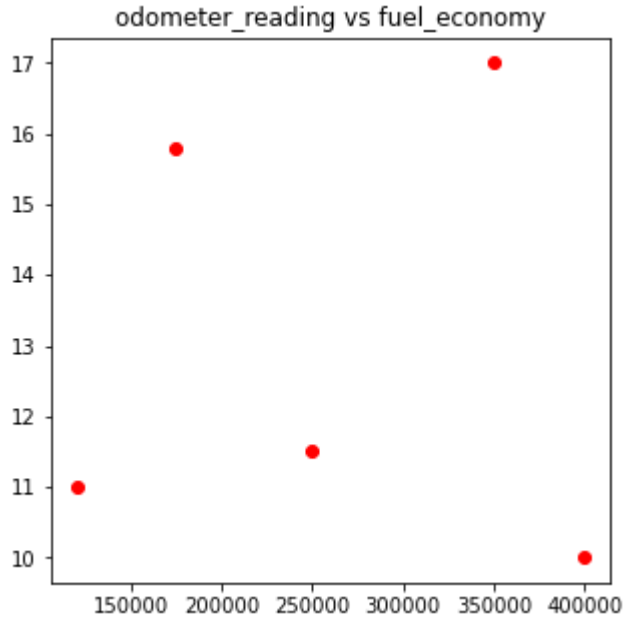
Data Normalization in Python

In [1]:
```
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
import os
import seaborn as sns

# data frame containing the odometer reading (km) and the fuel economy (km/l) of second-hand cars
df_cars = pd.DataFrame([[120000, 11], [250000, 11.5], [175000, 15.8], [350000, 17], [400000, 10]],
                       columns=['odometer_reading', 'fuel_economy'])

df_cars
```

Out[1]:

	odometer_reading	fuel_economy
0	120000	11.0
1	250000	11.5
2	175000	15.8
3	350000	17.0
4	400000	10.0

In [2]:
```
plt.figure(figsize=(5, 5))
plt.title('odometer_reading vs fuel_economy')
plt.scatter(df_cars['odometer_reading'],df_cars['fuel_economy'], color='red')
plt.show()
```



The maximum absolute scaling

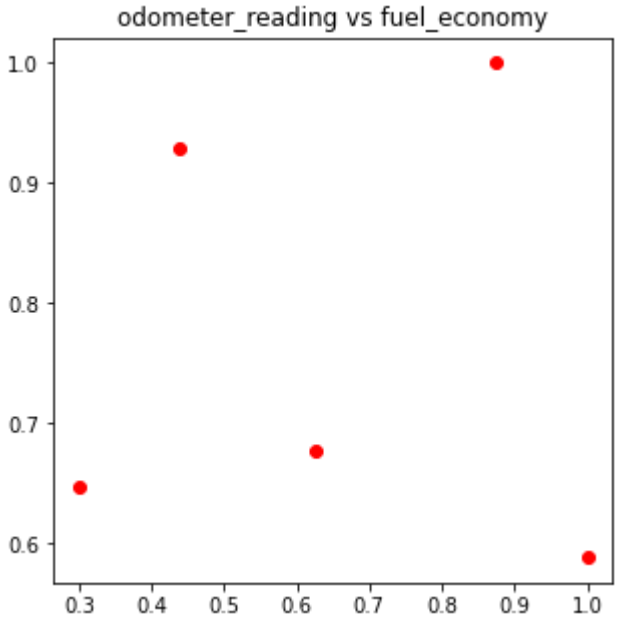
In [3]:

```
# apply the maximum absolute scaling in Pandas using the .abs() and .max() methods
def maximum_absolute_scaling(df):
    # copy the dataframe
    df_scaled = df.copy()
    # apply maximum absolute scaling
    for column in df_scaled.columns:
        df_scaled[column] = df_scaled[column]  / df_scaled[column].abs().max()
    return df_scaled

# call the maximum_absolute_scaling function
df_cars_scaled = maximum_absolute_scaling(df_cars)

df_cars_scaled
```

Out[3]:

	odometer_reading	fuel_economy
0	0.3000	0.647059
1	0.6250	0.676471
2	0.4375	0.929412
3	0.8750	1.000000
4	1.0000	0.588235

In [4]:
```
plt.figure(figsize=(5, 5))
plt.title('odometer_reading vs fuel_economy')
plt.scatter(df_cars_scaled['odometer_reading'],df_cars_scaled['fuel_economy'], color='red')
plt.show()
```



The Min-max scaling

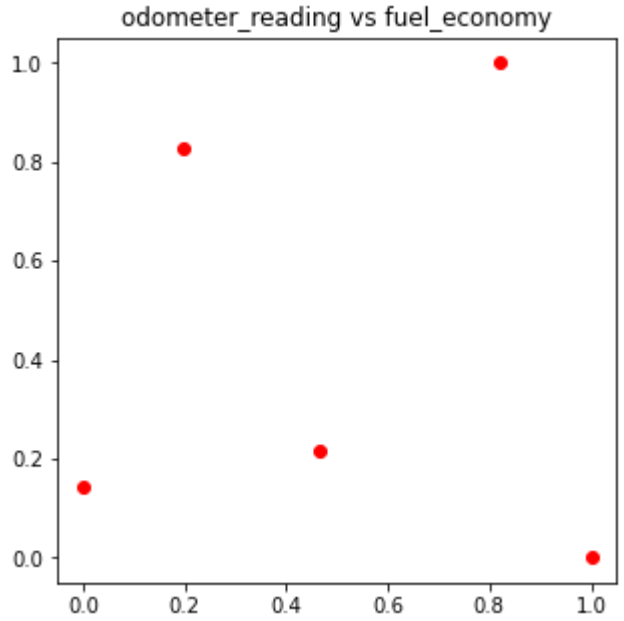
In [5]:

```
# apply the min-max scaling in Pandas using the .min() and .max() methods
def min_max_scaling(df):
    # copy the dataframe
    df_norm = df.copy()
    # apply min-max scaling
    for column in df_norm.columns:
        df_norm[column] = (df_norm[column] - df_norm[column].min()) / (df_norm[column].max() - df_norm[colu

    return df_norm

# call the min_max_scaling function
df_cars_normalized = min_max_scaling(df_cars)

df_cars_normalized
```

Out[5]:

	odometer_reading	fuel_economy
0	0.000000	0.142857
1	0.464286	0.214286
2	0.196429	0.828571
3	0.821429	1.000000
4	1.000000	0.000000

In [6]:
```
plt.figure(figsize=(5, 5))
plt.title('odometer_reading vs fuel_economy')
plt.scatter(df_cars_normalized['odometer_reading'],df_cars_normalized['fuel_economy'], color='red')
plt.show()
```



Z-score method

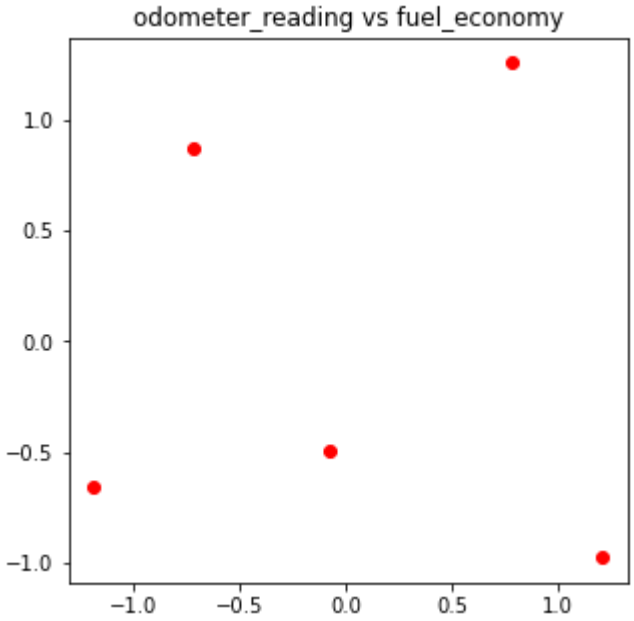
In [7]:

```
# apply the z-score method in Pandas using the .mean() and .std() methods
def z_score(df):
    # copy the dataframe
    df_std = df.copy()
    # apply the z-score method
    for column in df_std.columns:
        df_std[column] = (df_std[column] - df_std[column].mean()) / df_std[column].std()

    return df_std

# call the z_score function
df_cars_standardized = z_score(df_cars)

df_cars_standardized
```

Out[7]:

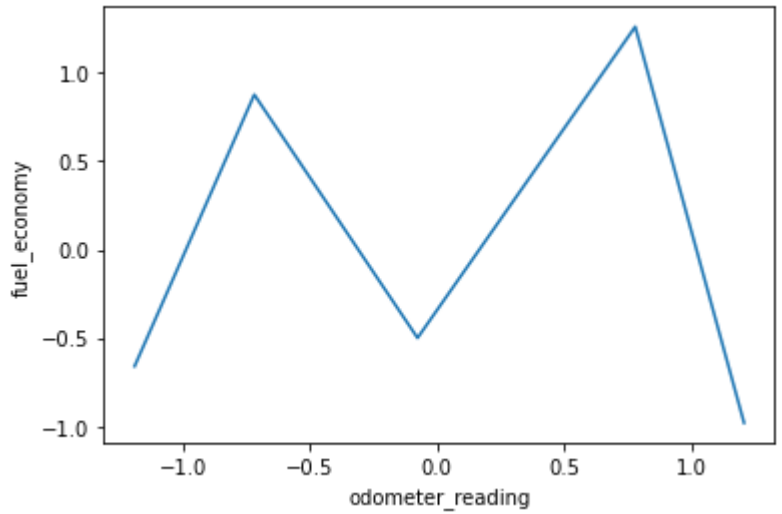
	odometer_reading	fuel_economy
0	-1.189512	-0.659120
1	-0.077019	-0.499139
2	-0.718842	0.876693
3	0.778745	1.260647
4	1.206628	-0.979081

In [8]:
```
plt.figure(figsize=(5, 5))
plt.title('odometer_reading vs fuel_economy')
plt.scatter(df_cars_standardized['odometer_reading'],df_cars_standardized['fuel_economy'], color='red')
plt.show()
```



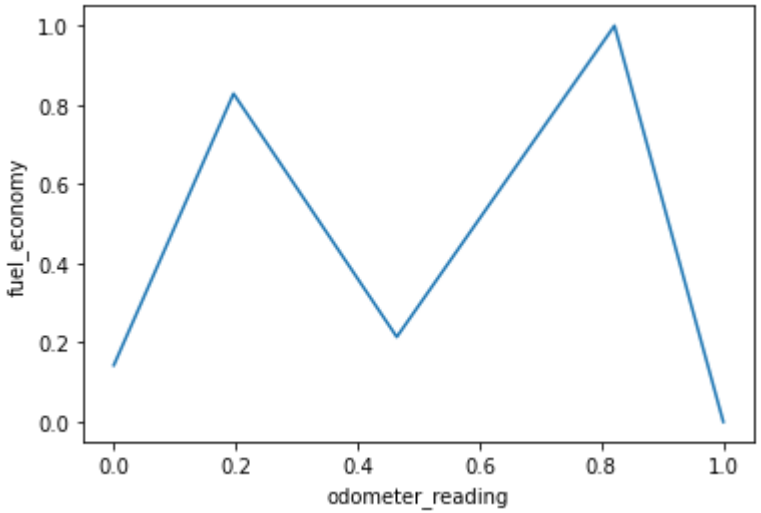
In [9]:
```
1 sns.lineplot(data=df_cars_standardized,x='odometer_reading', y='fuel_economy')
```

Out[9]: <matplotlib.axes._subplots.AxesSubplot at 0x1eaf0602310>



In [10]:
```
1 sns.lineplot(data=df_cars_normalized,x='odometer_reading', y='fuel_economy')
```

Out[10]: <matplotlib.axes._subplots.AxesSubplot at 0x1eaf06eaa00>



Robust Scaling

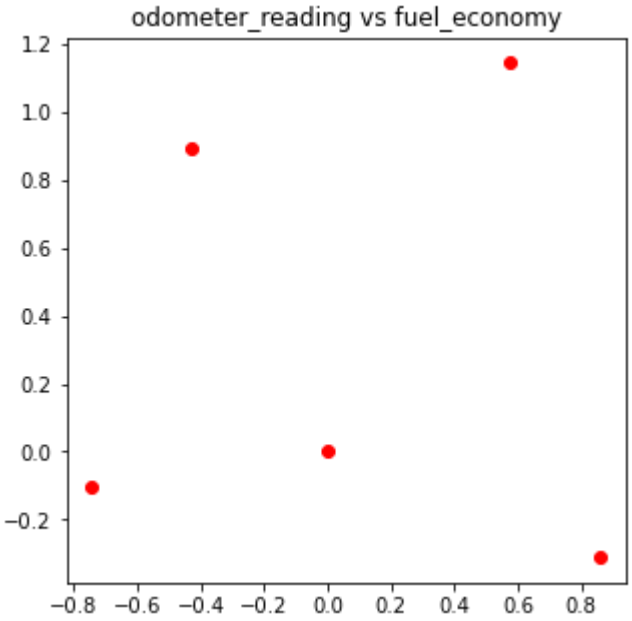
In [11]:

```
# apply the robust scaling in Pandas using the .median() and .quantile() methods
def robust_scaling(df):
    # copy the dataframe
    df_robust = df.copy()
    # apply robust scaling
    for column in df_robust.columns:
        df_robust[column] = (df_robust[column] - df_robust[column].median())  / (df_robust[column].quantile
                                                                                  df_robust[column].quantile
    return df_robust

# call the robust_scaling function
df_cars_robust = robust_scaling(df_cars)

df_cars_robust
```

Out[11]:

	odometer_reading	fuel_economy
0	-0.742857	-0.104167
1	0.000000	0.000000
2	-0.428571	0.895833
3	0.571429	1.145833
4	0.857143	-0.312500

In [12]:
```
plt.figure(figsize=(5, 5))
plt.title('odometer_reading vs fuel_economy')
plt.scatter(df_cars_robust['odometer_reading'],df_cars_robust['fuel_economy'], color='red')
plt.show()
```



In [13]:
```
# the data frame contains one outlier
df_data = pd.DataFrame({'variable1':[1,2,3,4,5,6,7,30], 'variable2':[1,2,3,4,5,6,7,8]})

df_data
```

Out[13]:

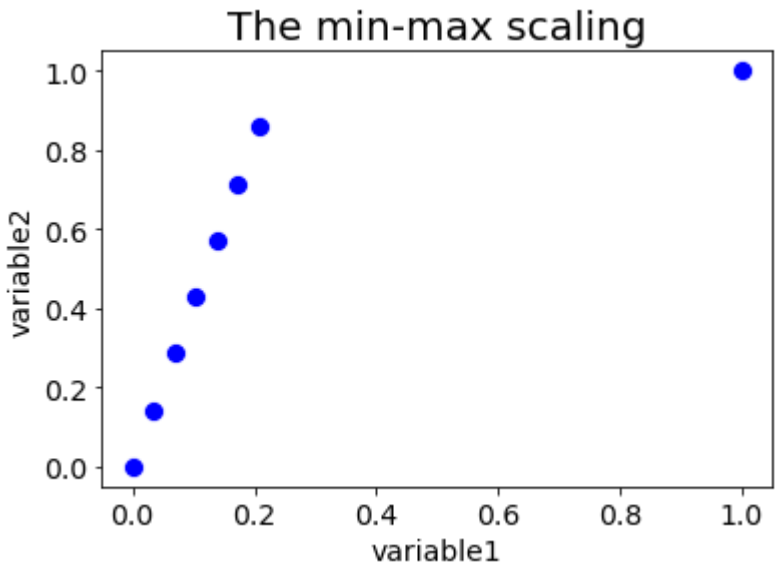
	variable1	variable2
0	1	1
1	2	2
2	3	3
3	4	4
4	5	5
5	6	6
6	7	7
7	30	8

In [14]:

```
#applying min_max_scaling
def min_max_scaling(df):
    # copy the dataframe
    df_norm = df.copy()
    # apply min-max scaling
    for column in df_norm.columns:
        df_norm[column] = (df_norm[column] - df_norm[column].min()) / (df_norm[column].max() - df_norm[colu

    return df_norm

# call the min_max_scaling function
df_min_max = min_max_scaling(df_data)

# scatter plot of the data after applying min-max scaling
sns.scatterplot(x='variable1', y='variable2', data=df_min_max, s=100, color='blue')

# xticks and yticks
plt.xticks(fontsize=14)
plt.yticks(fontsize=14)

# labels and title
plt.xlabel('variable1', fontsize=14)
plt.ylabel('variable2', fontsize=14)
plt.title('The min-max scaling', fontsize=20)
```

Out[14]:

```
Text(0.5, 1.0, 'The min-max scaling')
```


The min-max scaling
1.0
0.8
0.6
0.4
0.2
0.0
variable2
0.0
0.2
0.4
0.6
0.8
1.0
variable1

In [15]:

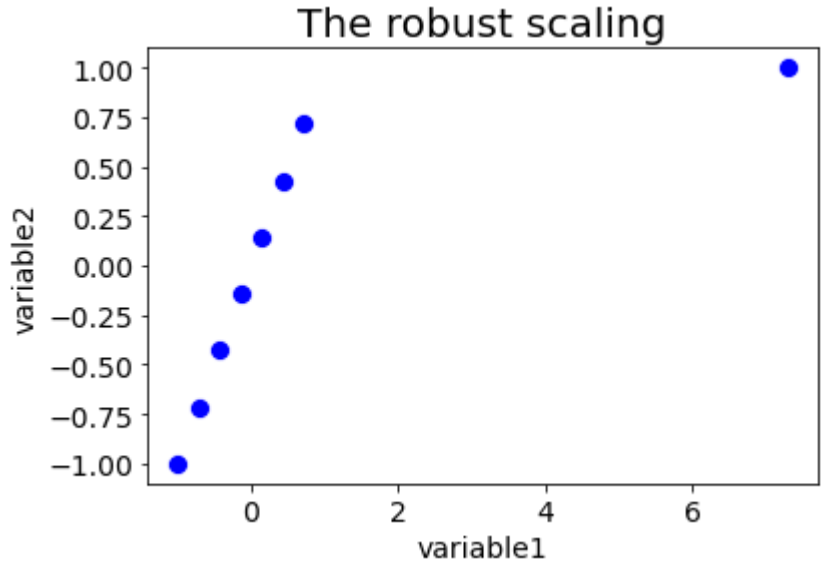
```
# apply the robust scaling in Pandas using the .median() and .quantile() methods
def robust_scaling(df):
    # copy the dataframe
    df_robust = df.copy()
    # apply robust scaling
    for column in df_robust.columns:
        df_robust[column] = (df_robust[column] - df_robust[column].median())  / (df_robust[column].quantile
    return df_robust

# call the robust_scaling function
df_robust = robust_scaling(df_data)

df_robust
```

Out[15]:

	variable1	variable2
0	-1.000000	-1.000000
1	-0.714286	-0.714286
2	-0.428571	-0.428571
3	-0.142857	-0.142857
4	0.142857	0.142857
5	0.428571	0.428571
6	0.714286	0.714286
7	7.285714	1.000000

In [16]:
```
sns.scatterplot(x='variable1', y='variable2', data=df_robust, s=100, color='blue')

# xticks and yticks
plt.xticks(fontsize=14)
plt.yticks(fontsize=14)

# labels and title
plt.xlabel('variable1', fontsize=14)
plt.ylabel('variable2', fontsize=14)
plt.title('The robust scaling', fontsize=20)
```

Out[16]: Text(0.5, 1.0, 'The robust scaling')



In [ ]:
```
1
```

In [ ]:
```
1
```