th", "no", "MCA", "BTECH"],
        'score':[100, 80, 98, 95]}

# creating a dataframe from a dictionary
df = pd.DataFrame(dict)

print(df)
columns=list(df)
for i in columns:
print(df[i][0])
```

Output:

```
        0
  0 mango 1
     papaya
2 grapes
3 pine-apple
4 banana
5 apple



       0
0 first
 1 second
2 third
3 four
4 five
5 six
6 eight



         Names
 101 yammu
 102 chamu
 103 sandy
 104 sowji
 105 ram
  106 sri
```

```
    Names
a one
b is
c always
d greater
e then
f two
g three
        Name Rol
0 raji a
 1 devi b
2 vaishu c
 3 yammu d
 4 chamu e
 5 annita f
```

```
      Name val
0 one 11 1 is
22
2 always 33 3
greater 44 4
then 55 5 two
66 6 three 77
```

```
    Name Age
0 raji 20
 1 sandy 20
2 madhu 20
 3 vaishu 19
4 devi 20
    Name Age
```

```
0 cherry 5
 1 puppy 3
2 sweety 6
3 honey 2
```

```
  cake place cake Name price 0 1
 Vanilla cupcakes 50 1 2 Chocolate
 cupcakes 60 2 3 Banana cake 30 3
                        4
walnut cake 40 4 5 coconut cake 25
```

```
   FName LName Age
0 cherry gadu 5
 1 puppy gadu 3
2 sweety papa 6
3 honey papa 6
```

```
                    Movies Place
0 Akkada Ammayi Ikkada Abbayi 1 1
bheemla nayak 27 2 Thammudu 5 3
Gabbar Singh 9 4 Kushi 7
5 Tholi Prema 4
 {'name': ['yammu', 'vaishu', 'devi', 'sanjay’], 'degree': ['puc', 'puc', 'puc', 'puc'], 'score':
[9.02, 9.8, 8.8, 9.0]}
       name degree score
0 yammu puc 9.02
 1 vaishu puc 9.80
2 devi puc 8.80
3 sanjay puc 9.00
```

```
0 name Adinarayana
degree 10th
```

```
 score 100
Name: 0, dtype: object

 1 name Lakshmi
 degree no
 score 80
Name: 1, dtype: object

2 name Srinu
 degree MCA
 score 98
Name: 2, dtype: object
 3 name Rajeswari
 degree BTECH
 score 95
Name: 3, dtype: object




        name degree score
 0 Adinarayana 10th 100
 1 Lakshmi no 80
2 Srinu MCA 98
 3 Rajeswari BTECH 95
Adinarayana
 10th
 100
```

LAB - 05

Working with Numpy Arrays: Numpy 1d Arrays,Numpy 2D Arrays

Code:

```
import numpy as np
#arrange
 arr=np.arange(20)
print(arr)
```

```
#shape
 arr.shape
print("Shape of array:",arr)
print(arr[4])

#asisgning a value
 arr[7]=777
print(arr)

#reshape the existing array
 arr=np.arange(20).reshape(4,5)
print("Rearranging the array:",arr)
print(arr.shape)
print(arr[1][2])

 array=np.arange(27).reshape(3,3,3)
print(array)

#zero function
print(np.zeros((2,4)))
#ones function
print(np.ones((2,4)))
#empty function
print(np.empty((2,2)))
#full function
print(np.full((4,3),7))
#eye function
print(np.eye(3,3))
#linespace
print(np.linspace(0, 100, num=5))
#conversion from list to array
list=[4,5,6]
print(list)
 array=np.array(list)
print(array)
print(type(array))
#random funcion
print(np.random.random((2,2)))
print(np.shape(array))
print(np.size(array))
print(np.dtype(float))
 array1=np.array([1,2,3,4,5])
```

```
print(array1[1:5])
print(array1[:])
print(array1[3:])#copying the array
myarray=np.copy(array1)
print(myarray)
myarray[2]=8
print(myarray,array1)
#view function
 arrayv=array1.view()
print(arrayv)
 arrayv[2]=9
print(arrayv,array1)
 yammu=np.array(['A','B'])
 ary=np.array([11,22,33,44])
print(ary)
print(np.delete(ary,2))
#atack function
 a=np.array([1,2,3,4])
b=np.array([5,6,7,8])
 c=np.stack((a,b),axis=1)
print(c)
#concatenate
x=np.array([[1,2],[3,4]])
y=np.array([[12,30]])
r=np.array([[33,44]])
z=np.concatenate((x,y),axis=0)
print(z)
print(np.vstack((x,y)))
print(np.hstack((y,r)))
print(np.dstack((y,r)))
 split=np.array([11,22,33,44,55,66])
newarr=np.array_split(split,3)
print(newarr)
#where function
t=np.arange(12)
 s=np.where(a<6,a,5*a)
print(s)
 fun=np.array([1,11,2,22,3,33])
print(np.max(fun))
print(np.min(fun))
print(np.mean(fun))
print(np.median(fun))
print(np.var(fun))
print(np.std(fun))
```

Output:

```
[ 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19] Shape of array: [ 0 1
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19] 4
[ 0 1 2 3 4 5 6 777 8 9 10 11 12 13 14 15 16 17 18 19]
Rearranging the array: [[ 0 1 2 3 4]
 [ 5 6 7 8 9]
 [10 11 12 13 14]
 [15 16 17 18 19]]
(4, 5)
7
[[[ 0 1 2]
  [ 3 4 5]
  [ 6 7 8]]

 [[ 9 10 11]
  [12 13 14]
  [15 16 17]]

 [[18 19 20]
  [21 22 23]
  [24 25 26]]]
[[0. 0. 0. 0.]
 [0. 0. 0. 0.]]
[[1. 1. 1. 1.]
 [1. 1. 1. 1.]]
[[2.12199579e-314 4.67296746e-307]
[1.11658836e-320  1.04614393e-311]]
[[7 7 7]
 [7 7 7]
 [7 7 7]
 [7 7 7]]
[[1. 0. 0.]
 [0. 1. 0.]
 [0. 0. 1.]]
[ 0. 25. 50. 75. 100.]
[4, 5, 6]
[4 5 6]
<class 'numpy.ndarray'>
[[0.04181302 0.70924674]
```

```
 [0.96165792 0.17146781]]
(3,)
3
float64
[2 3 4 5]
[1 2 3 4 5]
[4 5]
[1 2 3 4 5]
[1 2 8 4 5] [1 2 3 4 5]
[1 2 3 4 5]
[1 2 9 4 5] [1 2 9 4 5]
[11 22 33 44]
[11 22 44]
[[1 5]
 [2 6]
 [3 7]
 [4 8]]
[[ 1 2]
 [ 3 4]
 [12 30]]
[[ 1 2]
 [ 3 4]
 [12 30]]
[[12 30 33 44]]
[[[12 33]
  [30 44]]]
[array([11, 22]), array([33, 44]), array([55, 66])]
[1 2 3 4]
33
 1
 12.0
7.0
 140.66666666666666
 11.86029791643813
```

LAB -06

Cleaning and preparing the data: Identify the Handle Missing Values

Code:

```
import pandas as pd
```

```
data=pd.read_csv("C:\\Users\\Chameswari\\Downloads\\toyota.csv",index
            _col=0, na_values=['??','NaN'])

print(data)
new_data=data.dropna()
print(new_data)
 fill=data.fillna(5000)
print(fill)
null=data.isnull()
print(null)
```

Output:

```
Price Age KM FuelType ... Automatic CC Doors Weight 0 13500
23.0 46986.0 Diesel ... 0 2000 three 1165 1 13750 23.0 72937.0
Diesel ... 0 2000 3 1165 2 13950 24.0 41711.0 Diesel ... 0 2000 3
1165 3 14950 26.0 48000.0 Diesel ... 0 2000 3 1165 4 13750 30.0
38500.0 Diesel ... 0 2000 3 1170 ... ... ... ... ... ... ... ... ... 1431
7500 NaN 20544.0 Petrol ... 0 1300 3 1025 1432 10845 72.0
NaN Petrol ... 0 1300 3 1015 1433 8500 NaN 17016.0 Petrol ... 0
1300 3 1015 1434 7250 70.0 NaN NaN ... 0 1300 3 1015 1435
6950 76.0 1.0 Petrol ... 0 1600 5 1114

 [1436 rows x 10 columns]
     Price Age KM FuelType ... Automatic CC Doors Weight 0 13500
23.0 46986.0 Diesel ... 0 2000 three 1165 1 13750 23.0 72937.0
Diesel ... 0 2000 3 1165 3 14950 26.0 48000.0 Diesel ... 0 2000 3
1165 4 13750 30.0 38500.0 Diesel ... 0 2000 3 1170 5 12950 32.0
61000.0 Diesel ... 0 2000 3 1170 ... ... ... ... ... ... ... ... ... 1423 7950
80.0 35821.0 Petrol ... 1 1300 3 1015 1424 7750 73.0 34717.0 Petrol
... 0 1300 3 1015 1429 8950 78.0 24000.0 Petrol ... 1 1300 5 1065
1430 8450 80.0 23000.0 Petrol ... 0 1300 3 1015 1435 6950 76.0 1.0
Petrol ... 0 1600 5 1114

 [1099 rows x 10 columns]
     Price Age KM FuelType ... Automatic CC Doors Weight 0 13500
```

```
23.0 46986.0 Diesel ... 0 2000 three 1165 1 13750 23.0 72937.0 Diesel
... 0 2000 3 1165 2 13950 24.0 41711.0 Diesel ... 0 2000 3 1165 3
14950 26.0 48000.0 Diesel ... 0 2000 3 1165 4 13750 30.0 38500.0
Diesel ... 0 2000 3 1170 ... ... ... ... ... ... ... ... ...
 1431 7500 5000.0 20544.0 Petrol ... 0 1300 3 1025 1432 10845
72.0 5000.0 Petrol ... 0 1300 3 1015 1433 8500 5000.0 17016.0
Petrol ... 0 1300 3 1015 1434 7250 70.0 5000.0 5000 ... 0 1300 3
1015 1435 6950 76.0 1.0 Petrol ... 0 1600 5 1114

 [1436 rows x 10 columns]
     Price Age KM FuelType ... Automatic CC Doors Weight 0 False
False False False ... False False False False 1 False False False False
... False False False False 2 False False False False ... False False
False False
3 False False False False ... False False False False 4 False
False False False ... False False False False ... ... ... ... ... ... ... ...
...
 1431 False True False False ... False False False False 1432 False
False True False ... False False False False 1433 False True False
False ... False False False False 1434 False False True True ...
False False False False 1435 False False False False ... False
False False False

 [1436 rows x 10 columns]
```

LAB - 07

Model Development: Simple and Multiple Linear Regression ,Model Evaluation Using Visualization

Simple Linear

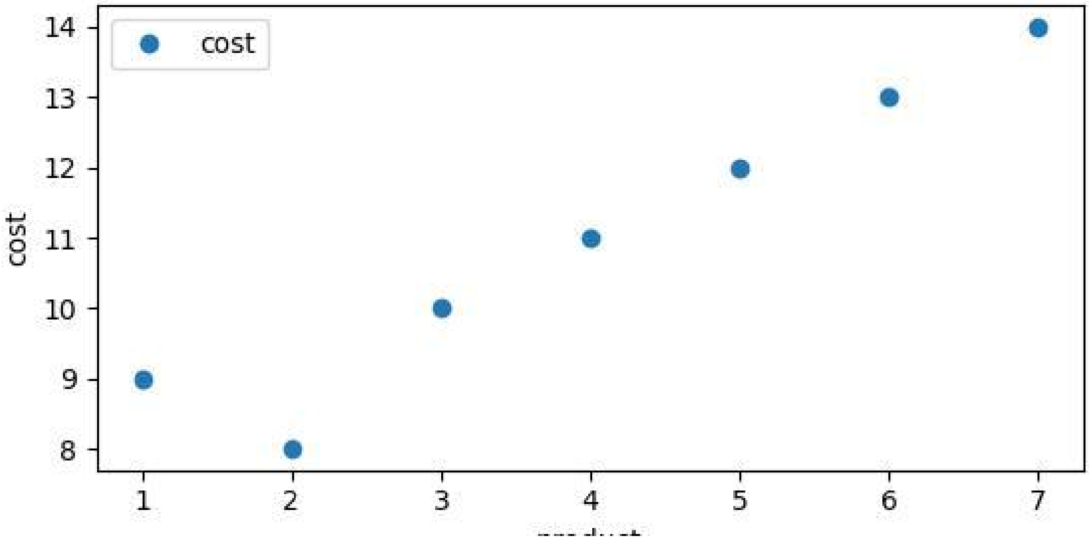
```
# -*- coding: utf-8 -*-
"""
Created on Sun Jun 18 13:03:25 2023

@author: chamu
"""
import numpy as np
```

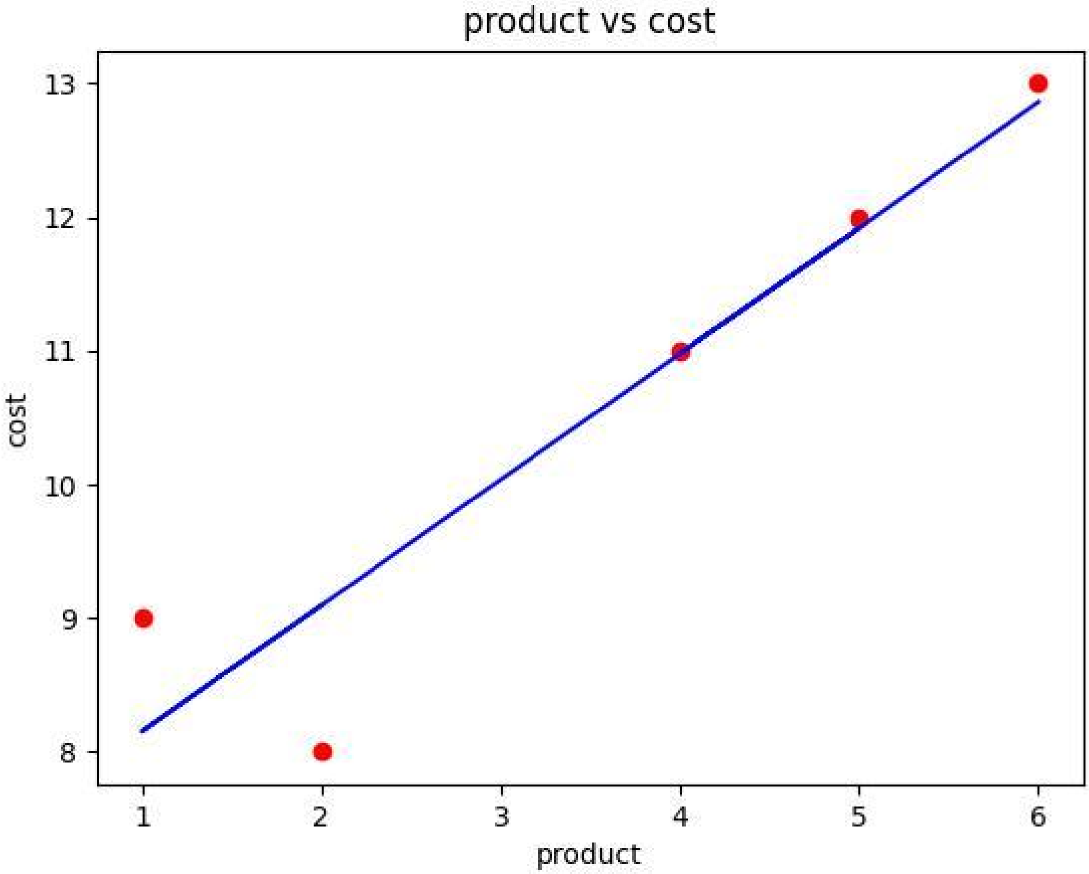
```
 import pandas as pd
 df=pd.read_csv("lin.csv")
 print(df)
 df.head()
 data_=df.loc[:,['product','cost']]
 print(data_.head(6))
 #showing the data in matplotlib
 #to use we need to first install matplotlib
 import matplotlib.pyplot as plt
 df.plot(x='product',y='cost',style='o')
 plt.xlabel('product')
 plt.ylabel('cost')
 plt.show()
 #dividing the variables into dependent and
independent
 x=pd.DataFrame(df['product'])
 y=pd.DataFrame(df['cost'])
 #split the data into train and test sets
 from sklearn.model_selection import
train_test_split
 x_train,x_test,y_train,y_test=train_test_split(x,y,tes
t_size=0.2,random_state=1)
 #knowning the shapes of the test and train
 print(x_train.shape)
 print(x_test.shape)
 print(y_train.shape)
 print(y_test.shape)
 #train the algorithm
 from sklearn.linear_model import
LinearRegression
 regressor=LinearRegression()
 regressor.fit(x_train,y_train)
 #retriving the intercept
 print(regressor.intercept_)
 #retriving the slope
 print(regressor.coef_)
 #predicting the test results
 y_pred=regressor.predict(x_test)
 y_test
 print(y_pred)
 print(y_test)
 #evaluting the algorithm
 from sklearn import metrics
 import numpy as np
 print('Mean Absolute
Error:',metrics.mean_absolute_error(y_test,y_pred
))
 print('Mean Squared
Error:',metrics.mean_squared_error(y_test,y_pred)
)
 print('Root Mean Squared
Error:',np.sqrt(metrics.mean_squared_error(y_test,
y_pred)))

 #plot for the train train set
 plt.scatter(x_train,y_train,color='red')#plotting the
observation line
 plt.plot(x_train,regressor.predict(x_train),color='bl
ue')#plotting the regression line
 plt.title("product vs cost")
 plt.xlabel("product")
 plt.ylabel("cost")
 plt.show()#specifies end of the graph
 #plot the test set
 plt.scatter(x_test,y_test,color='red')
 plt.plot(x_train,regressor.predict(x_train),color='bl
ue')#plotting the regresion line
 plt.title("product vs cost")
 plt.xlabel("product")
 plt.ylabel("cost")
 plt.show()
```

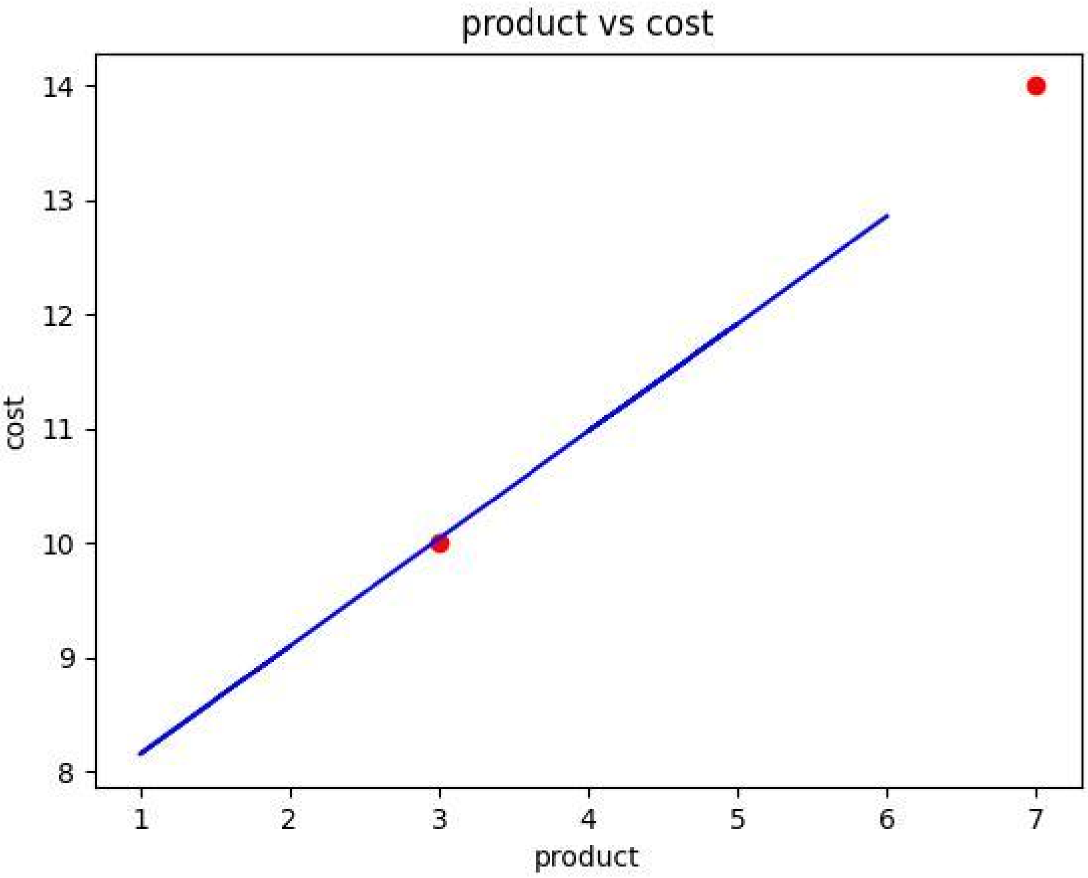
Output:-

```
   sno  product  cost  rating
0    1        1     9       2
1    2        2     8       3
2    3        3    10       4
3    4        4    11       5
4    5        5    12       6
5    6        6    13       7
6    7        7    14       8
   product  cost
0        1     9
1        2     8
2        3    10
3        4    11
4        5    12
```

5	6	13


cost
14
13
12
11
10
9
8
cost
1
2
3
4
5
6
7
product


product vs cost
13
12
11
10
9
8
cost
1
2
3
4
5
6
product



```
(5, 1)
(2, 1)
(5, 1)
(2, 1)
[7.20930233]
[[0.94186047]]
[[13.80232558]
 [10.03488372]]
   cost
6    14
2    10
 Mean Absolute Error:
0.11627906976744118
 Mean Squared Error:
0.020146024878312466
 Root Mean Squared Error:
0.14193669320620536
```

Multiple Regression

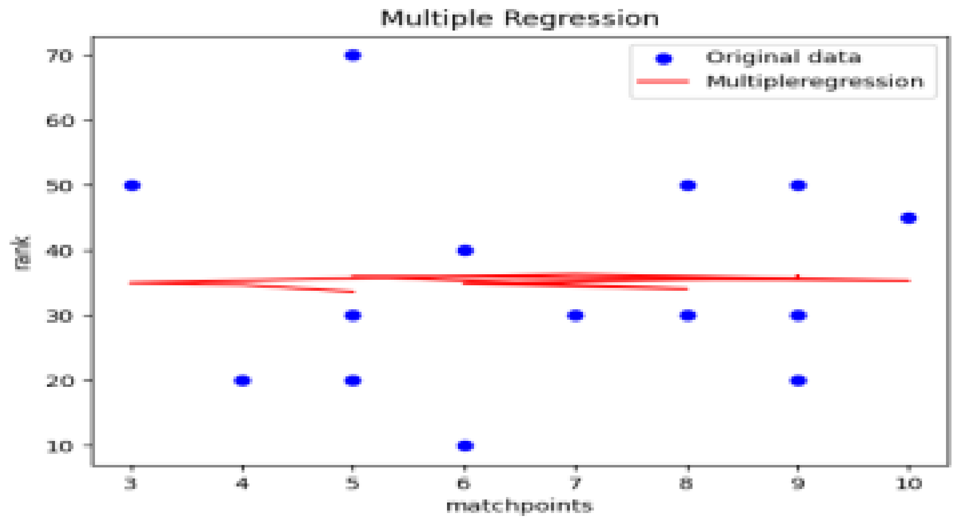
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
#from sklearn.linear_model import LinearRegression as lr

# Load the dataset
data = pd.read_csv('pra.csv')

# Extract the independent variables (features)
X = data[['$cost','rating']].values

# Extract the dependent variable
y = data['discount'].values

# Create and fit the multiple regression model
from sklearn.linear_model import LinearRegression
model = LinearRegression()
model.fit(X, y)

# Generate predicted values
predicted_y = model.predict(X)
print("Coefficients: ", model.coef_)
print("Intercept: ", model.intercept_)
print("Predicted values: ", predicted_y)

# Plot the original data points and the predicted values
plt.scatter( X[:, 1], y, c='blue', label='Original data') plt.plot(
X[:, 1], predicted_y, c='red', label='Multipleregression')
plt.xlabel('matchpoints')
plt.ylabel('rank')
plt.title('Multiple Regression')
plt.legend()
plt.show()


fig = plt.figure()
ax = fig.add_subplot(111, projection='3d')
```

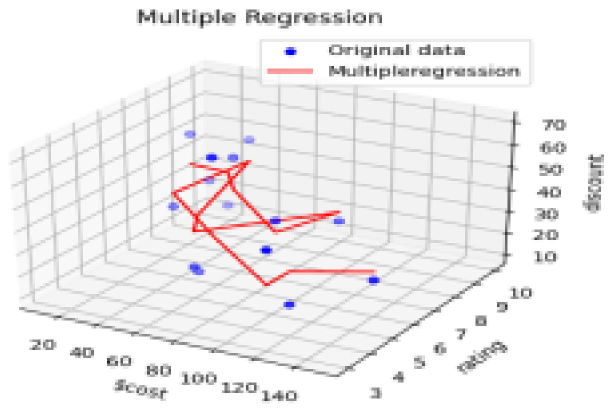
```
ax.scatter(X[:, 0], X[:, 1], y, c='blue', label='Original data')
ax.plot(X[:, 0], X[:, 1], predicted_y, c='red', label='Multipleregression')
ax.set_xlabel('$cost')
ax.set_ylabel('rating')
ax.set_zlabel('discount')
ax.set_title('Multiple Regression')
ax.legend()
plt.show()
```

Output:

```
Coefficients: [-0.02574741 -0.28450588]
Intercept: 38.95936897090988
Predicted values: [33.67472874 34.73165679 35.01616266 35.73452119 36.32414269
35.34188804
 35.96496343 35.99199525 34.10858139 34.9350672 35.5246887 35.62639391
 35.88386797 36.14134203]
```

Graphs:



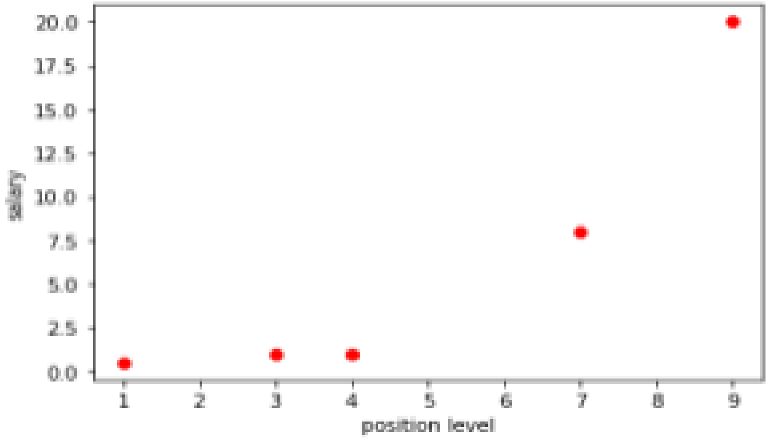


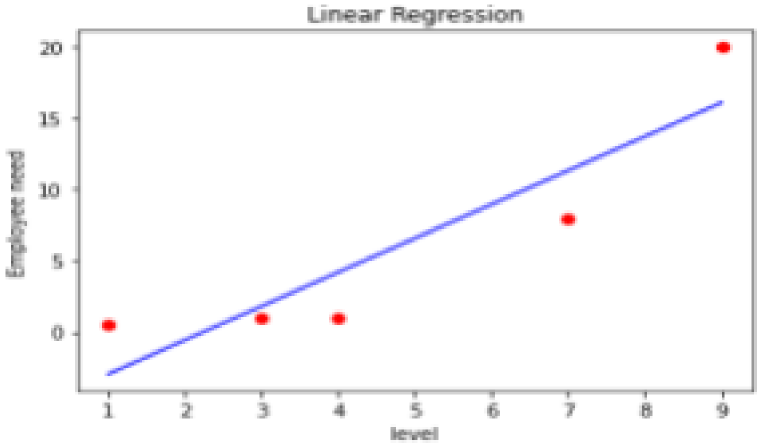
Polynomial Regression

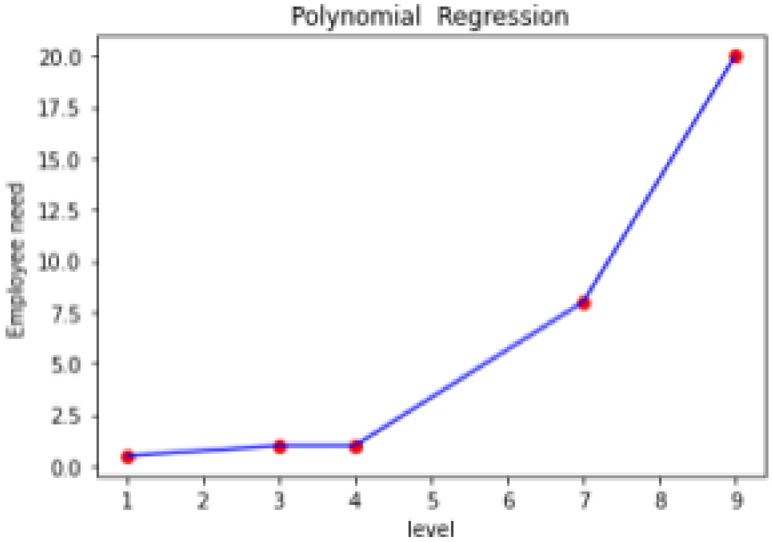
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
 dataset=pd.read_csv("poly1.csv")
 dataset.head()
x=dataset.iloc[:,1:-1].values
y=dataset.iloc[:,-1].values
#plotting the data points
plt.scatter(x,y,color="red")
plt.xlabel("position level")
plt.ylabel("salary")
plt.show()
#Linear regression
 from sklearn.linear_model import LinearRegression
lin_reg=LinearRegression()


lin_reg.fit(x,y)
#polynomial regression
 from sklearn.preprocessing import PolynomialFeatures
poly_reg=PolynomialFeatures(degree=4)
x_poly=poly_reg.fit_transform(x)
lin_reg_2=LinearRegression()
lin_reg_2.fit(x_poly,y)
print(x_poly)
#plotting linear regression
plt.scatter(x,y,color="red")
plt.plot(x,lin_reg.predict(x),color="blue")
plt.title("Linear Regression")
plt.xlabel("level")
plt.ylabel("Employee need")
plt.show()
#plotting of polynomial regression
plt.scatter(x,y,color="red")
plt.plot(x,lin_reg_2.predict(poly_reg.fit_transform(x)),color="blue")
plt.title("Polynomial Regression")
plt.xlabel("level")
plt.ylabel("Employee need")
plt.show()
# predicting the final result with the linear Regression model:
lin_pred=lin_reg.predict([[6.5]])
```

```
print(lin_pred)

## predicting the final result with the polynomial Regression model:
poly_pred=lin_reg_2.predict(poly_reg.fit_transform([[6.5]]))
print(poly_pred)
```

Output:







```
[[1.000e+00 1.000e+00 1.000e+00 1.000e+00 1.000e+00]
[1.000e+00 3.000e+00 9.000e+00 2.700e+01 8.100e+01]
[1.000e+00 4.000e+00 1.600e+01 6.400e+01 2.560e+02]
[1.000e+00 7.000e+00 4.900e+01 3.430e+02 2.401e+03]
[1.000e+00 9.000e+00 8.100e+01 7.290e+02 6.561e+03]]
[10.14583333]
[5.87706163]
```

LAB -09

Model Evaluation: Over-fitting ,under-fitting, Ridge Regression

Ridge Regression

```
from sklearn.linear_model import Ridge
from sklearn.model_selection import train_test_split
from sklearn.datasets import load_boston
from sklearn.preprocessing import StandardScaler

# loading boston dataset
boston = load_boston()
X = boston.data[:, :13]
y = boston.target

print ("Boston dataset keys : \n", boston.keys())

print ("\nBoston data : \n", boston.data)

# scaling the inputs
scaler = StandardScaler()
scaled_X = scaler.fit_transform(X)

# Train Test split will be used for both models
X_train, X_test, y_train, y_test = train_test_split(scaled_X, y,
                                        test_size = 0.3)

# training model with 0.5 alpha value
model = Ridge(alpha = 0.5, normalize = False, tol = 0.001, \
            solver ='auto', random_state = 42)
model.fit(X_train, y_train)

# predicting the y_test
y_pred = model.predict(X_test)
# finding score for our model
score = model.score(X_test, y_test)
```

```
print("\n\nModel score : ", score)
```

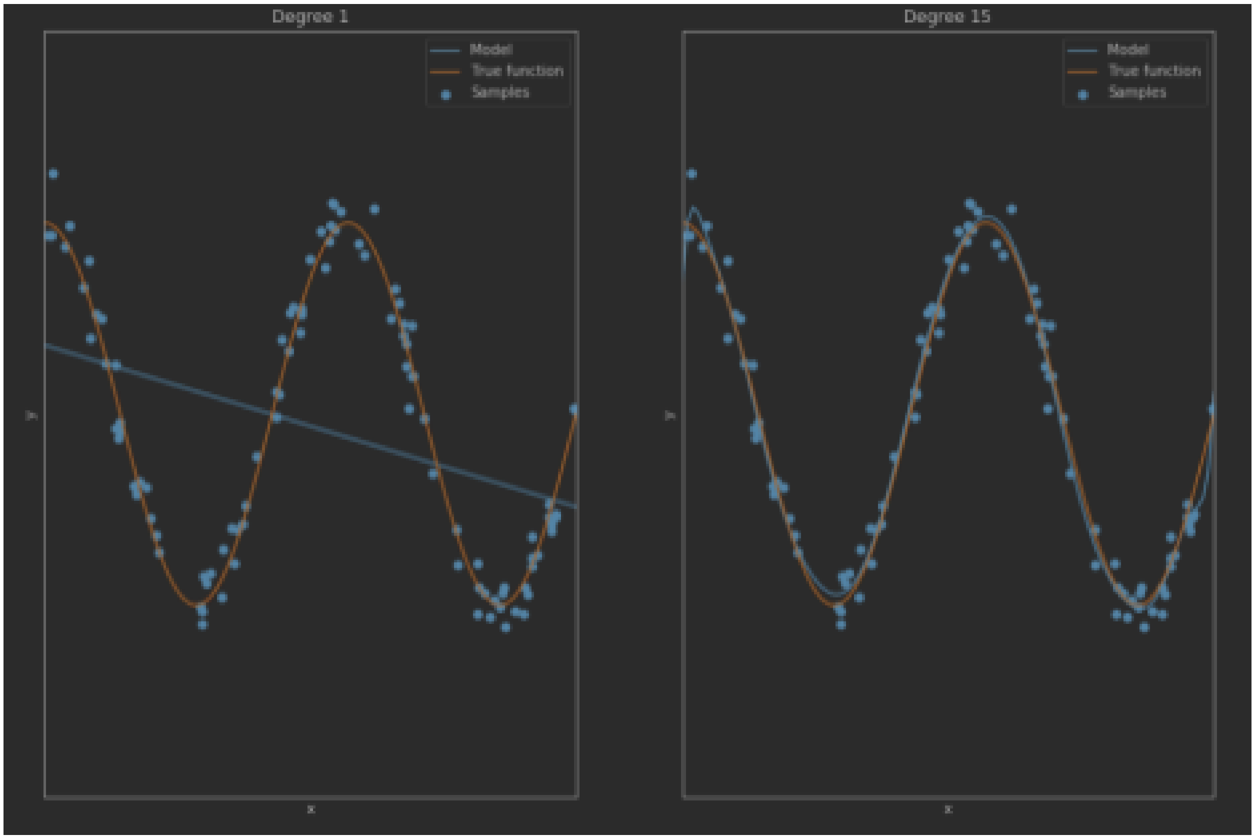
Output:

```
Boston dataset keys :
 dict_keys(['feature_names', 'DESCR', 'data', 'target'])

Boston data :
 [[6.3200e-03 1.8000e+01 2.3100e+00 ... 1.5300e+01 3.9690e+02 4.9800e+00]
 [2.7310e-02 0.0000e+00 7.0700e+00 ... 1.7800e+01 3.9690e+02 9.1400e+00]
 [2.7290e-02 0.0000e+00 7.0700e+00 ... 1.7800e+01 3.9283e+02 4.0300e+00]
 ...
 [6.0760e-02 0.0000e+00 1.1930e+01 ... 2.1000e+01 3.9690e+02 5.6400e+00]
[1.0959e-01 0.0000e+00 1.1930e+01 ... 2.1000e+01 3.9345e+02 6.4800e+00]
[4.7410e-02 0.0000e+00 1.1930e+01 ... 2.1000e+01 3.9690e+02 7.8800e+00]]
Model score : 0.6819292026260749
```

Overfitting and underfitting Problem:

```
Import numpy as np
Import matplotlib.pypplot as plt
 from sklearn.pipeline import Pipeline from sklearn.preprocessing import PolynomialFeatures
 from sklearn.linear_model import LinearRegression #this allows us to create a random dataset
X = np.sort(np.random.rand(100)) #Lets create a true function
true_f = lambda X: np.cos(3.5 * np.pi * X)
 y = true_f(X) + np.random.randn(100) * 0.1
 degrees = [1,15]
plt.figure(figsize=(15, 10))
 for i in range(len(degrees)):
  ax = plt.subplot(1, len(degrees), i+1)
plt.setp(ax, xticks=(), yticks=()) polynomial_features = PolynomialFeatures(degree=degrees[i],
include_bias=False) linear_regression = LinearRegression()
pipeline=Pipeline([("polynomial_features",polynomial_features),("linear_regression",
linear_regression)])
pipeline.fit(X[:, np.newaxis], y) #Testing
X_test = np.linspace(0, 1, 100)
hat = pipeline.predict(X_test[:, np.newaxis])
 plt.plot(X_test, hat,label="Model")
 plt.plot(X_test, true_f(X_test), label="True function") plt.scatter(X, y, label="Samples")
 plt.xlabel("x") plt.ylabel("y")
plt.xlim((0, 1))
 plt.ylim((-2, 2))
 plt.legend(loc="best")
plt.title("Degree %d" % degrees[i])
plt.show()
```

Output:



LAB - 09

Introduction to Visualization Tools

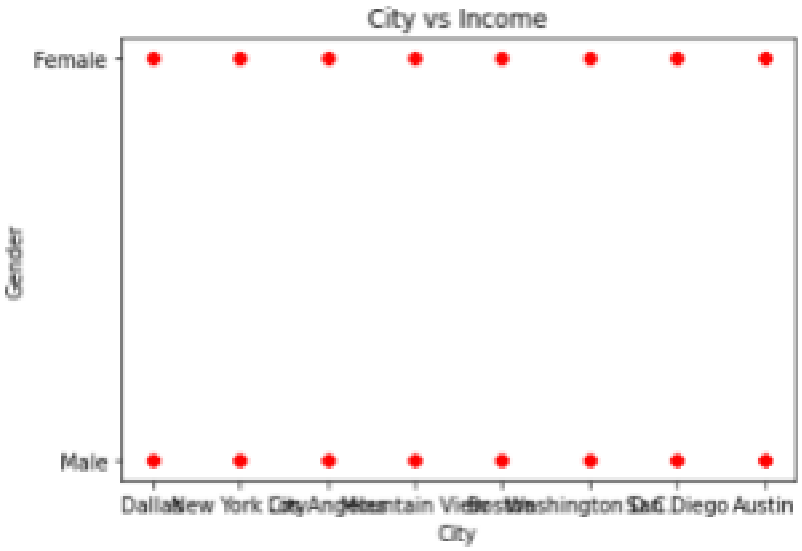
code:

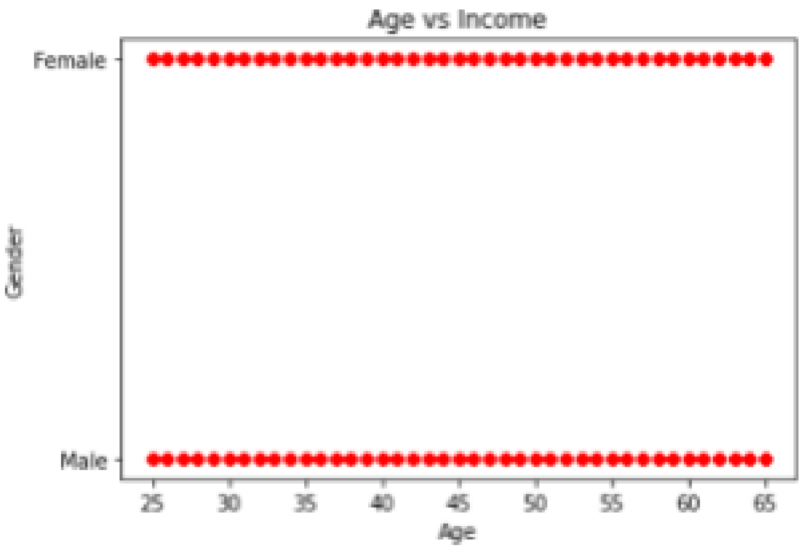
```
import pandas as pd
import matplotlib.pyplot as plt
data=pd.read_csv(r"C:\Users\YAMUNA370\Downloads\toy_dataset\toy_dataset.csv",index
_col=0) print(data)
#index
print(data.index)
#prints the first 20 Records
print(data.head(20))
#Prints the last 20 Records
print(data.tail(20))
#prints the dimension of dataframe
print(data.ndim)
x=(data[['City']])
print(x)
```

```
y=(data[['Income']])
print(y)
 data.plot(kind='scatter',x='City',y='Gender',color='red')
plt.title('City vs Income')
plt.show()

 data.plot(kind='scatter',x='Age',y='Gender',color='red')
plt.title('Age vs Income')
plt.show()
```

Output:

```
Number City Gender Age Income Illness

 149981 Austin Female 53 89384.0 Yes
 149982 Austin Male 50 77134.0 No
 149983 Austin Female 47 92157.0 No
 149984 Austin Female 25 92482.0 No
 149985 Austin Male 51 99075.0 No
 149986 Austin Female 25 74947.0 No
 149987 Austin Female 63 80381.0 No
 149988 Austin Female 55 62501.0 No
 149989 Austin Female 26 77823.0 No
 149990 Austin Male 52 83688.0 No 149991
 Austin Female 26 82163.0 No 149992
 Austin Male 51 97510.0 No 149993 Austin
 Male 37 88408.0 No 149994 Austin Male 64
 89906.0 No
 149995 Austin Female 37 106097.0 No
 149996 Austin Male 48 93669.0 No 149997
Austin Male 25 96748.0 No 149998 Austin
Male 26 111885.0 No 149999 Austin Male 25
111878.0 No 150000 Austin Female 37
87251.0 No 2
          City
Number
 1 Dallas
2 Dallas
 3 Dallas
4 Dallas
 5 Dallas
       ...
 149996 Austin
 149997 Austin
 149998 Austin
 149999 Austin
 150000 Austin

[150000 rows x 1 columns]
         Income
Number
 1 40367.0
2 45084.0
 3 52483.0
4 40941.0
 5 50289.0
         ...
 149996 93669.0
 149997 96748.0
 149998 111885.0
 149999 111878.0
 150000 87251.0
```





LAB - 10

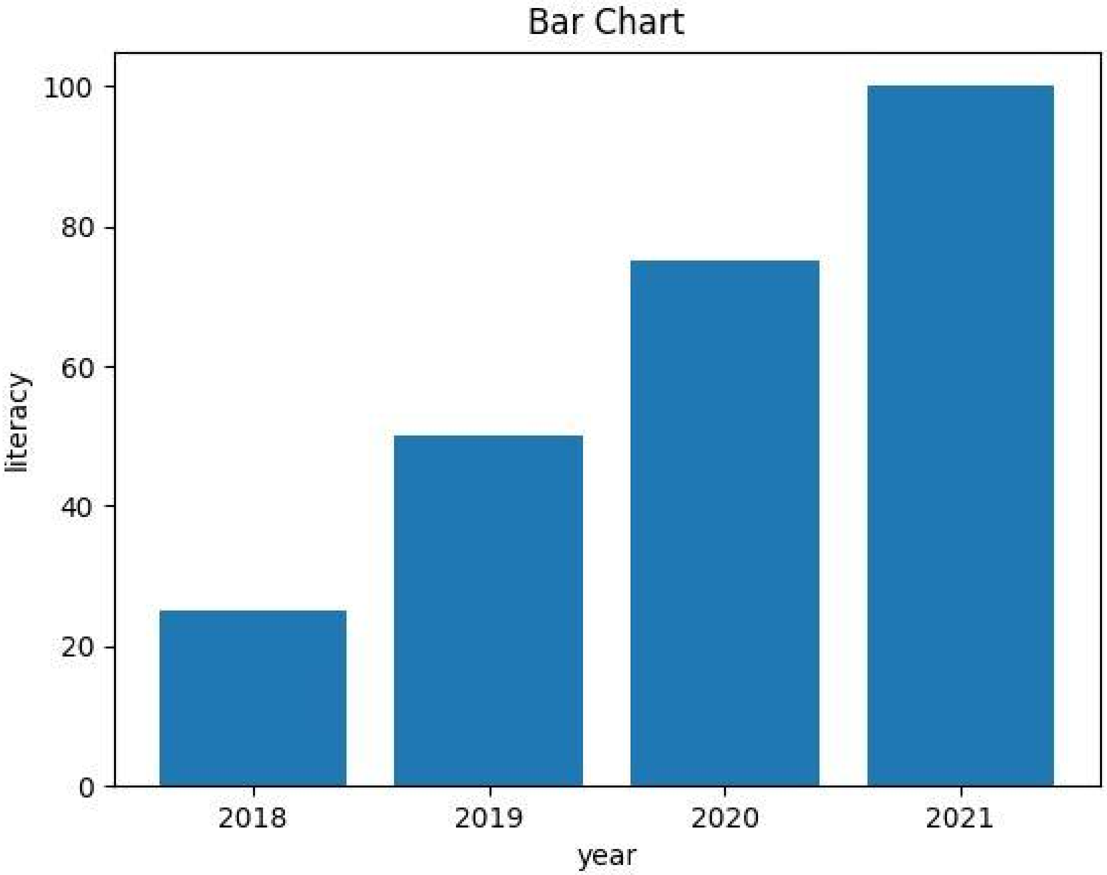
Basic Visualization Tools: Area plots,Histogram,Bar Charts

BAR PLOT:-

```
import matplotlib.pyplot as plt

# Sample data

year= ['2018', '2019', '2020', '2021']

literacy = [25, 50, 75, 100]

# Create a bar chart

plt.bar(year, literacy)

# Add labels and title

plt.xlabel('year')

plt.ylabel('literacy')

plt.title('Bar Chart')
```

```
# Display the chart

plt.show()
```

Output:-

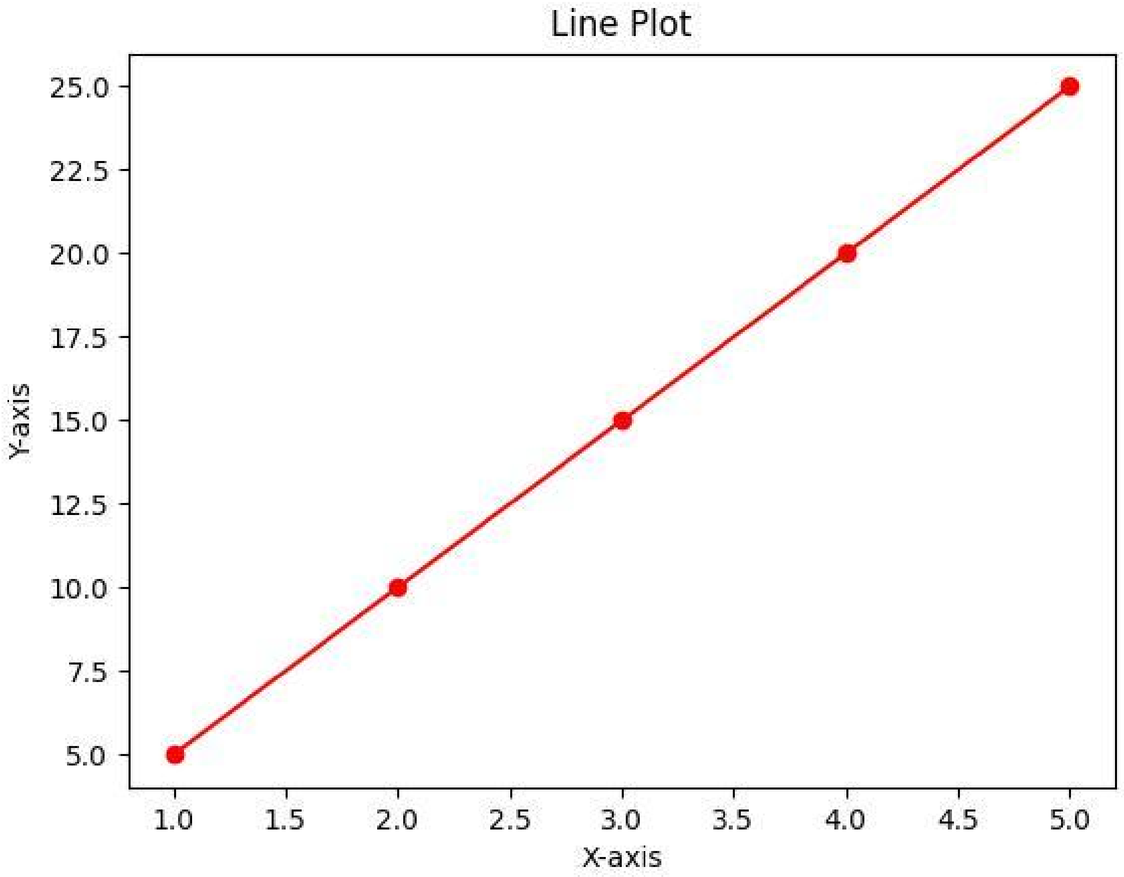


LINE PLOT:-

```
#lineplot

# Sample data

x = [1, 2, 3, 4, 5]

y = [5, 10, 15, 20, 25]
```

```
# Create a figure and axis

fig, ax = plt.subplots()

# Plot the data

ax.plot(x, y, marker='o', linestyle='-', color='r')

# Customize the plot

ax.set_xlabel('X-axis')

ax.set_ylabel('Y-axis')

ax.set_title('Line Plot')

# Display the plot

plt.show()
```

OUTPUT:-

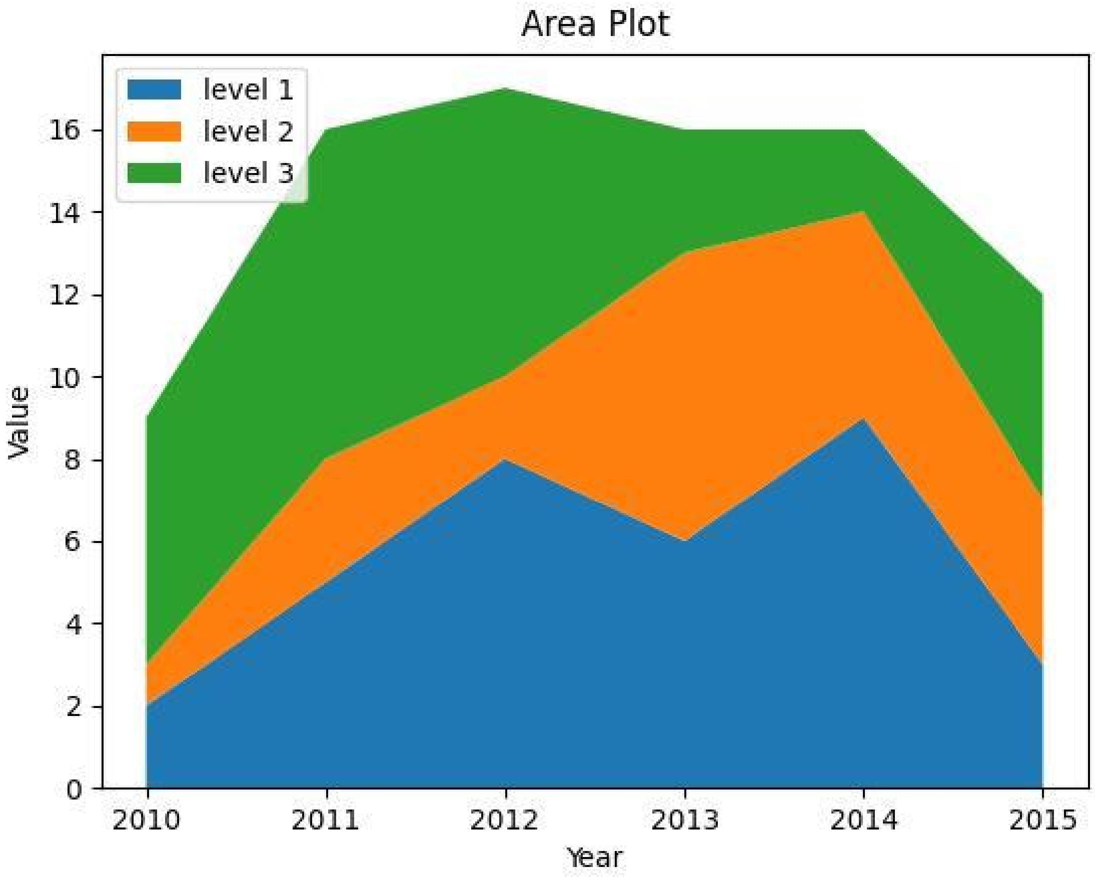


AREA PLOT:-

```
#area plot

# Sample data

years = [2010, 2011, 2012, 2013, 2014, 2015]

level1 = [2, 5, 8, 6, 9, 3]

level2 = [1, 3, 2, 7, 5, 4]

level3 = [6, 8, 7, 3, 2, 5]

# Plotting
```

```
plt.stackplot(years, level1, level2, level3, labels=['level 1', 'level 2', 'level 3'])

plt.legend(loc='upper left')

plt.xlabel('Year')

plt.ylabel('Value')

plt.title('Area Plot')

plt.show()
```

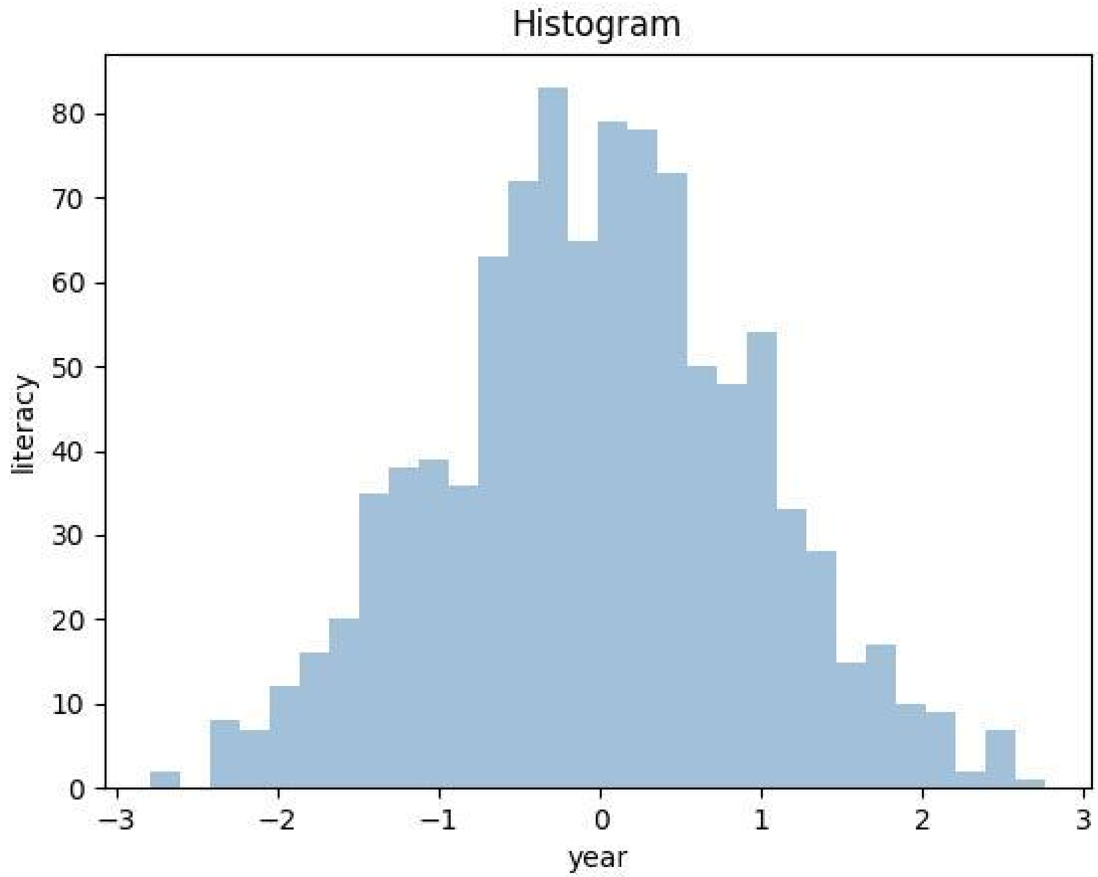
OUTPUT:-



HISTOGRAM:-

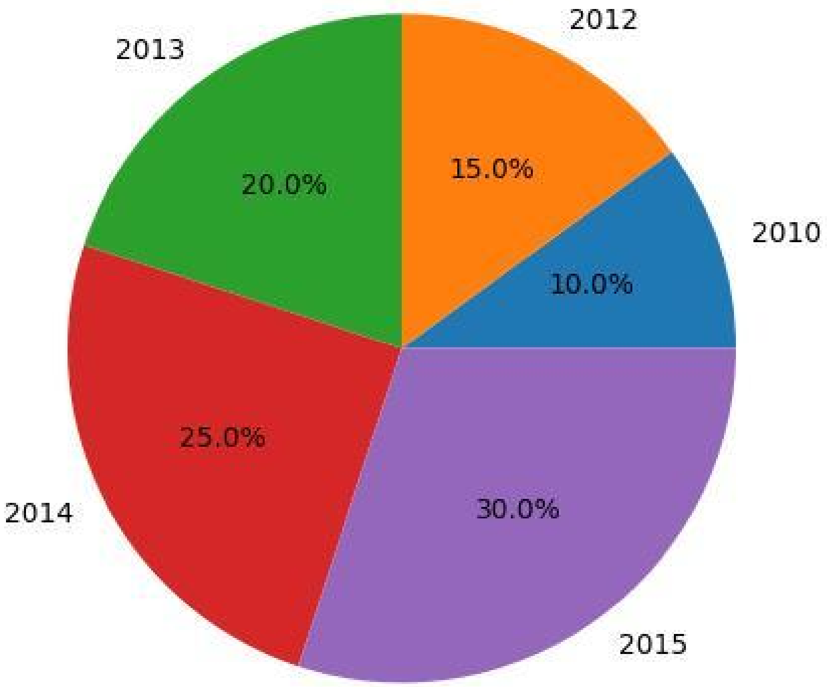
```
#histogram
import numpy as np
data = np.random.randn(1000)
plt.hist(data, bins=30, alpha=0.5, color='steelblue')
plt.xlabel('year')
plt.ylabel('literacy')
plt.title('Histogram')
plt.show()
#pie chart
x=[2010,2012,2013,2014,2015]
y=[20,30,40,50,60]
plt.pie(y,labels=x,autopct='%1.1f%%')
plt.axis("equal")
plt.show()
```

OUTPUT:-



```
#pie chart
x=[2010,2012,2013,2014,2015]
y=[20,30,40,50,60]
plt.pie(y,labels=x,autopct='%1.1f%%')
plt.axis("equal")
plt.show()
```

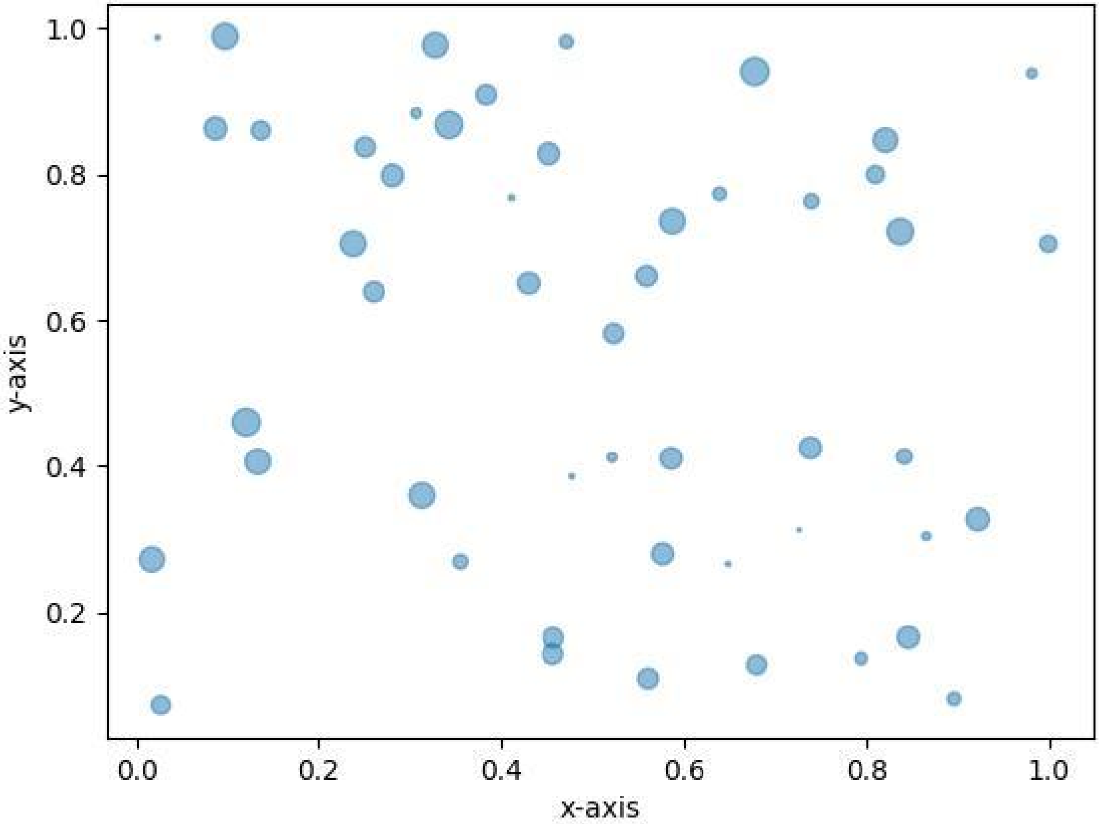
Output:-



Bubble plot:

```
#Bubble plot
x=np.random.rand(50)
y=np.random.rand(50)
sizes=np.random.rand(50)*100
plt.scatter(x,y,s=sizes,alpha=0.5,marker='o')
plt.xlabel("x-axis")
plt.ylabel("y-axis")
plt.show()
```

Output:



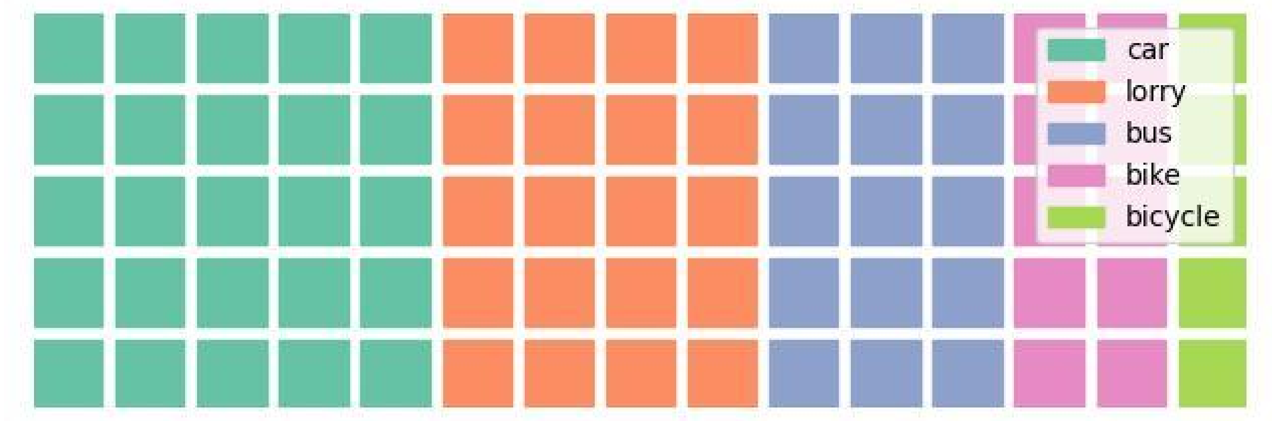
LAB -12

Advanced Visualization Tools: Waffle charts,Word Clouds Seaborn and Regression plots

Waffle charts:

```
import pandas as pd
import matplotlib.pyplot as plt
from pywaffle import Waffle
data={'vehicles':['car', 'lorry','bus','bike','bicycle'],
      'stock':[25,20,15,10,5]}
df=pd.DataFrame(data)
fig=plt.figure(FigureClass=Waffle,rows=5,values=df.stock,
              labels=list(df.vehicles))
plt.show()
```

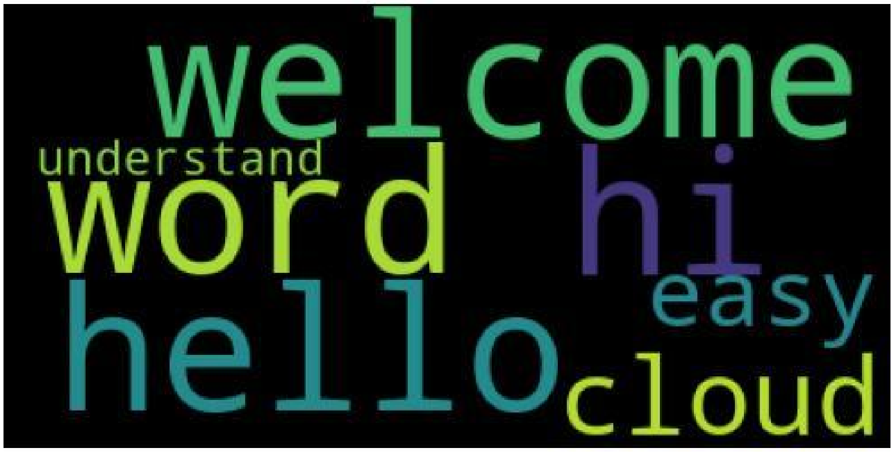
Output:-



Word clouds

```
#word cloud
from wordcloud import WordCloud
import matplotlib.pyplot as plt
text="hi hello welcome to word cloud it is very easy to understand"
wc=WordCloud().generate(text)
plt.imshow(wc)
plt.axis("off")
plt.show()
```

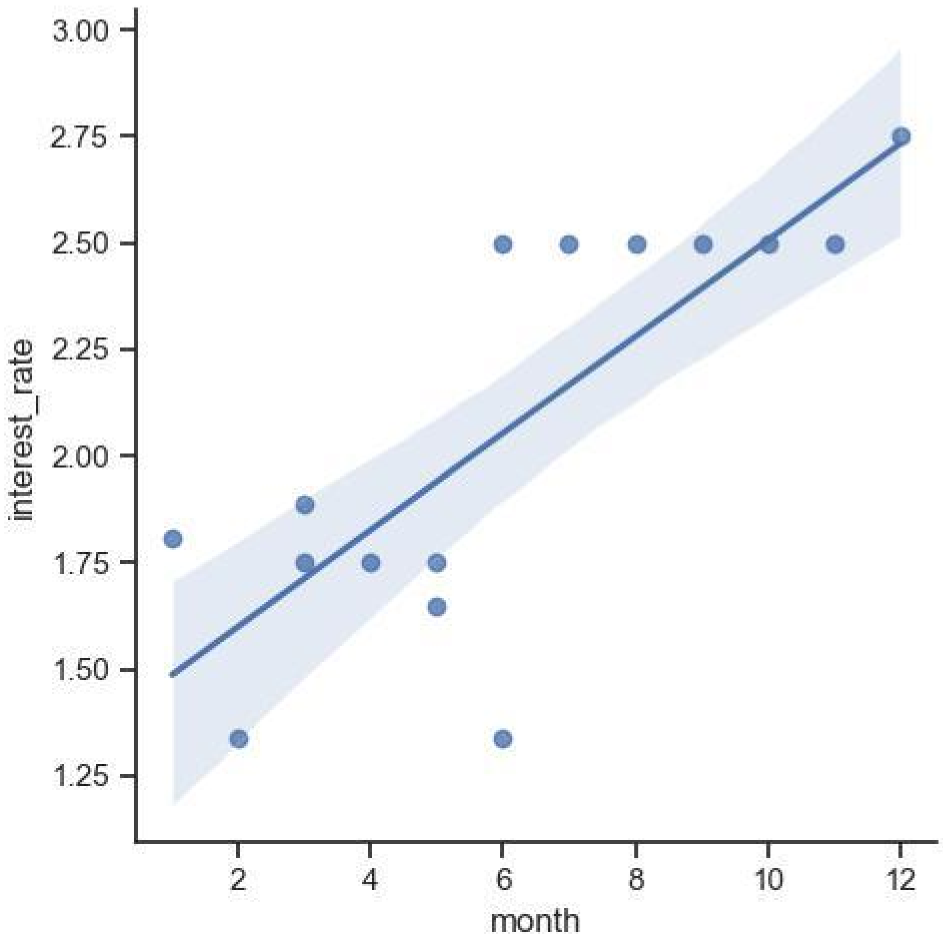
Output:



Seaborn :

```
import seaborn as sns
sns.set(style="ticks")
df=pd.read_csv("cham.csv")
print(df)
sns.lmplot(x="month",y="interest_rate",data=df)
plt.show()
```

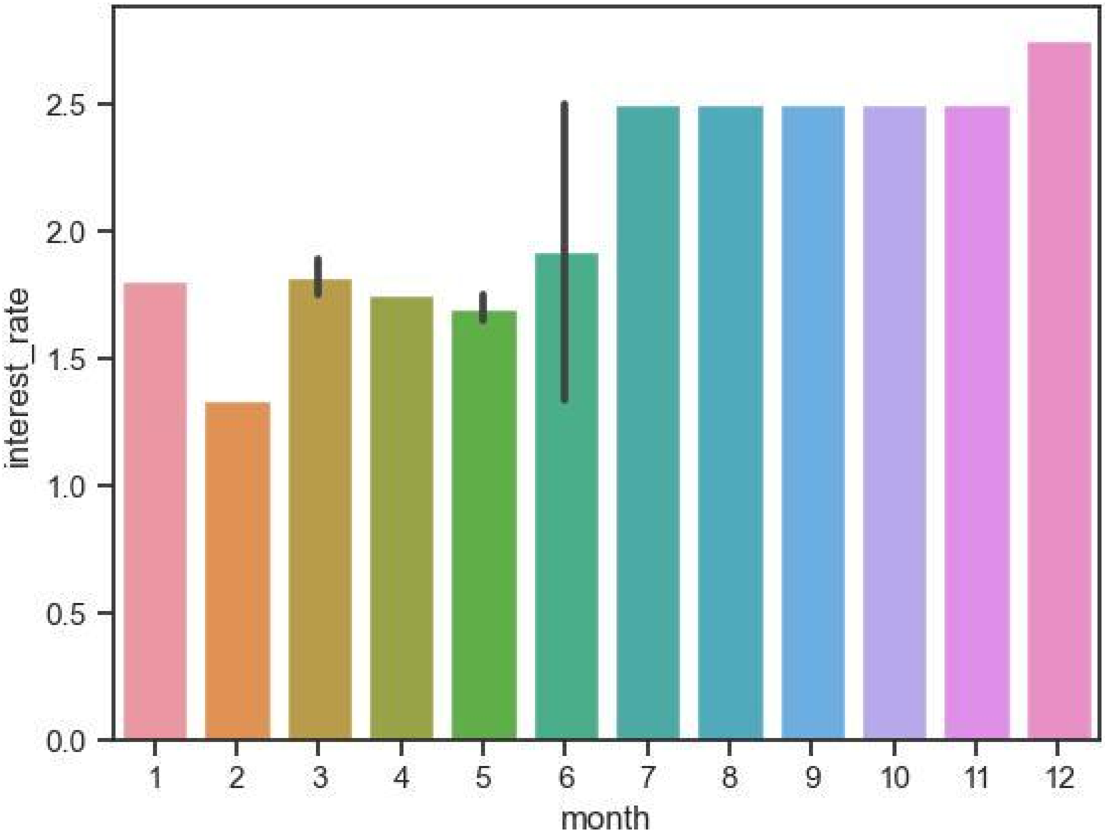
Output:



Barplot:

```
import seaborn as sns
df=pd.read_csv("cham.csv")
sns.barplot(x="month",y="interest_rate",data=df)
plt.show()
```

Output:-


interest_rate
0.0
0.5
1.0
1.5
2.0
2.5
1
2
3
4
5
6
7
8
9
10
11
12
month