22P-9252-A02

May 6, 2024

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0.1 Assignment 2

[ ]:

```
import pandas as pd
import re

df = pd.read_csv('listing_data_publish.csv')
df.head()
```

[ ]:

```
   listing_id   type sub_type start_date end_date listing_type building_age  \
0           1  Konut    Daire     1/3/19   1/3/19      satılık            3
1           2  Konut    Daire     1/2/19   1/2/19      satılık            0
2           3  Konut    Daire     1/2/19   1/2/19      satılık            0
3           4  Konut    Daire     1/2/19   1/2/19      satılık            0
4           5  Konut    Daire     1/2/19   1/2/19      satılık            0

  total_floor_count floor_no room_count   size  student_avaliable  \
0                 4    Kot 3        3+1  130.0                NaN
1                 5        1        4+1  175.0                NaN
2                 3        1        3+1  125.0                NaN
3                10        7        2+1   72.0                NaN
4                 4        3        1+1   75.0                NaN

   mortgage_avaliable                         address furnished  \
0                 NaN             Kocaeli/Körfez/Fatih   Eşyasız
1                 NaN          Ankara/Yenimahalle/Burç   Eşyasız
2                 NaN            Antalya/Kepez/Kütükçü   Eşyasız
3                 NaN  İstanbul/Esenler/Kazım Karabekir   Eşyasız
4                 NaN       İstanbul/Beylikdüzü/Yakuplu   Eşyasız

          heating_type     price currency
0  Kalorifer (Doğalgaz)       NaN      NaN
1      Kombi (Doğalgaz)  209500.0      TRY
2                 Klima  210000.0      TRY
```

```
3                 Klima  285000.0      TRY
4      Kombi (Doğalgaz)  139000.0      TRY
```

```
[ ]: print(len(df['type'].unique()))
     print(len(df['sub_type'].unique()))
     print(len(df['listing_type'].unique()))
     print(len(df['furnished'].unique()))
     print(len(df['student_avaliable'].unique()))
     print(len(df['mortgage_avaliable'].unique()))
     print(len(df['currency'].unique()))
     print(df['currency'].unique())
```

```
1
1
1
4
1
1
5
[nan 'TRY' 'EUR' 'GBP' 'USD']
```

```
[ ]: # time period calculation using the column start_date and end_date
     df['start_date'] = pd.to_datetime(df['start_date'], format='%m/%d/%y')
     df['end_date'] = pd.to_datetime(df['end_date'], format='%m/%d/%y')
     df['time_period'] = df['end_date'] - df['start_date']
     df['time_period'] = df['time_period'].dt.days
     df['time_period'].tail()
```

```
[ ]: 225732    116
     225733     35
     225734     10
     225735    341
     225736    102
     Name: time_period, dtype: int64
```

```
[ ]: from sklearn.preprocessing import LabelEncoder
     le = LabelEncoder()
     df['building_age'] = le.fit_transform(df['building_age'])
     df['building_age'].unique()
```

```
[ ]: array([ 7,  0, 13,  5,  4,  1, 10,  6,  2,  3, 12,  8, 11,  9])
```

```
[ ]: df['total_floor_count'] = le.fit_transform(df['total_floor_count'])
     df['total_floor_count'].unique()
```

```
[ ]: array([ 6,  7,  5,  1,  2,  3, 10,  8,  0, 11,  4,  9])
```

[ ]:
```
df['floor_no'] = le.fit_transform(df['floor_no'])
df['floor_no'].unique()
```

[ ]:
```
array([28,  0, 17, 13, 11, 26, 30, 21, 14, 32, 22, 15,  4, 18, 12,  5,  2,
       19, 24, 27,  9, 23, 16, 20,  1,  6, 34, 33, 29,  8,  3,  7, 31, 10,
       25])
```

[ ]:
```
df['room'] = df['room_count'].apply(lambda x: int(str(x).split('+')[0]) if␣
 ↪str(x).split('+')[0].isdigit() else 0)
df['living_room'] = df['room_count'].apply(lambda x: int(str(x).split('+')[1])␣
 ↪if len(str(x).split('+')) > 1 and str(x).split('+')[1].isdigit() else 0)
print(df['room'].count())
print(df['living_room'].count())
```

```
225737
225737
```

[ ]:
```
df['address'] = le.fit_transform(df['address'])
df['heating_type'] = le.fit_transform(df['heating_type'])
df['furnished'] = le.fit_transform(df['furnished'])
df['currency'] = le.fit_transform(df['currency'])
```

[ ]:
```
# selecting X and y features
X  =␣
 ↪df[['time_period','building_age','total_floor_count','floor_no','room','living_room','size'
y= df['price']

print(X.isnull().sum())
print(y.isnull().sum())
```

```
time_period            0
building_age           0
total_floor_count      0
floor_no               0
room                   0
living_room            0
size                 164
address                0
furnished              0
heating_type           0
currency               0
dtype: int64
21
```

[ ]:
```
from sklearn.impute import SimpleImputer

imputer = SimpleImputer(strategy='mean')
```

```
X = X.copy()
X['size'] = imputer.fit_transform(X[['size']])
X.isnull().sum()
```

```
[ ]: time_period          0
     building_age         0
     total_floor_count    0
     floor_no             0
     room                 0
     living_room          0
     size                 0
     address              0
     furnished            0
     heating_type         0
     currency             0
     dtype: int64
```

```
[ ]: y = y.fillna(y.mean())
     y.isnull().sum()
```

```
[ ]: 0
```

```
[ ]: from sklearn.preprocessing import StandardScaler
     scaler = StandardScaler()
     X = scaler.fit_transform(X)

     y = y.values.reshape(-1,1)
     y = scaler.fit_transform(y)


     from sklearn.model_selection import train_test_split
     X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2,␣
      ↪random_state=42)
```

```
[ ]: print(X_train.shape, X_test.shape, y_train.shape, y_test.shape)
```

```
(180589, 11) (45148, 11) (180589, 1) (45148, 1)
```

```
[ ]: from sklearn.metrics import accuracy_score
     from keras.models import Sequential
     from keras.layers import Dense
     import warnings
     warnings.filterwarnings('ignore')
```

```
[ ]: from sklearn.metrics import mean_squared_error

     model = Sequential([
             Dense(10, input_dim=11, activation='relu'),
             Dense(20, activation='relu'),
             Dense(50, activation='relu'),
             Dense(1)
         ])
     model.compile(optimizer='adam', loss='mean_squared_error')
     model.fit(X_train, y_train, epochs=10, batch_size=10, verbose=2)



     y_pred = model.predict(X_test)
     print('MSE:', mean_squared_error(y_test, y_pred))
```

```
Epoch 1/10
18059/18059 - 48s - loss: 0.4406 - 48s/epoch - 3ms/step
Epoch 2/10
18059/18059 - 50s - loss: 0.4313 - 50s/epoch - 3ms/step
Epoch 3/10
18059/18059 - 49s - loss: 0.4293 - 49s/epoch - 3ms/step
Epoch 4/10
18059/18059 - 50s - loss: 0.4269 - 50s/epoch - 3ms/step
Epoch 5/10
18059/18059 - 44s - loss: 0.4259 - 44s/epoch - 2ms/step
Epoch 6/10
18059/18059 - 47s - loss: 0.4256 - 47s/epoch - 3ms/step
Epoch 7/10
18059/18059 - 51s - loss: 0.4234 - 51s/epoch - 3ms/step
Epoch 8/10
18059/18059 - 49s - loss: 0.4232 - 49s/epoch - 3ms/step
Epoch 9/10
18059/18059 - 45s - loss: 0.4239 - 45s/epoch - 2ms/step
Epoch 10/10
18059/18059 - 47s - loss: 0.4219 - 47s/epoch - 3ms/step
1411/1411 [==============================] - 5s 3ms/step
MSE: 3.0213154679094996
```

[ ]:

```
# linear regression
from sklearn.linear_model import LinearRegression
regressor = LinearRegression()

df =␣
 ↪df[['time_period','building_age','total_floor_count','floor_no','room','living_room','size'

df['size'] = df['size'].fillna(df['size'].mean())
df['price'] = df['price'].fillna(df['price'].mean())

Q1 = df.quantile(0.25)
```

```
Q3 = df.quantile(0.75)

IQR = Q3 - Q1
print(IQR)
```

```
time_period               108.0
building_age                6.0
total_floor_count           2.0
floor_no                    8.0
room                        1.0
living_room                 0.0
size                       60.0
address                  3538.0
furnished                   0.0
heating_type                0.0
currency                    0.0
price                  170000.0
dtype: float64
```

```
[ ]: min_threshold = Q1 - 1.5 * IQR
     max_threshold = Q3 + 1.5 * IQR

     print(min_threshold)
     print(max_threshold)
```

```
time_period             -132.0
building_age              -9.0
total_floor_count          2.0
floor_no                  -1.0
room                       0.5
living_room                1.0
size                       0.0
address                -4255.0
furnished                  1.0
heating_type               8.0
currency                   2.0
price                 -86000.0
dtype: float64
time_period               300.0
building_age               15.0
total_floor_count          10.0
floor_no                   31.0
room                        4.5
living_room                 1.0
size                      240.0
address                  9897.0
furnished                   1.0
heating_type                8.0
```

```
currency                  2.0
price                594000.0
dtype: float64
```

[ ]:
```
outliers = (df < (Q1 - 1.5 * IQR)) | (df > (Q3 + 1.5 * IQR))

print(outliers.sum())
```

```
time_period           2790
building_age             0
total_floor_count    14082
floor_no             23442
room                  5746
living_room           6546
size                  5964
address                  0
furnished            28637
heating_type         83322
currency              1904
price                15516
dtype: int64
```

[ ]:
```
outliers = (df < (Q1 - 1.5 * IQR)) | (df > (Q3 + 1.5 * IQR))

print(outliers.sum())

# replace outliers with the median of the column
df = df.mask(outliers, df.median(), axis=1)


# size of the dataset after removing outliers
print(df.shape)

print(df.head())
```

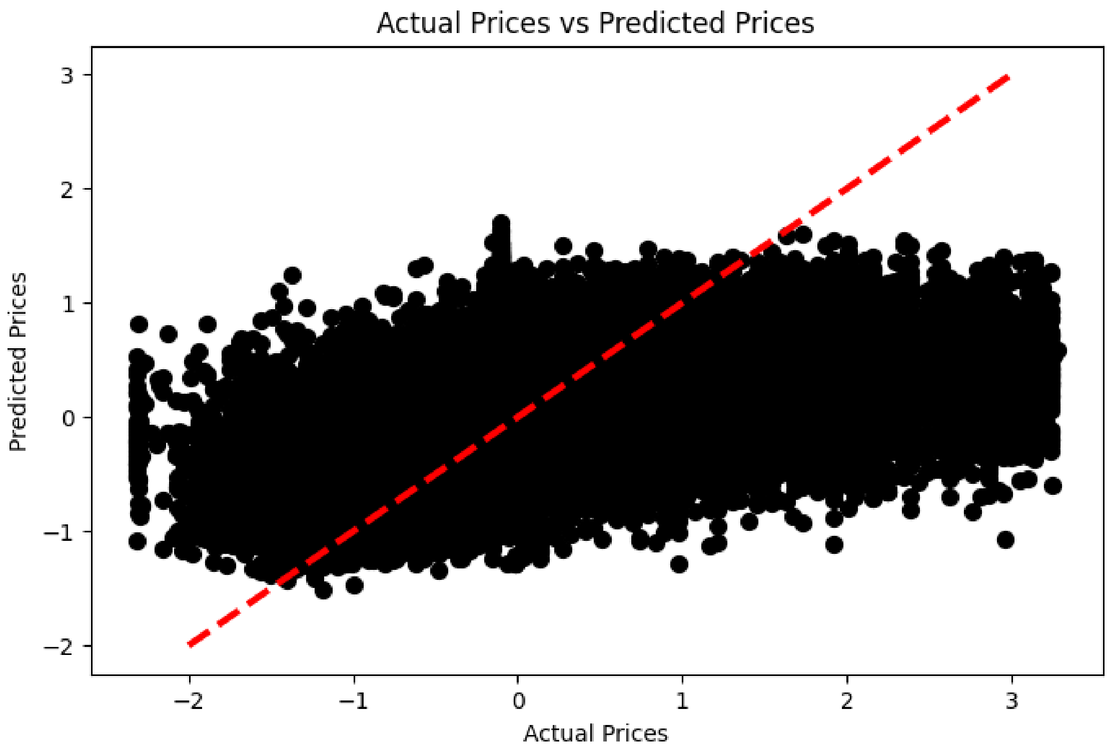
```
time_period           2790
building_age             0
total_floor_count    14082
floor_no             23442
room                  5746
living_room           6546
size                  5964
address                  0
furnished            28637
heating_type         83322
currency              1904
price                15516
dtype: int64
```

```
(225737, 12)
   time_period  building_age  total_floor_count  floor_no  room  living_room  \
0            0             7                  6        28     3            1
1            0             0                  7         0     4            1
2            0             0                  5         0     3            1
3            0             0                  6        17     2            1
4            0             0                  6        13     1            1

    size  address  furnished  heating_type  currency          price
0  130.0     2564          1             8         2  308794.894203
1  175.0      517          1             8         2  209500.000000
2  125.0      760          1             8         2  210000.000000
3   72.0     4583          1             8         2  285000.000000
4   75.0     4494          1             8         2  139000.000000
```

[ ]:
```
scaler = StandardScaler()
X =␣
 ↪df[['time_period','building_age','total_floor_count','floor_no','room','living_room','size'
X = scaler.fit_transform(X)

y = df['price'].values.reshape(-1,1)
y = scaler.fit_transform(y)

X_train, X_test, y_train, y_test2 = train_test_split(X, y, test_size=0.2,␣
 ↪random_state=42)

regressor.fit(X_train, y_train)
y_pred2 = regressor.predict(X_test)
print('MSE:', mean_squared_error(y_test2, y_pred2))
```

```
MSE: 0.775443656516242
```

[ ]:
```
import matplotlib.pyplot as plt

plt.figure(figsize=(8, 5))

plt.scatter(y_test2, y_pred2, s=50, color='black')

plt.xlabel('Actual Prices')
plt.ylabel('Predicted Prices')
plt.title('Actual Prices vs Predicted Prices')

plt.plot([-2,3],[-2,3] ,color='red', label='Regression line', linewidth=3,␣
 ↪linestyle='--')

plt.show()
```


Actual Prices vs Predicted Prices
Predicted Prices
3
2
1
0
−1
−2
Actual Prices
−2
−1
0
1
2
3

```
[ ]:
```