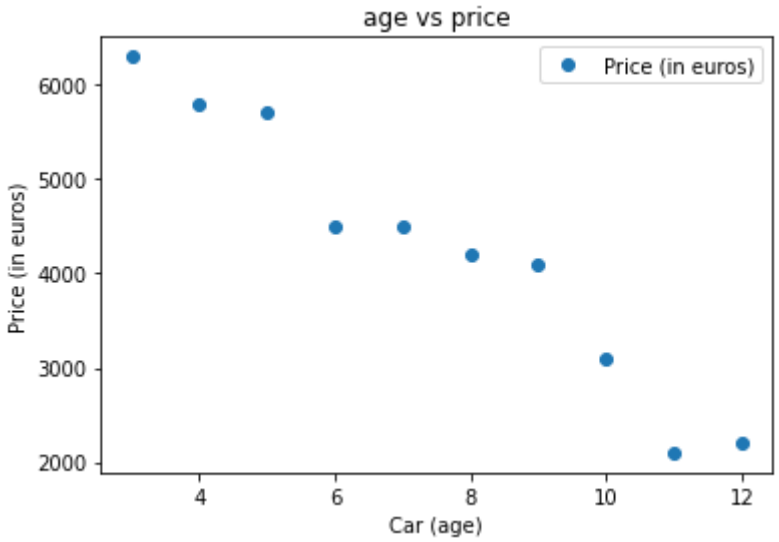
Exercise 1 - Basic Algorithms

1
```
import pandas as pd
import numpy as np
from sklearn.linear_model import LinearRegression
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.metrics import mean_squared_error, r2_score
from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from sklearn import preprocessing
```

1.1

2
```
#visualisierung

cars = pd.DataFrame(data={'Car (age)': [3, 4, 5, 6, 7, 8, 9, 10, 11, 12], 'Price (in euros)
cars.describe()
cars.plot(x='Car (age)', y='Price (in euros)', style='o')
plt.title('age vs price')
plt.xlabel('Car (age)')
plt.ylabel('Price (in euros)')
plt.show()
```

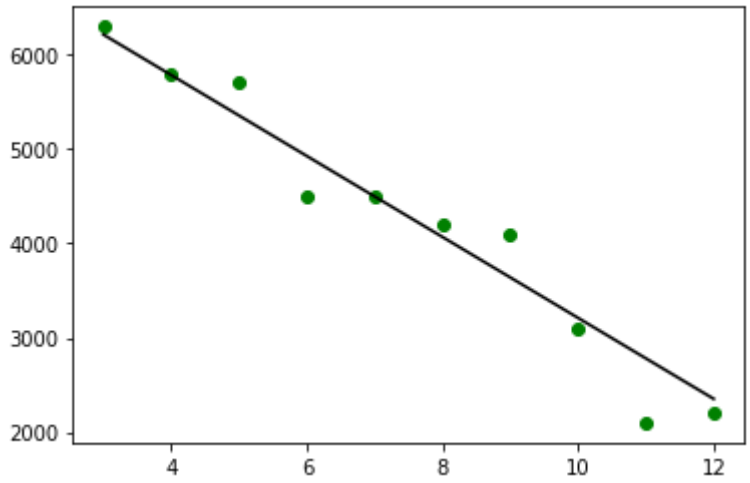


3
```
#linear regression model

x = cars.iloc[:, :-1].values
y = cars.iloc[:, 1].values
X_train, X_test, y_train, y_test = train_test_split(x, y, test_size=0.2, random_state=0)
lm = LinearRegression()
lm.fit(X_train, y_train)

# plot
plt.scatter(x, y,color='g')
plt.plot(x, lm.predict(x),color='k')

plt.show()
y_pred = lm.predict(X_test)
df = pd.DataFrame({'Actual': y_test, 'Predicted': y_pred})
df
```



3

	Actual	Predicted
0	5700	5356.751468
1	2100	2781.800391

4

```
# The coefficients
print('Coefficients: \n', lm.coef_)
# The mean squared error
print('Mean squared error: %.2f'
      % mean_squared_error(y_test, y_pred))
# The coefficient of determination: 1 is perfect prediction
print('Coefficient of determination: %.2f'
      % r2_score(y_test, y_pred))
```

```
Coefficients:
 [-429.15851272]
Mean squared error: 291335.66
Coefficient of determination: 0.91
```

1.2

5

```
household_income = pd.read_csv('Household_income.csv')
household_income.head()
```

5

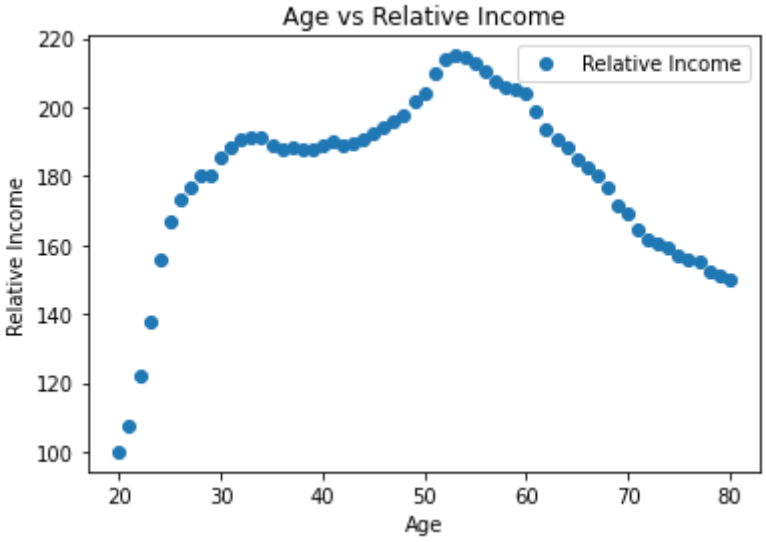
	Age	Relative Income
0	20	100.0
1	21	107.5
2	22	122.2
3	23	138.0
4	24	155.7

6

```
#visualise

household_income.describe()
household_income.plot(x='Age', y='Relative Income', style='o')
plt.title('Age vs Relative Income')
plt.xlabel('Age')
```

```
plt.ylabel('Relative Income')
plt.show()
```

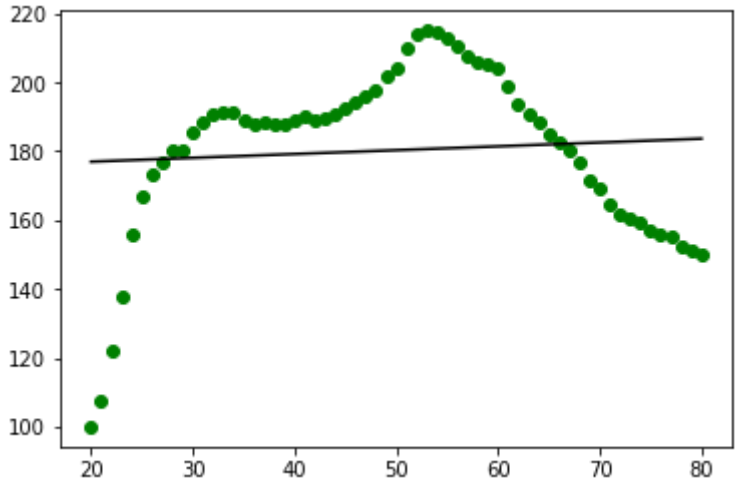


7
```
#linear regression model

x = household_income.iloc[:, :-1].values
y = household_income.iloc[:, 1].values
X_train, X_test, y_train, y_test = train_test_split(x, y, test_size=0.2, random_state=0)
lm = LinearRegression()
lm.fit(X_train, y_train)

# plot
plt.scatter(x, y,color='g')
plt.plot(x, lm.predict(x),color='k')

plt.show()
y_pred = lm.predict(X_test)
df = pd.DataFrame({'Actual': y_test, 'Predicted': y_pred})
df
pred_45_55 = lm.predict([[45], [55]])
print(pred_45_55)
```




```
[179.72379541 180.83746903]
```

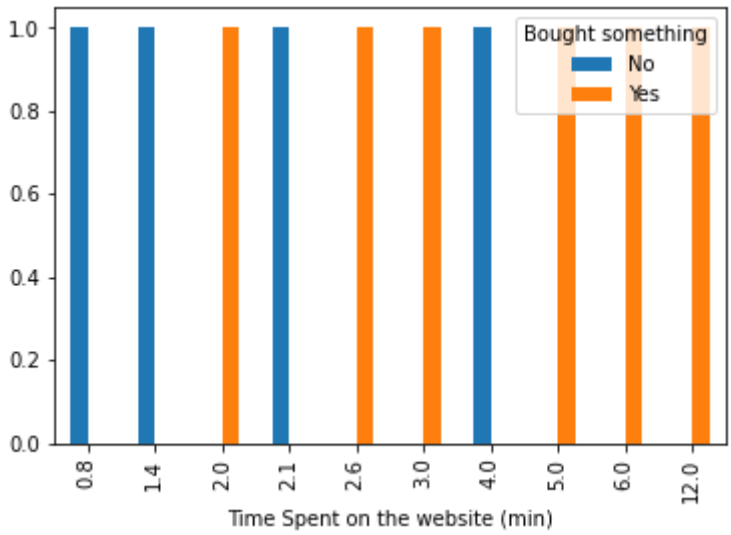
1.3

8
```
store_statistics = pd.DataFrame(data={'Time Spent on the website (min)': [3, 12, 2.1, 2.6,
```

9
```
#visualise

store_statistics.describe()
store_statistics = store_statistics.sort_values(by=['Time Spent on the website (min)'])
df = store_statistics.groupby(['Time Spent on the website (min)','Bought something']).size(
df = df.unstack()
df.plot(kind='bar')
```

9
```
<AxesSubplot:xlabel='Time Spent on the website (min)'>
```



10
```
#logistic regression model

x = store_statistics.iloc[:, :-1].values
y = store_statistics.iloc[:, 1].values
X_train, X_test, y_train, y_test = train_test_split(x, y, test_size=0.2, random_state=0)
model = LogisticRegression(solver='liblinear', random_state=0).fit(X_train, y_train)
pred = model.predict([[2.3]])
print(pred)
```

```
['Yes']
```

1.4

15
```
#preprocessing
le = preprocessing.LabelEncoder()
y_encoded = le.fit_transform(y)


#K-NN

model = KNeighborsClassifier(n_neighbors=3)


model.fit(x, y_encoded)

pred = model.predict([[1.8]])
print(pred)
```

```
[0]
```