РК ИУ5-62Б

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.svm import SVC , LinearSVC
from sklearn.datasets.samples_generator import make_blobs
from sklearn.svm import SVR
from sklearn.model_selection import GridSearchCV
from matplotlib import pyplot as plt
from sklearn.metrics import mean_absolute_error, mean_squared_error,  median_absolute_error, r2_score
```

In [2]:
```
data = pd.read_csv('toy.csv', sep = ';')
data.head()
```

Out[2]:

	Number	City	Gender	Age	Income	Illness	Unnamed: 6
0	1	Dallas	Male	41	40367.0	No	NaN
1	2	Dallas	Male	54	45084.0	No	NaN
2	3	Dallas	Male	42	52483.0	No	NaN
3	4	Dallas	Male	40	40941.0	No	NaN
4	5	Dallas	Male	46	50289.0	No	NaN

In [3]:
```
data.dtypes
```

Out[3]:
```
Number           int64
City            object
Gender          object
Age              int64
Income         float64
Illness         object
Unnamed: 6     float64
dtype: object
```

In [4]:
```
data['Gender'].value_counts()
```

Out[4]:
```
Male      145
Female    119
Name: Gender, dtype: int64
```

In [5]:
```
data['Illness'].value_counts()
```

Out[5]:
```
No     240
Yes     24
Name: Illness, dtype: int64
```

In [6]:
```
data['IsGender']=data.Gender.replace({'Female':0,'Male':1})
data.drop('Gender', axis = 1, inplace = True)
data['IsIllness']=data.Illness.replace({'No':0,'Yes':1})
data.drop('Illness', axis = 1, inplace = True)
```

In [7]:
```
data.isnull().sum()
# проверим есть ли пропущенные значения
```

Out[7]:
```
Number          0
City            0
Age             0
Income          0
Unnamed: 6    264
IsGender        0
IsIllness       0
dtype: int64
```

In [8]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 264 entries, 0 to 263
Data columns (total 7 columns):
 #   Column      Non-Null Count  Dtype  
---  ------      --------------  -----  
 0   Number      264 non-null    int64  
 1   City        264 non-null    object 
 2   Age         264 non-null    int64  
 3   Income      264 non-null    float64
 4   Unnamed: 6  0 non-null      float64
 5   IsGender    264 non-null    int64  
 6   IsIllness   264 non-null    int64  
dtypes: float64(2), int64(4), object(1)
memory usage: 14.6+ KB
```

In [9]:
```
data.head()
```

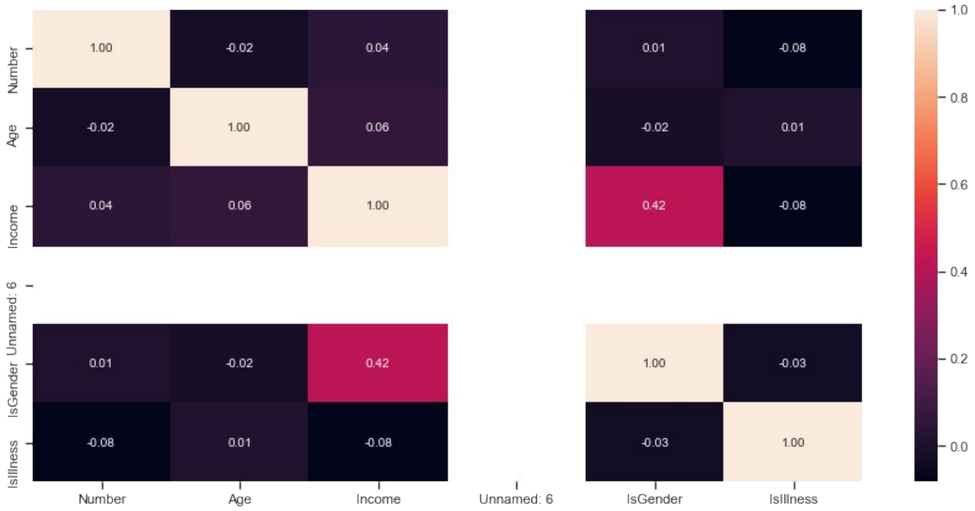
Out[9]:

	Number	City	Age	Income	Unnamed: 6	IsGender	IsIllness
0	1	Dallas	41	40367.0	NaN	1	0
1	2	Dallas	54	45084.0	NaN	1	0
2	3	Dallas	42	52483.0	NaN	1	0
3	4	Dallas	40	40941.0	NaN	1	0
4	5	Dallas	46	50289.0	NaN	1	0

In [10]:

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

Out[10]: <AxesSubplot:>



In [11]:

```
X = data[["Number","IsGender"]]
Y = data.Income
print('Входные данные:\n\n', X.head(), '\n\nВыходные данные:\n\n', Y.head())
```

```
Входные данные:

    Number  IsGender
0        1         1
1        2         1
2        3         1
3        4         1
4        5         1

Выходные данные:

 0    40367.0
1    45084.0
2    52483.0
3    40941.0
4    50289.0
Name: Income, dtype: float64
```

In [12]:

```
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:

      Number  IsGender
45        46         0
241      242         1
74        75         0
201      202         1
258      259         1

Входные параметры тестовой выборки:

      Number  IsGender
136      137         1
101      102         1
240      241         1
8          9         1
181      182         1

Выходные параметры обучающей выборки:

 45     40661.0
241    61320.0
74     27897.0
201    32404.0
258    51490.0
Name: Income, dtype: float64

Выходные параметры тестовой выборки:

 136    43573.0
101    48433.0
240    23579.0
8      68667.0
181    48899.0
Name: Income, dtype: float64
```

```
In [13]: from sklearn.ensemble import RandomForestRegressor
```

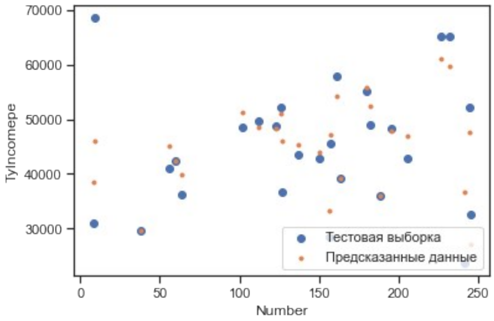
```
In [14]: forest_1 = RandomForestRegressor(n_estimators=5, oob_score=True, random_state=10)
         forest_1.fit(X, Y)

Out[14]: RandomForestRegressor(n_estimators=5, oob_score=True, random_state=10)
```

```
In [15]: Y_predict = forest_1.predict(X_test)
         print('Средняя абсолютная ошибка:',    mean_absolute_error(Y_test, Y_predict))
         print('Средняя квадратичная ошибка:', mean_squared_error(Y_test, Y_predict))
         print('Median absolute error:',       median_absolute_error(Y_test, Y_predict))
         print('Коэффициент детерминации:',    r2_score(Y_test, Y_predict))

         Средняя абсолютная ошибка: 4009.0148148148146
         Средняя квадратичная ошибка: 38785407.00888889
         Median absolute error: 3479.199999999997
         Коэффициент детерминации: 0.6951589334459994
```

```
In [16]: plt.scatter(X_test.Number, Y_test,    marker = 'o', label = 'Тестовая выборка')
         plt.scatter(X_test.Number, Y_predict, marker = '.', label = 'Предсказанные данные')
         plt.legend(loc = 'lower right')
         plt.xlabel('Number')
         plt.ylabel('TyIncomepe')
         plt.show()
```



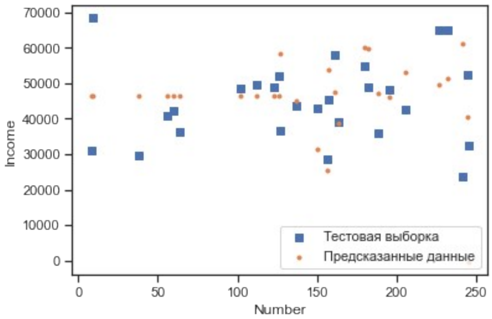
```
In [17]: from sklearn.svm import SVC , LinearSVC
         from sklearn.pipeline import make_pipeline
         from matplotlib import pyplot as plt
         from sklearn.preprocessing import StandardScaler
```

```
In [18]: svc = clf = make_pipeline(StandardScaler(), SVC(gamma='auto'))
         svc.fit(X_train,Y_train)

Out[18]: Pipeline(steps=[('standardscaler', StandardScaler()),
                         ('svc', SVC(gamma='auto'))])
```

```
In [19]: pred_y = svc.predict(X_test)
```

```
In [20]: plt.scatter(X_test.Number, Y_test,    marker = 's', label = 'Тестовая выборка')
         plt.scatter(X_test.Number, pred_y, marker = '.', label = 'Предсказанные данные')
         plt.legend (loc = 'lower right')
         plt.xlabel ('Number')
         plt.ylabel ('Income')
         plt.show()
```


70000
60000
50000
40000
30000
20000
10000
0
Income
0
50
100
150
200
250
Number
Тестовая выборка
Предсказанные данные