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ДИСЦИПЛИНА:
«ТМО»

Отчет по рубежному контролю №2
Вариант 13

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Импорт библиотек

In [1]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from pandas.plotting import scatter_matrix
import warnings
warnings.filterwarnings('ignore')
sns.set(style="ticks")
%matplotlib inline
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.metrics import mean_absolute_error, mean_squared_error,  median_absolute_error, r2_score
```

In [2]:
```
data = pd.read_csv('marvel.csv', sep = ';' )
data = data.fillna(0)
```

In [3]:
```
data.head()
```

Out[3]:

	page_id	name	urlslug	ID	ALIGN	EYE	HAIR	SEX	GSM	ALIVE	APPEARANCES	FIRST APPEARANCE
0	1678	Spider-Man (Peter Parker)	\/Spider-Man_(Peter_Parker)	Secret Identity	Good Characters	Hazel Eyes	Brown Hair	Male Characters	0	Living Characters	4043	Aug-62
1	7139	Captain America (Steven Rogers)	\/Captain_America_(Steven_Rogers)	Public Identity	Good Characters	Blue Eyes	White Hair	Male Characters	0	Living Characters	3360	Mar-41
2	64786	Wolverine (James \"Logan\" Howlett)	\/Wolverine_(James_%22Logan%22_Howlett)	Public Identity	Neutral Characters	Blue Eyes	Black Hair	Male Characters	0	Living Characters	3061	Oct-74
3	1868	Iron Man (Anthony \"Tony\" Stark)	\/Iron_Man_(Anthony_%22Tony%22_Stark)	Public Identity	Good Characters	Blue Eyes	Black Hair	Male Characters	0	Living Characters	2961	Mar-63
4	2460	Thor (Thor Odinson)	\/Thor_(Thor_Odinson)	No Dual Identity	Good Characters	Blue Eyes	Blond Hair	Male Characters	0	Living Characters	2258	Nov-50

In [4]:
```
data.dtypes
```

Out[4]:
```
page_id               int64
name                 object
urlslug              object
ID                   object
ALIGN                object
EYE                  object
HAIR                 object
SEX                  object
GSM                  object
ALIVE                object
APPEARANCES           int64
FIRST APPEARANCE     object
Year                float64
dtype: object
```

In [5]:
```
data.isnull().sum()
# проверим есть ли пропущенные значения
```

Out[5]:
```
page_id             0
name                0
urlslug             0
ID                  0
ALIGN               0
EYE                 0
HAIR                0
SEX                 0
GSM                 0
ALIVE               0
APPEARANCES         0
FIRST APPEARANCE    0
Year                0
dtype: int64
```

In [6]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 309 entries, 0 to 308
Data columns (total 13 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   page_id           309 non-null    int64  
 1   name              309 non-null    object 
 2   urlslug           309 non-null    object 
 3   ID                309 non-null    object 
 4   ALIGN             309 non-null    object 
 5   EYE               309 non-null    object 
 6   HAIR              309 non-null    object 
 7   SEX               309 non-null    object 
 8   GSM               309 non-null    object 
 9   ALIVE             309 non-null    object 
 10  APPEARANCES       309 non-null    int64  
 11  FIRST APPEARANCE  309 non-null    object 
 12  Year              309 non-null    float64
dtypes: float64(1), int64(2), object(10)
memory usage: 31.5+ KB
```

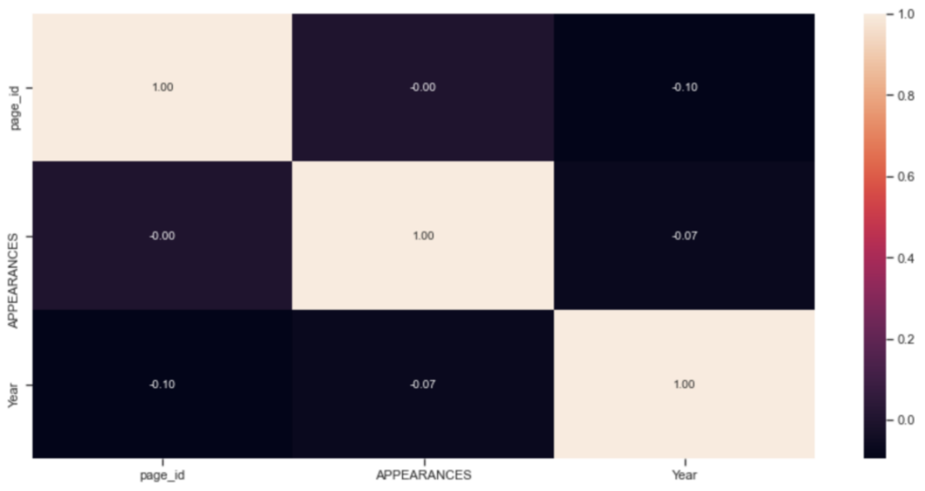
In [7]:
```
data.head()
```

Out[7]:

	page_id	name	urlslug	ID	ALIGN	EYE	HAIR	SEX	GSM	ALIVE	APPEARANCES	FIRST APPEARANCE
0	1678	Spider-Man (Peter Parker)	\/Spider-Man_(Peter_Parker)	Secret Identity	Good Characters	Hazel Eyes	Brown Hair	Male Characters	0	Living Characters	4043	Aug-62
1	7139	Captain America (Steven Rogers)	\/Captain_America_(Steven_Rogers)	Public Identity	Good Characters	Blue Eyes	White Hair	Male Characters	0	Living Characters	3360	Mar-41
2	64786	Wolverine (James \"Logan\" Howlett)	\/Wolverine_(James_%22Logan%22_Howlett)	Public Identity	Neutral Characters	Blue Eyes	Black Hair	Male Characters	0	Living Characters	3061	Oct-74
3	1868	Iron Man (Anthony \"Tony\" Stark)	\/Iron_Man_(Anthony_%22Tony%22_Stark)	Public Identity	Good Characters	Blue Eyes	Black Hair	Male Characters	0	Living Characters	2961	Mar-63
4	2460	Thor (Thor Odinson)	\/Thor_(Thor_Odinson)	No Dual Identity	Good Characters	Blue Eyes	Blond Hair	Male Characters	0	Living Characters	2258	Nov-50

In [8]:
```
#Построим корреляционную матрицу
fig, ax = plt.subplots(figsize=(15,7))
sns.heatmap(data.corr(method='pearson'), ax=ax, annot=True, fmt='.2f')
```

```
Out[8]: <AxesSubplot:>
```



```
In [9]: X = data.drop(['name','urlslug','ID','ALIGN','EYE','HAIR','SEX','GSM', 'ALIVE','FIRST APPEARANCE','APPEARANCES'], axis
        Y = data.APPEARANCES
        print('Входные данные:\n\n', X.head(), '\n\nВыходные данные:\n\n', Y.head())
```

```
Входные данные:

    page_id    Year
0     1678  1962.0
1     7139  1941.0
2    64786  1974.0
3     1868  1963.0
4     2460  1950.0

Выходные данные:

 0    4043
1    3360
2    3061
3    2961
4    2258
Name: APPEARANCES, dtype: int64
```

```
In [10]: X_train,  X_test,  Y_train,  Y_test = train_test_split(X,  Y, random_state = 0, test_size = 0.1)
         print('Входные параметры обучающей выборки:\n\n',X_train.head(), \
               '\n\nВходные параметры тестовой выборки:\n\n', X_test.head(), \
               '\n\nВыходные параметры обучающей выборки:\n\n', Y_train.head(), \
               '\n\nВыходные параметры тестовой выборки:\n\n', Y_test.head())
```

```
Входные параметры обучающей выборки:

      page_id    Year
144     1808  1962.0
256     2624  1970.0
252     1756  1978.0
116     1161  1978.0
161     2034  1963.0

Входные параметры тестовой выборки:

      page_id    Year
63      1285  1976.0
231     2065  1969.0
167     2309  1983.0
159     1029  1967.0
189     8844  1964.0

Выходные параметры обучающей выборки:
```

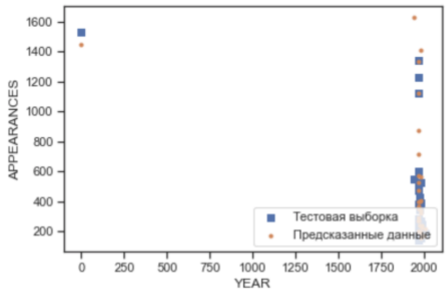
```
In [11]: from sklearn.ensemble import RandomForestRegressor
```

```
In [12]: forest_1 = RandomForestRegressor(n_estimators=5, oob_score=True, random_state=10)
         forest_1.fit(X_train,Y_train)
```

```
Out[12]: RandomForestRegressor(n_estimators=5, oob_score=True, random_state=10)
```

```
In [13]: pred_y = forest_1.predict(X_test)
```

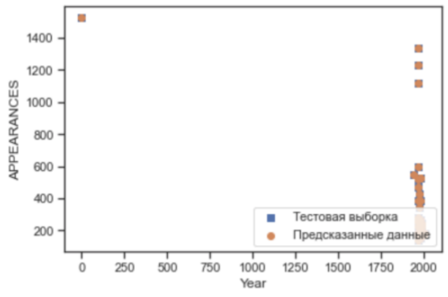
In [14]:
```
plt.scatter(X_test.Year, Y_test,    marker = 's', label = 'Тестовая выборка')
plt.scatter(X_test.Year, pred_y, marker = '.', label = 'Предсказанные данные')
plt.legend (loc = 'lower right')
plt.xlabel ('YEAR')
plt.ylabel ('APPEARANCES')
plt.show()
```



In [15]:
```
from sklearn.tree import DecisionTreeClassifier, DecisionTreeRegressor, export_graphviz
from sklearn.tree import export_graphviz
from sklearn import tree
import re
```

In [16]:
```
clf = tree.DecisionTreeClassifier()
clf = clf.fit(X, Y)
lr_y_pred = clf.predict(X_test)
```

In [17]:
```
plt.scatter(X_test.Year, Y_test,    marker = 's', label = 'Тестовая выборка')
plt.scatter(X_test.Year, lr_y_pred, marker = 'o', label = 'Предсказанные данные')
plt.legend (loc = 'lower right')
plt.xlabel ('Year')
plt.ylabel ('APPEARANCES')
plt.show()
```


APPEARANCES
Year
■ Тестовая выборка
● Предсказанные данные