Darshan UNIVERSITY
योग: कर्मसु कौशलम्

Data Mining

Lab - 3

Name:- Ritesh Lakhani

Enrollment No- 22010101099

1) First, you need to read the titanic dataset from local disk and display first five records

In [1]:
```
import pandas as pd
```

In [2]:
```
df = pd.read_csv("titanic.csv")
df
```

Out[2]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	C
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	S
...	...	...	...	...	...	...	...	...	...	...	...	...
886	887	0	2	Montvila, Rev. Juozas	male	27.0	0	0	211536	13.0000	NaN	S
887	888	1	1	Graham, Miss. Margaret Edith	female	19.0	0	0	112053	30.0000	B42	S
888	889	0	3	Johnston, Miss. Catherine Helen "Carrie"	female	NaN	1	2	W./C. 6607	23.4500	NaN	S
889	890	1	1	Behr, Mr. Karl Howell	male	26.0	0	0	111369	30.0000	C148	C
890	891	0	3	Dooley, Mr. Patrick	male	32.0	0	0	370376	7.7500	NaN	Q

891 rows × 12 columns

In [3]:
```
df.head(5)
```

Out[3]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	C
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	S

2) Identify Nominal, Ordinal, Binary and Numeric attributes from data sets and display all values.

In [5]:
```
print("Nominal")
print(df["Name"])
print(df["Ticket"])
print(df["Embarked"])
print(df["Cabin"])
```

```
Nominal
0                                Braund, Mr. Owen Harris
1      Cumings, Mrs. John Bradley (Florence Briggs Th...
2                                 Heikkinen, Miss. Laina
3           Futrelle, Mrs. Jacques Heath (Lily May Peel)
4                               Allen, Mr. William Henry
                             ...
886                             Montvila, Rev. Juozas
887                      Graham, Miss. Margaret Edith
888          Johnston, Miss. Catherine Helen "Carrie"
889                             Behr, Mr. Karl Howell
890                               Dooley, Mr. Patrick
Name: Name, Length: 891, dtype: object
0             A/5 21171
1              PC 17599
2      STON/O2. 3101282
3                113803
4                373450
              ...
886              211536
887              112053
888          W./C. 6607
889              111369
890              370376
Name: Ticket, Length: 891, dtype: object
0      S
1      C
2      S
3      S
4      S
      ..
886    S
887    S
888    S
889    C
890    Q
Name: Embarked, Length: 891, dtype: object
0       NaN
1       C85
2       NaN
3      C123
4       NaN
       ...
886     NaN
887     B42
888     NaN
889    C148
890     NaN
Name: Cabin, Length: 891, dtype: object
```

In [6]:
```
print("Ordinal")
print(df["Pclass"])
```

```
Ordinal
0      3
1      1
2      3
3      1
4      3
      ..
886    2
887    1
888    3
889    1
890    3
Name: Pclass, Length: 891, dtype: int64
```

In [7]:
```
print("Binary")
print(df["Sex"])
print(df["Survived"])
```

```
Binary
0        male
1      female
2      female
3      female
4        male
        ...
886      male
887    female
888    female
889      male
890      male
Name: Sex, Length: 891, dtype: object
0      0
1      1
2      1
3      1
4      0
      ..
886    0
887    1
888    0
889    1
890    0
Name: Survived, Length: 891, dtype: int64
```

In [12]:
```
print("Numeric")
print(df["PassengerId"])
print(df["Age"])
print(df["Fare"])
print(df["SibSp"])
```

```
Numeric
0        1
1        2
2        3
3        4
4        5
      ...
886    887
887    888
888    889
889    890
890    891
Name: PassengerId, Length: 891, dtype: int64
0      22.0
1      38.0
2      26.0
3      35.0
4      35.0
       ...
886    27.0
887    19.0
888     NaN
889    26.0
890    32.0
Name: Age, Length: 891, dtype: float64
0       7.2500
1      71.2833
2       7.9250
3      53.1000
4       8.0500
        ...
886    13.0000
887    30.0000
888    23.4500
889    30.0000
890     7.7500
Name: Fare, Length: 891, dtype: float64
0      1
1      1
2      0
3      1
4      0
      ..
886    0
887    0
888    1
889    0
890    0
Name: SibSp, Length: 891, dtype: int64
```

3) Identify symmetric and asymmetric binary attributes from data sets and display all values.

In [10]:
```
print('symmetric')
print(df['Sex'])
```

```
symmetric
0        male
1      female
2      female
3      female
4        male
        ...
886      male
887    female
888    female
889      male
890      male
Name: Sex, Length: 891, dtype: object
```

In [11]:
```
print("Asymmetric")
print(df["Survived"])
```

```
Asymmetric
0      0
1      1
2      1
3      1
4      0
      ..
886    0
887    1
888    0
889    1
890    0
Name: Survived, Length: 891, dtype: int64
```

4) For each quantitative attribute, calculate its average, standard deviation, minimum, mode, range and maximum values.

In [13]:
```
from pandas.api.types import is_numeric_dtype
for col in df.columns:
    if is_numeric_dtype(df[col]):
        print("%s: " % (col));
        print("\t Mean = %.2f" % df[col].mean())
        print("\t Standard Deviation = %.2f" % df[col].std())
        print("\t Mimimum = %.2f" % df[col].min())
        print("\t Maximum deviation = %.2f" % df[col].max())
        print("\t Mode = ", df[col].mode()[0])
        print("\t Range =",df[col].max()- df[col].min())
```

```
PassengerId:
         Mean = 446.00
         Standard Deviation = 257.35
         Mimimum = 1.00
         Maximum deviation = 891.00
         Mode =  1
         Range = 890
Survived:
         Mean = 0.38
         Standard Deviation = 0.49
         Mimimum = 0.00
         Maximum deviation = 1.00
         Mode =  0
         Range = 1
Pclass:
         Mean = 2.31
         Standard Deviation = 0.84
         Mimimum = 1.00
         Maximum deviation = 3.00
         Mode =  3
         Range = 2
Age:
         Mean = 29.70
         Standard Deviation = 14.53
         Mimimum = 0.42
         Maximum deviation = 80.00
         Mode =  24.0
         Range = 79.58
SibSp:
         Mean = 0.52
         Standard Deviation = 1.10
         Mimimum = 0.00
         Maximum deviation = 8.00
         Mode =  0
         Range = 8
Parch:
         Mean = 0.38
         Standard Deviation = 0.81
         Mimimum = 0.00
         Maximum deviation = 6.00
         Mode =  0
         Range = 6
Fare:
         Mean = 32.20
         Standard Deviation = 49.69
         Mimimum = 0.00
         Maximum deviation = 512.33
         Mode =  8.05
         Range = 512.3292
```

6) For the qualitative attribute (class), count the frequency for each of its distinct values.

In [17]:
```
df.Pclass.value_counts()
```

Out[17]:
```
Pclass
3    491
1    216
2    184
Name: count, dtype: int64
```

7) It is also possible to display the summary for all the attributes simultaneously in a table using the describe() function. If an attribute is quantitative, it will display its mean, standard deviation and various quantiles (including minimum, median, and maximum) values. If an attribute is qualitative, it will display its number of unique values and the top (most frequent) values.

In [19]:
```
df.describe(include="all")
```

Out[19]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
count	891.000000	891.000000	891.000000	891	891	714.000000	891.000000	891.000000	891	891.000000	204	889
unique	NaN	NaN	NaN	891	2	NaN	NaN	NaN	681	NaN	147	3
top	NaN	NaN	NaN	Braund, Mr. Owen Harris	male	NaN	NaN	NaN	347082	NaN	B96 B98	S
freq	NaN	NaN	NaN	1	577	NaN	NaN	NaN	7	NaN	4	644
mean	446.000000	0.383838	2.308642	NaN	NaN	29.699118	0.523008	0.381594	NaN	32.204208	NaN	NaN
std	257.353842	0.486592	0.836071	NaN	NaN	14.526497	1.102743	0.806057	NaN	49.693429	NaN	NaN
min	1.000000	0.000000	1.000000	NaN	NaN	0.420000	0.000000	0.000000	NaN	0.000000	NaN	NaN
25%	223.500000	0.000000	2.000000	NaN	NaN	20.125000	0.000000	0.000000	NaN	7.910400	NaN	NaN
50%	446.000000	0.000000	3.000000	NaN	NaN	28.000000	0.000000	0.000000	NaN	14.454200	NaN	NaN
75%	668.500000	1.000000	3.000000	NaN	NaN	38.000000	1.000000	0.000000	NaN	31.000000	NaN	NaN
max	891.000000	1.000000	3.000000	NaN	NaN	80.000000	8.000000	6.000000	NaN	512.329200	NaN	NaN

8) For multivariate statistics, you can compute the covariance and correlation between pairs of attributes.

In [20]:
```
df.cov(numeric_only= True)
```

Out[20]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
PassengerId	66231.000000	-0.626966	-7.561798	138.696504	-16.325843	-0.342697	161.883369
Survived	-0.626966	0.236772	-0.137703	-0.551296	-0.018954	0.032017	6.221787
Pclass	-7.561798	-0.137703	0.699015	-4.496004	0.076599	0.012429	-22.830196
Age	138.696504	-0.551296	-4.496004	211.019125	-4.163334	-2.344191	73.849030
SibSp	-16.325843	-0.018954	0.076599	-4.163334	1.216043	0.368739	8.748734
Parch	-0.342697	0.032017	0.012429	-2.344191	0.368739	0.649728	8.661052
Fare	161.883369	6.221787	-22.830196	73.849030	8.748734	8.661052	2469.436846

In [21]:
```
df.corr(numeric_only= True)
```

Out[21]:

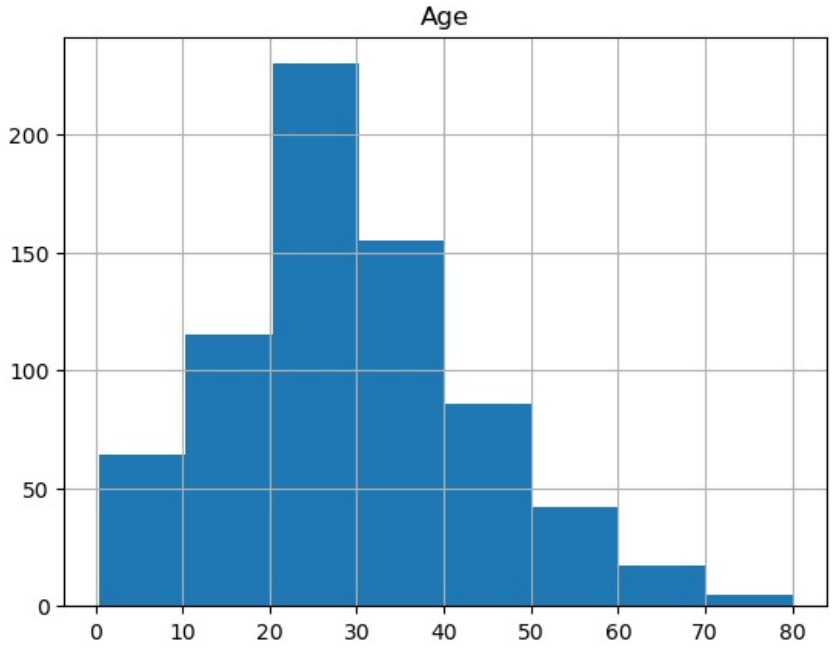
	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
PassengerId	1.000000	-0.005007	-0.035144	0.036847	-0.057527	-0.001652	0.012658
Survived	-0.005007	1.000000	-0.338481	-0.077221	-0.035322	0.081629	0.257307
Pclass	-0.035144	-0.338481	1.000000	-0.369226	0.083081	0.018443	-0.549500
Age	0.036847	-0.077221	-0.369226	1.000000	-0.308247	-0.189119	0.096067
SibSp	-0.057527	-0.035322	0.083081	-0.308247	1.000000	0.414838	0.159651
Parch	-0.001652	0.081629	0.018443	-0.189119	0.414838	1.000000	0.216225
Fare	0.012658	0.257307	-0.549500	0.096067	0.159651	0.216225	1.000000

9) Display the histogram for Age attribute by discretizing it into 8 separate bins and counting the frequency for each bin.

In [12]:
```
import matplotlib.pyplot as plot
```

In [18]:
```
df.hist(column="Age", bins = 8)
```

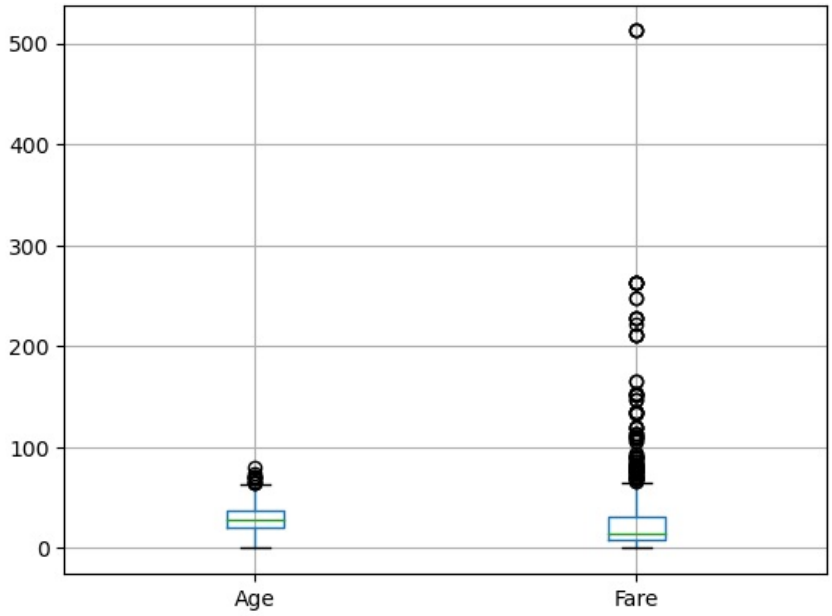
Out[18]:
```
array([[<Axes: title={'center': 'Age'}>]], dtype=object)
```



10) A boxplot can also be used to show the distribution of values for each attribute.

In [23]:
```
df.boxplot(column=["Age","Fare"])
```

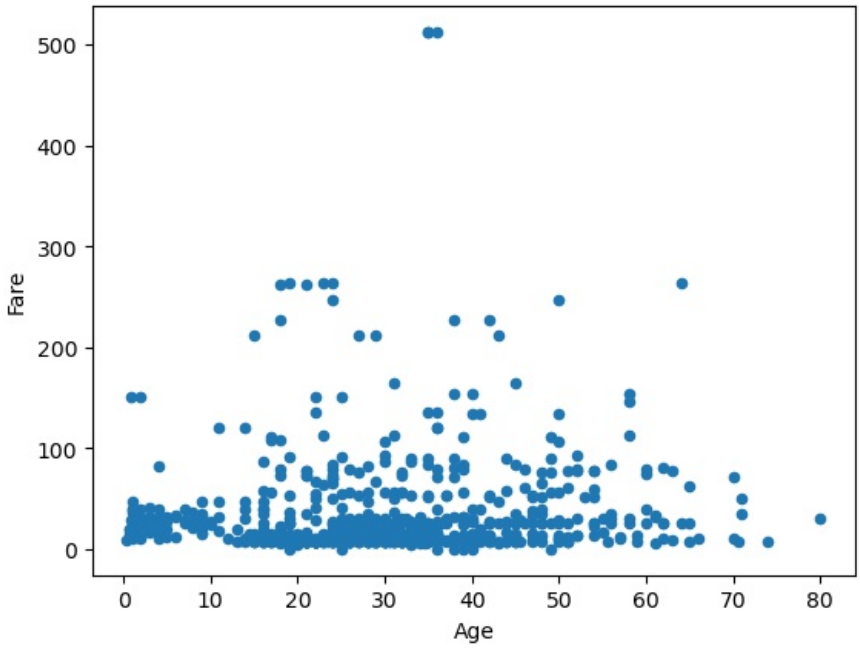
Out[23]:
```
<Axes: >
```



11) Display scatter plot for any 5 pair of attributes , we can use a scatter plot to visualize their joint distribution.

In [25]:
```
df.plot.scatter(x="Age",y="Fare")
```

Out[25]:
```
<Axes: xlabel='Age', ylabel='Fare'>
```


500
400
300
200
100
0
Fare
0
10
20
30
40
50
60
70
80
Age