In [1]:
```
# Import the required library
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:
```
#Import the dataset
data=pd.read_csv('Social_Network_Ads.csv')
```

In [4]:
```
data.head(5)
```

Out[4]:

| | User ID | Gender | Age | EstimatedSalary | Purchased |
|---|---|---|---|---|---|
| **0** | 15624510 | Male | 19 | 19000 | 0 |
| **1** | 15810944 | Male | 35 | 20000 | 0 |
| **2** | 15668575 | Female | 26 | 43000 | 0 |
| **3** | 15603246 | Female | 27 | 57000 | 0 |
| **4** | 15804002 | Male | 19 | 76000 | 0 |

In [5]:
```
data.isnull()
```

Out[5]:

| | User ID | Gender | Age | EstimatedSalary | Purchased |
|---|---|---|---|---|---|
| **0** | False | False | False | False | False |
| **1** | False | False | False | False | False |
| **2** | False | False | False | False | False |
| **3** | False | False | False | False | False |
| **4** | False | False | False | False | False |
| **...** | ... | ... | ... | ... | ... |
| **395** | False | False | False | False | False |
| **396** | False | False | False | False | False |
| **397** | False | False | False | False | False |
| **398** | False | False | False | False | False |
| **399** | False | False | False | False | False |

400 rows × 5 columns

In [6]:
```
data.shape
```

Out[6]:
```
(400, 5)
```

In [7]:
```
data.describe()
```

Out[7]:

| | User ID | Age | EstimatedSalary | Purchased |
|---|---|---|---|---|
| **count** | 4.000000e+02 | 400.000000 | 400.000000 | 400.000000 |
| **mean** | 1.569154e+07 | 37.655000 | 69742.500000 | 0.357500 |
| **std** | 7.165832e+04 | 10.482877 | 34096.960282 | 0.479864 |
| **min** | 1.556669e+07 | 18.000000 | 15000.000000 | 0.000000 |
| **25%** | 1.562676e+07 | 29.750000 | 43000.000000 | 0.000000 |
| **50%** | 1.569434e+07 | 37.000000 | 70000.000000 | 0.000000 |
| **75%** | 1.575036e+07 | 46.000000 | 88000.000000 | 1.000000 |
| **max** | 1.581524e+07 | 60.000000 | 150000.000000 | 1.000000 |

In [11]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 400 entries, 0 to 399
Data columns (total 5 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   User ID          400 non-null    int64
 1   Gender           400 non-null    object
 2   Age              400 non-null    int64
 3   EstimatedSalary  400 non-null    int64
 4   Purchased        400 non-null    int64
dtypes: int64(4), object(1)
memory usage: 15.8+ KB
```

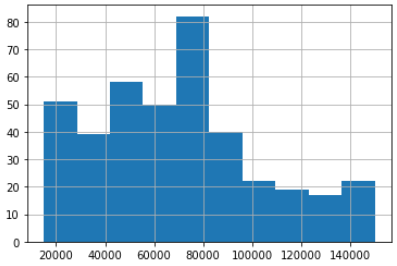
In [15]:
```
data['Purchased'].value_counts()
```

Out[15]:
```
0    257
1    143
Name: Purchased, dtype: int64
```

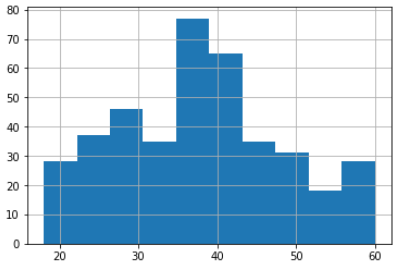
In [16]:
```
data['Gender'].value_counts()
```

Out[16]:
```
Female    204
Male      196
Name: Gender, dtype: int64
```

In [19]:
```
# distribution
data['EstimatedSalary'].hist()
plt.show()
```




In [21]:
```
data['Age'].hist()
plt.show()
```




In [22]:
```
# Extract Independent var & dep var i.e. age & salary
X=data.iloc[:,2:4].values
```

In [23]:
```
X
```

Out[23]:
```
array([[    19,  19000],
       [    35,  20000],
       [    26,  43000],
       [    27,  57000],
       [    19,  76000],
       [    27,  58000],
       [    27,  84000],
       [    32, 150000],
       [    25,  33000],
       [    35,  65000],
       [    26,  80000],
       [    26,  52000],
       [    20,  86000],
       [    32,  18000],
       [    18,  82000],
       [    29,  80000],
       [    47,  25000],
       [    45,  26000],
       [    46,  28000],
       [    48,  29000],
       [    45,  22000],
       [    47,  49000],
       [    48,  41000],
       [    45,  22000],
       [    46,  23000],
       [    47,  20000],
       [    49,  28000],
       [    47,  30000],
       [    29,  43000],
       [    31,  18000],
       [    31,  74000],
       [    27, 137000],
       [    21,  16000],
       [    28,  44000],
       [    27,  90000],
       [    35,  27000],
       [    33,  28000],
       [    30,  49000],
       [    26,  72000],
       [    27,  31000],
       [    27,  17000],
       [    33,  51000],
       [    35, 108000],
       [    30,  15000],
       [    28,  84000],
       [    23,  20000],
       [    25,  79000],
       [    27,  54000],
       [    30, 135000],
       [    31,  89000],
       [    24,  32000],
       [    18,  44000],
       [    29,  83000],
       [    35,  23000],
       [    27,  58000],
       [    24,  55000],
       [    23,  48000],
       [    28,  79000],
       [    22,  18000],
       [    32, 117000],
       [    27,  20000],
       [    25,  87000],
       [    23,  66000],
       [    32, 120000],
       [    59,  83000],
       [    24,  58000],
       [    24,  19000],
```

```
[    23,  82000],
[    22,  63000],
[    31,  68000],
[    25,  80000],
[    24,  27000],
[    20,  23000],
[    33, 113000],
[    32,  18000],
[    34, 112000],
[    18,  52000],
[    22,  27000],
[    28,  87000],
[    26,  17000],
[    30,  80000],
[    39,  42000],
[    20,  49000],
[    35,  88000],
[    30,  62000],
[    31, 118000],
[    24,  55000],
[    28,  85000],
[    26,  81000],
[    35,  50000],
[    22,  81000],
[    30, 116000],
[    26,  15000],
[    29,  28000],
[    29,  83000],
[    35,  44000],
[    35,  25000],
[    28, 123000],
[    35,  73000],
[    28,  37000],
[    27,  88000],
[    28,  59000],
[    32,  86000],
[    33, 149000],
[    19,  21000],
[    21,  72000],
[    26,  35000],
[    27,  89000],
[    26,  86000],
[    38,  80000],
[    39,  71000],
[    37,  71000],
[    38,  61000],
[    37,  55000],
[    42,  80000],
[    40,  57000],
[    35,  75000],
[    36,  52000],
[    40,  59000],
[    41,  59000],
[    36,  75000],
[    37,  72000],
[    40,  75000],
[    35,  53000],
[    41,  51000],
[    39,  61000],
[    42,  65000],
[    26,  32000],
[    30,  17000],
[    26,  84000],
[    31,  58000],
[    33,  31000],
[    30,  87000],
[    21,  68000],
[    28,  55000],
[    23,  63000],
[    20,  82000],
[    30, 107000],
[    28,  59000],
[    19,  25000],
[    19,  85000],
[    18,  68000],
[    35,  59000],
[    30,  89000],
[    34,  25000],
[    24,  89000],
[    27,  96000],
[    41,  30000],
[    29,  61000],
[    20,  74000],
[    26,  15000],
[    41,  45000],
[    31,  76000],
[    36,  50000],
[    40,  47000],
[    31,  15000],
[    46,  59000],
[    29,  75000],
[    26,  30000],
[    32, 135000],
[    32, 100000],
[    25,  90000],
[    37,  33000],
[    35,  38000],
[    33,  69000],
[    18,  86000],
[    22,  55000],
[    35,  71000],
[    29, 148000],
[    29,  47000],
[    21,  88000],
[    34, 115000],
[    26, 118000],
[    34,  43000],
[    34,  72000],
[    23,  28000],
[    35,  47000],
[    25,  22000],
```

```
[    24,  23000],
[    31,  34000],
[    26,  16000],
[    31,  71000],
[    32, 117000],
[    33,  43000],
[    33,  60000],
[    31,  66000],
[    20,  82000],
[    33,  41000],
[    35,  72000],
[    28,  32000],
[    24,  84000],
[    19,  26000],
[    29,  43000],
[    19,  70000],
[    28,  89000],
[    34,  43000],
[    30,  79000],
[    20,  36000],
[    26,  80000],
[    35,  22000],
[    35,  39000],
[    49,  74000],
[    39, 134000],
[    41,  71000],
[    58, 101000],
[    47,  47000],
[    55, 130000],
[    52, 114000],
[    40, 142000],
[    46,  22000],
[    48,  96000],
[    52, 150000],
[    59,  42000],
[    35,  58000],
[    47,  43000],
[    60, 108000],
[    49,  65000],
[    40,  78000],
[    46,  96000],
[    59, 143000],
[    41,  80000],
[    35,  91000],
[    37, 144000],
[    60, 102000],
[    35,  60000],
[    37,  53000],
[    36, 126000],
[    56, 133000],
[    40,  72000],
[    42,  80000],
[    35, 147000],
[    39,  42000],
[    40, 107000],
[    49,  86000],
[    38, 112000],
[    46,  79000],
[    40,  57000],
[    37,  80000],
[    46,  82000],
[    53, 143000],
[    42, 149000],
[    38,  59000],
[    50,  88000],
[    56, 104000],
[    41,  72000],
[    51, 146000],
[    35,  50000],
[    57, 122000],
[    41,  52000],
[    35,  97000],
[    44,  39000],
[    37,  52000],
[    48, 134000],
[    37, 146000],
[    50,  44000],
[    52,  90000],
[    41,  72000],
[    40,  57000],
[    58,  95000],
[    45, 131000],
[    35,  77000],
[    36, 144000],
[    55, 125000],
[    35,  72000],
[    48,  90000],
[    42, 108000],
[    40,  75000],
[    37,  74000],
[    47, 144000],
[    40,  61000],
[    43, 133000],
[    59,  76000],
[    60,  42000],
[    39, 106000],
[    57,  26000],
[    57,  74000],
[    38,  71000],
[    49,  88000],
[    52,  38000],
[    50,  36000],
[    59,  88000],
[    35,  61000],
[    37,  70000],
[    52,  21000],
[    48, 141000],
[    37,  93000],
[    37,  62000],
[    48, 138000],
[    41,  79000],
```

```
[    37,  78000],
[    39, 134000],
[    49,  89000],
[    55,  39000],
[    37,  77000],
[    35,  57000],
[    36,  63000],
[    42,  73000],
[    43, 112000],
[    45,  79000],
[    46, 117000],
[    58,  38000],
[    48,  74000],
[    37, 137000],
[    37,  79000],
[    40,  60000],
[    42,  54000],
[    51, 134000],
[    47, 113000],
[    36, 125000],
[    38,  50000],
[    42,  70000],
[    39,  96000],
[    38,  50000],
[    49, 141000],
[    39,  79000],
[    39,  75000],
[    54, 104000],
[    35,  55000],
[    45,  32000],
[    36,  60000],
[    52, 138000],
[    53,  82000],
[    41,  52000],
[    48,  30000],
[    48, 131000],
[    41,  60000],
[    41,  72000],
[    42,  75000],
[    36, 118000],
[    47, 107000],
[    38,  51000],
[    48, 119000],
[    42,  65000],
[    40,  65000],
[    57,  60000],
[    36,  54000],
[    58, 144000],
[    35,  79000],
[    38,  55000],
[    39, 122000],
[    53, 104000],
[    35,  75000],
[    38,  65000],
[    47,  51000],
[    47, 105000],
[    41,  63000],
[    53,  72000],
[    54, 108000],
[    39,  77000],
[    38,  61000],
[    38, 113000],
[    37,  75000],
[    42,  90000],
[    37,  57000],
[    36,  99000],
[    60,  34000],
[    54,  70000],
[    41,  72000],
[    40,  71000],
[    42,  54000],
[    43, 129000],
[    53,  34000],
[    47,  50000],
[    42,  79000],
[    42, 104000],
[    59,  29000],
[    58,  47000],
[    46,  88000],
[    38,  71000],
[    54,  26000],
[    60,  46000],
[    60,  83000],
[    39,  73000],
[    59, 130000],
[    37,  80000],
[    46,  32000],
[    46,  74000],
[    42,  53000],
[    41,  87000],
[    58,  23000],
[    42,  64000],
[    48,  33000],
[    44, 139000],
[    49,  28000],
[    57,  33000],
[    56,  60000],
[    49,  39000],
[    39,  71000],
[    47,  34000],
[    48,  35000],
[    48,  33000],
[    47,  23000],
[    45,  45000],
[    60,  42000],
[    39,  59000],
[    46,  41000],
[    51,  23000],
[    50,  20000],
[    36,  33000],
[    49,  36000]], dtype=int64)
```

In [24]:
```
# Extract Independent var & dep var
y=data.iloc[:,4].values
y
```

Out[24]:
```
array([0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 1, 0, 1, 0, 1, 0, 1, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 1,
       0, 1, 1, 1, 0, 0, 1, 1, 0, 1, 1, 0, 1, 1, 0, 1, 0, 0, 0, 1, 1, 0,
       1, 1, 0, 1, 0, 1, 0, 1, 0, 0, 1, 1, 0, 1, 0, 0, 1, 1, 0, 1, 1, 0,
       1, 1, 0, 0, 1, 0, 0, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 0, 1, 1, 0, 1,
       0, 1, 0, 1, 1, 1, 1, 0, 0, 0, 1, 1, 0, 1, 1, 1, 1, 1, 0, 0, 0, 1,
       1, 0, 0, 1, 0, 1, 0, 1, 1, 0, 1, 0, 1, 1, 0, 1, 1, 0, 0, 0, 1, 1,
       0, 1, 0, 0, 1, 0, 1, 0, 0, 1, 1, 0, 0, 1, 1, 0, 1, 1, 0, 0, 1, 0,
       1, 0, 1, 1, 1, 0, 1, 0, 1, 1, 1, 0, 1, 1, 1, 1, 0, 1, 1, 0, 1, 1,
       0, 1, 0, 0, 1, 1, 0, 1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 1, 0, 1,
       1, 1, 0, 1], dtype=int64)
```

In [25]:
```
# Split the data into train set & test set X & Y -4
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.25,random_state=0)
```

In [26]:
```
# Scaling- Standard Scaling z=X-Xmean/std
from sklearn.preprocessing import StandardScaler
sc=StandardScaler()
X_train=sc.fit_transform(X_train)
X_test=sc.transform(X_test)
```

In [27]:
```
X_train
```

Out[27]:
```
array([[ 0.58164944, -0.88670699],
       [-0.60673761,  1.46173768],
       [-0.01254409, -0.5677824 ],
       [-0.60673761,  1.89663484],
       [ 1.37390747, -1.40858358],
       [ 1.47293972,  0.99784738],
       [ 0.08648817, -0.79972756],
       [-0.01254409, -0.24885782],
       [-0.21060859, -0.5677824 ],
       [-0.21060859, -0.19087153],
       [-0.30964085, -1.29261101],
       [-0.30964085, -0.5677824 ],
       [ 0.38358493,  0.09905991],
       [ 0.8787462 , -0.59677555],
       [ 2.06713324, -1.17663843],
       [ 1.07681071, -0.13288524],
       [ 0.68068169,  1.78066227],
       [-0.70576986,  0.56295021],
       [ 0.77971394,  0.35999821],
       [ 0.8787462 , -0.53878926],
       [-1.20093113, -1.58254245],
       [ 2.1661655 ,  0.93986109],
       [-0.01254409,  1.22979253],
       [ 0.18552042,  1.08482681],
       [ 0.38358493, -0.48080297],
       [-0.30964085, -0.30684411],
       [ 0.97777845, -0.8287207 ],
       [ 0.97777845,  1.8676417 ],
       [-0.01254409,  1.25878567],
       [-0.90383437,  2.27354572],
       [-1.20093113, -1.58254245],
       [ 2.1661655 , -0.79972756],
       [-1.39899564, -1.46656987],
       [ 0.38358493,  2.30253886],
       [ 0.77971394,  0.76590222],
       [-1.00286662, -0.30684411],
       [ 0.08648817,  0.76590222],
       [-1.00286662,  0.56295021],
       [ 0.28455268,  0.07006676],
       [ 0.68068169, -1.26361786],
       [-0.50770535, -0.01691267],
       [-1.79512465,  0.35999821],
       [-0.70576986,  0.12805305],
       [ 0.38358493,  0.30201192],
       [-0.30964085,  0.07006676],
       [-0.50770535,  2.30253886],
       [ 0.18552042,  0.04107362],
       [ 1.27487521,  2.21555943],
       [ 0.77971394,  0.27301877],
       [-0.30964085,  0.1570462 ],
       [-0.01254409, -0.53878926],
       [-0.21060859,  0.1570462 ],
       [-0.11157634,  0.24402563],
       [-0.01254409, -0.24885782],
       [ 2.1661655 ,  1.11381995],
       [-1.79512465,  0.35999821],
       [ 1.86906873,  0.12805305],
       [ 0.38358493, -0.13288524],
       [-1.20093113,  0.30201192],
       [ 0.77971394,  1.37475825],
       [-0.30964085, -0.24885782],
       [-1.6960924 , -0.04590581],
       [-1.00286662, -0.74174127],
       [ 0.28455268,  0.50496393],
       [-0.11157634, -1.06066585],
       [-1.10189888,  0.59194336],
       [ 0.08648817, -0.79972756],
       [-1.00286662,  1.54871711],
       [-0.70576986,  1.40375139],
       [-1.00996338,  0.50496393],
```

```
[-0.30964085,  0.04107362],
[-0.11157634,  0.01208048],
[-0.30964085, -0.88670699],
[ 0.8787462 , -1.3505973 ],
[-0.30964085,  2.24455257],
[ 0.97777845,  1.98361427],
[-1.20093113,  0.47597078],
[-1.29996338,  0.27301877],
[ 1.37390747,  1.98361427],
[ 1.27487521, -1.3505973 ],
[-0.30964085, -0.27785096],
[-0.50770535,  1.25878567],
[-0.80480212,  1.08482681],
[ 0.97777845, -1.06066585],
[ 0.28455268,  0.30201192],
[ 0.97777845,  0.76590222],
[-0.70576986, -1.49556302],
[-0.70576986,  0.04107362],
[ 0.48261718,  1.72267598],
[ 2.06713324,  0.18603934],
[-1.99318916, -0.74174127],
[-0.21060859,  1.40375139],
[ 0.38358493,  0.59194336],
[ 0.8787462 , -1.14764529],
[-1.20093113, -0.77073441],
[ 0.18552042,  0.24402563],
[ 0.77971394, -0.30684411],
[ 2.06713324, -0.79972756],
[ 0.77971394,  0.12805305],
[-0.30964085,  0.6209365 ],
[-1.00286662, -0.30684411],
[ 0.18552042, -0.3648304 ],
[ 2.06713324,  2.12857999],
[ 1.86906873, -1.26361786],
[ 1.37390747, -0.91570013],
[ 0.8787462 ,  1.25878567],
[ 1.47293972,  2.12857999],
[-0.30964085, -1.23462472],
[ 1.96810099,  0.91086794],
[ 0.68068169, -0.71274813],
[-1.49802789,  0.35999821],
[ 0.77971394, -1.3505973 ],
[ 0.38358493, -0.13288524],
[-1.00286662,  0.41798449],
[-0.01254409, -0.30684411],
[-1.20093113,  0.41798449],
[-0.90383437, -1.20563157],
[-0.11157634,  0.04107362],
[-1.59706014, -0.42281668],
[ 0.97777845, -1.00267957],
[ 1.07681071, -1.20563157],
[-0.01254409, -0.13288524],
[-1.10189888, -1.52455616],
[ 0.77971394, -1.20563157],
[ 0.97777845,  2.07059371],
[-1.20093113, -1.52455616],
[-0.30964085,  0.79489537],
[ 0.08648817, -0.30684411],
[-1.39899564, -1.23462472],
[-0.60673761, -1.49556302],
[ 0.77971394,  0.53395707],
[-0.30964085, -0.33583725],
[ 1.77003648, -0.27785096],
[ 0.8787462 , -1.03167271],
[ 0.18552042,  0.07006676],
[-0.60673761,  0.8818748 ],
[-1.89415691, -1.40858358],
[-1.29996338,  0.59194336],
[-0.30964085,  0.53395707],
[-1.00286662, -1.089659  ],
[ 1.17584296, -1.43757673],
[ 0.18552042, -0.30684411],
[ 1.17584296, -0.74174127],
[-0.30964085,  0.07006676],
[ 0.18552042,  2.09958685],
[ 0.77971394, -1.089659  ],
[ 0.08648817,  0.04107362],
[-1.79512465,  0.12805305],
[-0.90383437,  0.1570462 ],
[-0.70576986,  0.18603934],
[ 0.8787462 , -1.29261101],
[ 0.18552042, -0.24885782],
[-0.4086731 ,  1.22979253],
[-0.01254409,  0.30201192],
[ 0.38358493,  0.1570462 ],
[ 0.8787462 , -0.65476184],
[ 0.08648817,  0.1570462 ],
[-1.89415691, -1.29261101],
[-0.11157634,  0.30201192],
[-0.21060859, -0.27785096],
[ 0.28455268, -0.50979612],
[-0.21060859,  1.6067034 ],
[ 0.97777845, -1.17663843],
[-0.21060859,  1.63569655],
[ 1.27487521,  1.8676417 ],
[-1.10189888, -0.3648304 ],
[-0.01254409,  0.04107362],
[ 0.08648817, -0.24885782],
[-1.59706014, -1.23462472],
[-0.50770535, -0.27785096],
[ 0.97777845,  0.12805305],
[ 1.96810099, -1.3505973 ],
[ 1.47293972,  0.07006676],
[-0.60673761,  1.37475825],
[ 1.57197197,  0.01208048],
[-0.80480212,  0.30201192],
[ 1.96810099,  0.73690908],
[-1.20093113, -0.50979612],
[ 0.68068169,  0.27301877],
[-1.39899564, -0.42281668],
[ 0.18552042,  0.1570462 ],
```

```
[-0.50770535, -1.20563157],
[ 0.58164944,  2.01260742],
[-1.59706014, -1.49556302],
[-0.50770535, -0.53878926],
[ 0.48261718,  1.83864855],
[-1.39899564, -1.089659  ],
[ 0.77971394, -1.37959044],
[-0.30964085, -0.42281668],
[ 1.57197197,  0.99784738],
[ 0.97777845,  1.43274454],
[-0.30964085, -0.48080297],
[-0.11157634,  2.15757314],
[-1.49802789, -0.1038921 ],
[-0.11157634,  1.95462113],
[-0.70576986, -0.33583725],
[-0.50770535, -0.8287207 ],
[ 0.68068169, -1.37959044],
[-0.80480212, -1.58254245],
[-1.89415691, -1.46656987],
[ 1.07681071,  0.12805305],
[ 0.08648817,  1.51972397],
[-0.30964085,  0.09905991],
[ 0.08648817,  0.04107362],
[-1.39899564, -1.3505973 ],
[ 0.28455268,  0.07006676],
[-0.90383437,  0.38899135],
[ 1.57197197, -1.26361786],
[-0.30964085, -0.74174127],
[-0.11157634,  0.1570462 ],
[-0.90383437, -0.65476184],
[-0.70576986, -0.04590581],
[ 0.38358493, -0.45180983],
[-0.80480212,  1.89663484],
[ 1.37390747,  1.28777882],
[ 1.17584296, -0.97368642],
[ 1.77003648,  1.83864855],
[-0.90383437, -0.24885782],
[-0.80480212,  0.56295021],
[-1.20093113, -1.5535493 ],
[-0.50770535, -1.11865214],
[ 0.28455268,  0.07006676],
[-0.21060859, -1.06066585],
[ 1.67100423,  1.6067034 ],
[ 0.97777845,  1.78066227],
[ 0.28455268,  0.04107362],
[-0.80480212, -0.21986468],
[-0.11157634,  0.07006676],
[ 0.28455268, -0.19087153],
[ 1.96810099, -0.65476184],
[-0.80480212,  1.3457651 ],
[-1.79512465, -0.59677555],
[-0.11157634,  0.12805305],
[ 0.28455268, -0.30684411],
[ 1.07681071,  0.56295021],
[-1.00286662,  0.27301877],
[ 1.47293972,  0.35999821],
[ 0.18552042, -0.3648304 ],
[ 2.1661655 , -1.03167271],
[-0.30964085,  1.11381995],
[-1.6960924 ,  0.07006676],
[-0.01254409,  0.04107362],
[ 0.08648817,  1.05583366],
[-0.11157634, -0.3648304 ],
[-1.20093113,  0.07006676],
[-0.30964085, -1.3505973 ],
[ 1.57197197,  1.11381995],
[-0.80480212, -1.52455616],
[ 0.08648817,  1.8676417 ],
[-0.90383437, -0.77073441],
[-0.50770535, -0.77073441],
[-0.30964085, -0.91570013],
[ 0.28455268, -0.71274813],
[ 0.28455268,  0.07006676],
[ 0.08648817,  1.8676417 ],
[-1.10189888,  1.95462113],
[-1.6960924 , -1.5535493 ],
[-1.20093113, -1.089659  ],
[-0.70576986, -0.1038921 ],
[ 0.08648817,  0.09905991],
[ 0.28455268,  0.27301877],
[ 0.8787462 , -0.5677824 ],
[ 0.28455268, -1.14764529],
[-0.11157634,  0.67892279],
[ 2.1661655 , -0.68375498],
[-1.29996338, -1.37959044],
[-1.00286662, -0.94469328],
[-0.01254409, -0.42281668],
[-0.21060859, -0.45180983],
[-1.79512465, -0.97368642],
[ 1.77003648,  0.99784738],
[ 0.18552042, -0.3648304 ],
[ 0.38358493,  1.11381995],
[-1.79512465, -1.3505973 ],
[ 0.18552042, -0.13288524],
[ 0.8787462 , -1.43757673],
[-1.99318916,  0.47597078],
[-0.30964085,  0.27301877],
[ 1.86906873, -1.06066585],
[-0.4086731 ,  0.07006676],
[ 1.07681071, -0.88670699],
[-1.10189888, -1.11865214],
[-1.89415691,  0.01208048],
[ 0.08648817,  0.27301877],
[-1.20093113,  0.33100506],
[-1.29996338,  0.30201192],
[-1.00286662,  0.44697764],
[ 1.67100423, -0.88670699],
[ 1.17584296,  0.53395707],
[ 1.07681071,  0.53395707],
[ 1.37390747,  2.331532  ],
[-0.30964085, -0.13288524],
```

```
       [ 0.38358493, -0.45180983],
       [-0.4086731 , -0.77073441],
       [-0.11157634, -0.50979612],
       [ 0.97777845, -1.14764529],
       [-0.90383437, -0.77073441],
       [-0.21060859, -0.50979612],
       [-1.10189888, -0.45180983],
       [-1.20093113,  1.40375139]])
```

In [28]:
```
# Apply KNN algorithm
from sklearn.neighbors import KNeighborsClassifier
cls=KNeighborsClassifier()
```

In [29]:
```
cls.fit(X_train,y_train)
```

Out[29]:
```
KNeighborsClassifier()
```

In [30]:
```
y_pred=cls.predict(X_test)
```

In [31]:
```
y_pred
```

Out[31]:
```
array([0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 1,
       0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0,
       1, 0, 0, 1, 0, 1, 1, 0, 0, 1, 1, 1, 0, 0, 1, 0, 0, 1, 0, 1, 0, 1,
       0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 1, 1, 1, 1, 0, 0, 1, 0, 0, 1,
       1, 0, 0, 1, 0, 0, 0, 0, 0, 1, 1, 1], dtype=int64)
```

In [32]:
```
y_test
```

Out[32]:
```
array([0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1,
       0, 1, 0, 1, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0,
       1, 0, 0, 1, 0, 1, 1, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 1, 0, 1, 0, 1,
       0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 1, 1, 0, 1,
       1, 0, 0, 1, 0, 0, 0, 1, 0, 1, 1, 1], dtype=int64)
```

In [33]:
```
#Confusion matrix
from sklearn.metrics import confusion_matrix
cm=confusion_matrix(y_test,y_pred)
print(cm)
```

```
[[64  4]
 [ 3 29]]
```

In [34]:
```
#Accuracy
from sklearn.metrics import accuracy_score
accuracy=accuracy_score(y_test,y_pred)*100
```

In [35]:
```
accuracy
```

Out[35]:
```
93.0
```

In [ ]:
```

```