Практична робота №6

Тема: КЛАСИФІКАЦІЯ ТА КЛАСТЕРИЗАЦІЯ. Мета: ознайомитись з

- методами класифікації та кластеризації
- моделями, що використовують дерева прийняття рішень
- інструментами факторного аналізу методом головних компонент та методом найбільшої подібності.

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In [1]:

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np
import plotly.express as px
```

In [2]:

```
df = pd.read_csv('./data/titanic.csv')
```

In [3]:

```
df.head()
```

Out[3]:

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

In [4]:

```
# check the types of the data
df.dtypes
```

Out[4]:

```
PassengerId      int64
Survived         int64
Pclass           int64
Name            object
Sex             object
Age            float64
SibSp            int64
Parch            int64
Ticket          object
Fare           float64
Cabin           object
Embarked        object
dtype: object
```

In [5]:

```
# check for missing values
df.isnull().sum()
```

Out[5]:

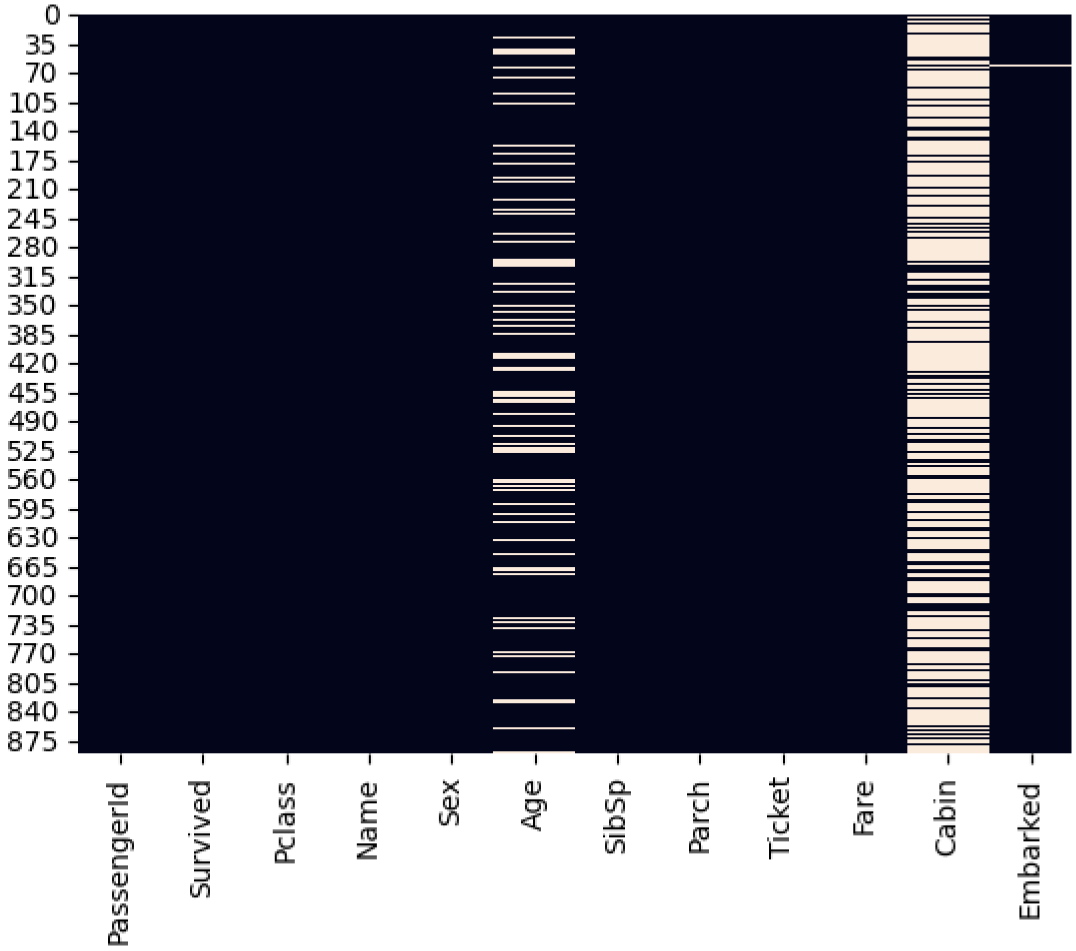
```
PassengerId      0
Survived         0
Pclass           0
Name             0
Sex              0
Age            177
SibSp            0
Parch            0
Ticket           0
Fare             0
Cabin          687
Embarked         2
dtype: int64
```

In [6]:

```
# heatmap of the missing values
sns.heatmap(df.isnull(), cbar=False)
```

Out[6]:

```
<Axes: >
```

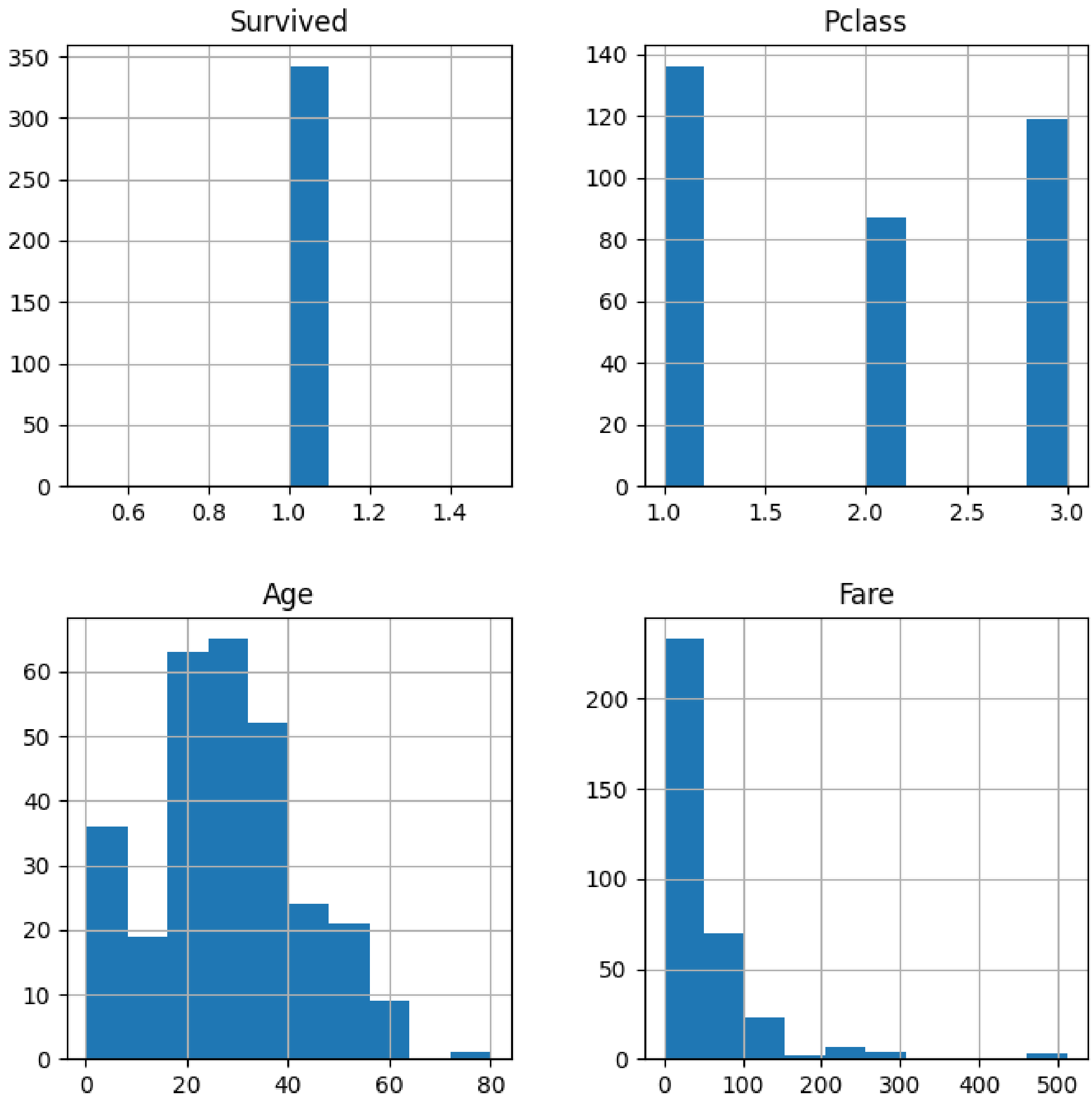


In [7]:

```
# drop the unnecessary columns
df = df.drop(['PassengerId'], axis=1)
df = df.drop(['Cabin'], axis=1) # too many missing values
df = df.drop(['Ticket'], axis=1) # not relevant
df = df.drop(['Parch'], axis=1)
df = df.drop(['SibSp'], axis=1)
```

In [8]:

```
# histograms of the survived passengers
df[df['Survived'] == 1].hist(figsize=(8, 8))
plt.show()
```



In [9]:

```
# fill the missing age values with the mean

df['Age'] = df['Age'].fillna(df['Age'].mean())
```

In [10]:

```
# get rid of strings
df['Sex'] = df['Sex'].replace({'male': 0, 'female': 1})
df['Embarked'] = df['Embarked'].replace({'S': 0, 'C': 1, 'Q': 2})
# fill null values
df['Embarked'] = df['Embarked'].fillna(df['Embarked'].mean())
df = df.drop(['Name'], axis=1)
```

In [11]:

```
# check for null values
df.isnull().sum()
```

Out[11]:

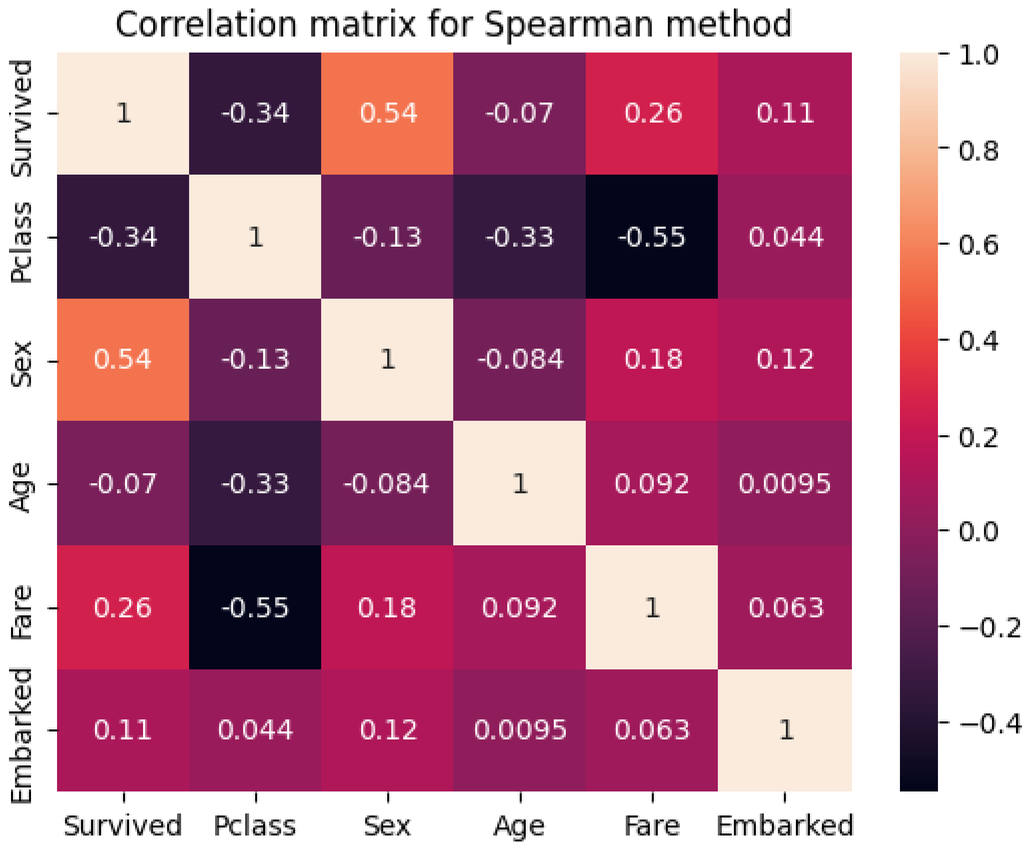
```
Survived    0
Pclass      0
Sex         0
Age         0
Fare        0
Embarked    0
dtype: int64
```

In [17]:

```
# check the correlation
fig, ax = plt.subplots()
pearson_corr = df.corr(method='pearson')

ax.set_title('Correlation matrix for Spearman method')
sns.heatmap(pearson_corr, annot=True)

plt.show()
```



	Survived	Pclass	Sex	Age	Fare	Embarked
Survived	1	-0.34	0.54	-0.07	0.26	0.11
Pclass	-0.34	1	-0.13	-0.33	-0.55	0.044
Sex	0.54	-0.13	1	-0.084	0.18	0.12
Age	-0.07	-0.33	-0.084	1	0.092	0.0095
Fare	0.26	-0.55	0.18	0.092	1	0.063
Embarked	0.11	0.044	0.12	0.0095	0.063	1

In [13]:

```
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score
# drop the target variable
X=df.drop("Survived",axis=1)
y=df["Survived"]
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.2,random_state=42
```

Linear Regression

In [14]:

```
from sklearn.linear_model import LinearRegression
from sklearn.metrics import r2_score, mean_squared_error

model_lin = LinearRegression()
model_lin.fit(X_train, y_train)

y_pred_lg = model_lin.predict(X_test)

r2 = r2_score(y_test, y_pred_lg)
mse = mean_squared_error(y_test, y_pred_lg)
accuracy_lg = accuracy_score(y_test, np.round(y_pred_lg))

print(f"R^2: {r2}\nMean squared error: {mse}\nAccuracy rate: {accuracy_lg}")
```

```
R^2: 0.43908586141534867
Mean squared error: 0.13602268520966077
Accuracy rate: 0.7877094972067039
```

Random Forest

In [15]:

```
from sklearn.ensemble import RandomForestClassifier
from sklearn.model_selection import GridSearchCV

rfc = RandomForestClassifier()
rfc_parameters = {
    'n_estimators': [10, 50, 100, 200],
    'max_depth': [None, 5, 10, 20, 50, 100]
}
rfc_grid_search = GridSearchCV(rfc, rfc_parameters, cv=5)
rfc_grid_search.fit(X_train, y_train)

print("Best value for 'n_estimators' hyperparameter is", rfc_grid_search.best_pa
print("Best value for 'max_depth' hyperparameter is", rfc_grid_search.best_param
```

```
Best value for 'n_estimators' hyperparameter is 100
Best value for 'max_depth' hyperparameter is 5
```

In [16]:

```
rfc = rfc_grid_search.best_estimator_
rfc.fit(X_train,y_train)
y_pred=rfc.predict(X_test)
test_accuracy = accuracy_score(y_test,y_pred)
print("Test Accuracy: ",test_accuracy)
```

```
Test Accuracy:  0.8212290502793296
```

Based on the results, the Random Forest model is a better choice for this dataset with an accuracy of 82%.