Винников Степан ИУ5-62Б РК№2 Вариант 9

```
# Импорт библиотек

import pandas as pd
from sklearn.preprocessing import LabelEncoder
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import r2_score, mean_squared_error
from sklearn.ensemble import RandomForestRegressor

# Загрузка датасета
data = pd.read_csv("houses_to_rent_v2.csv")

data.head()
```

```
           city  area  rooms  bathroom  parking spaces floor
animal  \
0     São Paulo    70      2         1               1     7
acept
1     São Paulo   320      4         4               0    20
acept
2  Porto Alegre    80      1         1               1     6
acept
3  Porto Alegre    51      2         1               0     2
acept
4     São Paulo    25      1         1               0     1  not
acept

       furniture  hoa (R$)  rent amount (R$)  property tax (R$)  \
0      furnished      2065              3300                211
1  not furnished      1200              4960               1750
2  not furnished      1000              2800                  0
3  not furnished       270              1112                 22
4  not furnished         0               800                 25

   fire insurance (R$)  total (R$)
0                   42        5618
1                   63        7973
2                   41        3841
3                   17        1421
4                   11         836
```

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10692 entries, 0 to 10691
```

```
Data columns (total 13 columns):
 #   Column               Non-Null Count  Dtype
---  ------               --------------  -----
 0   city                 10692 non-null  object
 1   area                 10692 non-null  int64
 2   rooms                10692 non-null  int64
 3   bathroom             10692 non-null  int64
 4   parking spaces       10692 non-null  int64
 5   floor                10692 non-null  object
 6   animal               10692 non-null  object
 7   furniture            10692 non-null  object
 8   hoa (R$)             10692 non-null  int64
 9   rent amount (R$)     10692 non-null  int64
 10  property tax (R$)    10692 non-null  int64
 11  fire insurance (R$)  10692 non-null  int64
 12  total (R$)           10692 non-null  int64
dtypes: int64(9), object(4)
memory usage: 1.1+ MB
```

```
data.isnull().sum()
```

```
city                   0
area                   0
rooms                  0
bathroom               0
parking spaces         0
floor                  0
animal                 0
furniture              0
hoa (R$)               0
rent amount (R$)       0
property tax (R$)      0
fire insurance (R$)    0
total (R$)             0
dtype: int64
```

```
data = data[data['total (R$)'] <= 10000]
```

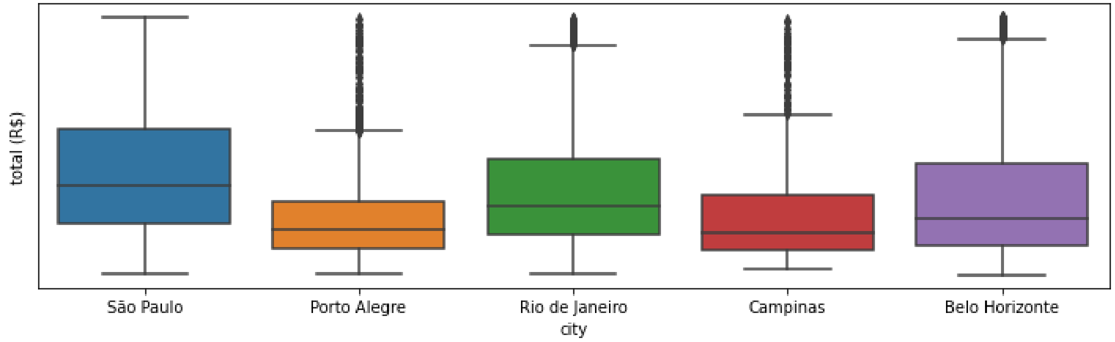
```
cols = data.columns
cols = list(cols)
cols.remove('area')
cols.remove('floor')
```

```
fig, axes = plt.subplots(nrows=6, ncols=1, figsize=(10, 20),
subplot_kw={'xticks': [], 'yticks': []})
```

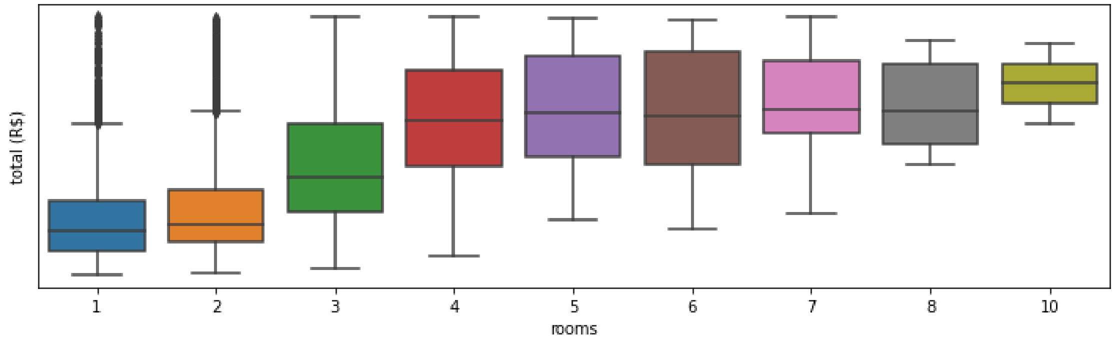
```
for i, ax in enumerate(axes.flat):
    col = cols[i]
    sns.boxplot(x=col,y='total (R$)', data = data, ax = ax)
    ax.set_title(f"Цены в зависимости от {col.capitalize()}")
```

```
plt.tight_layout()
plt.show()
```

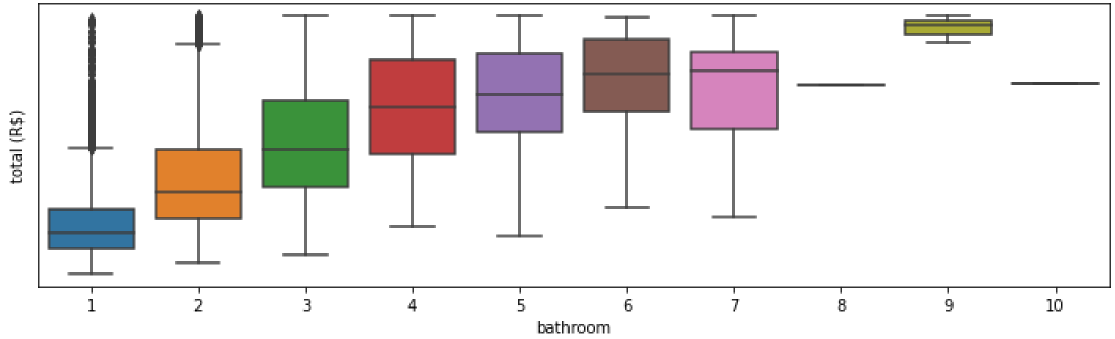
Цены в зависимости от City



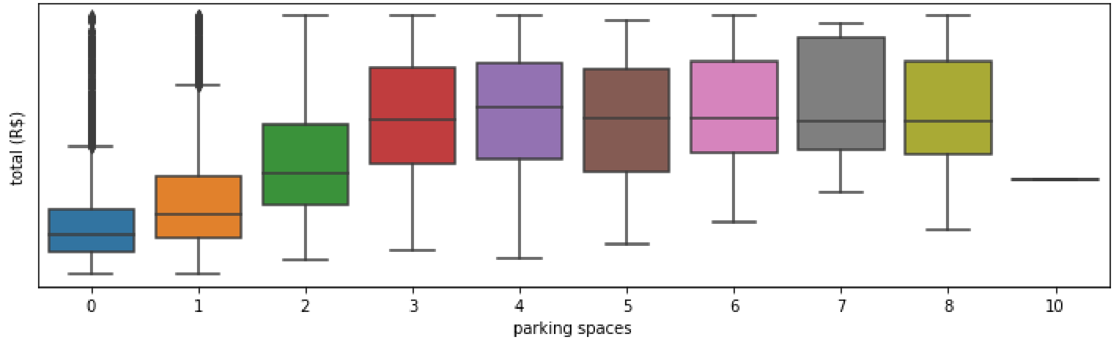
Цены в зависимости от Rooms



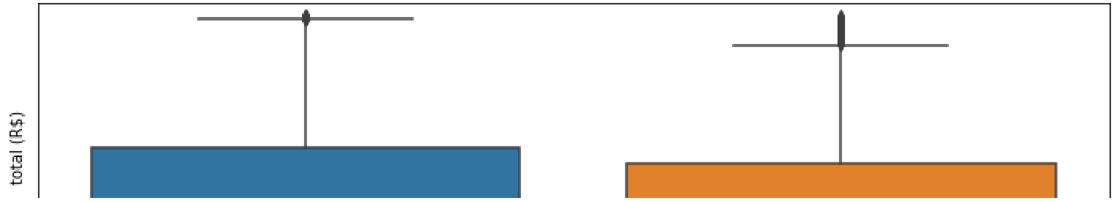
Цены в зависимости от Bathroom



Цены в зависимости от Parking spaces



Цены в зависимости от Animal

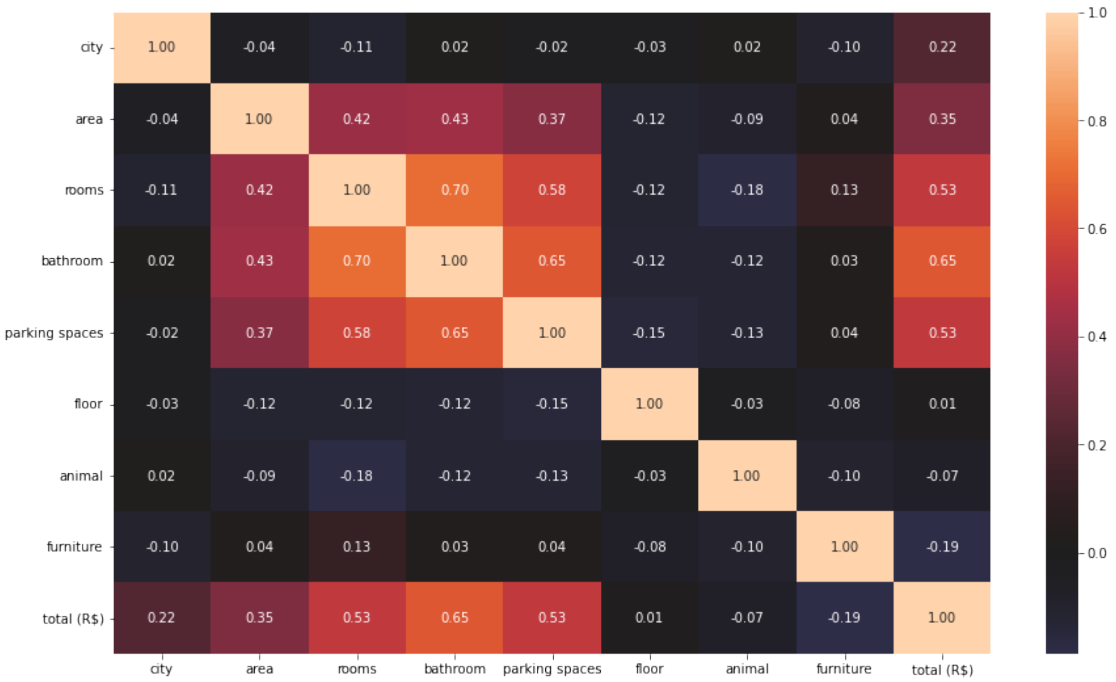


```
# Удаляем ненужные колонки
data = data.drop(['hoa (R$)', 'rent amount (R$)','property tax (R$)',
'fire insurance (R$)'], axis = 1)

#Кодирование категориальных признаков
LE = LabelEncoder()
for col in data.columns:
    if data[col].dtype == "object":
        data[col] = LE.fit_transform(data[col])

data.head()
```

```
   city  area  rooms  bathroom  parking spaces  floor  animal
furniture  \
0     4    70      2         1               1     30       0
0
1     4   320      4         4               0     13       0
1
2     2    80      1         1               1     29       0
1
3     2    51      2         1               0     12       0
1
4     4    25      1         1               0      1       1
1

   total (R$)
0        5618
1        7973
2        3841
3        1421
4         836
```

```
# Построение корреляционной матрицы
fig, ax = plt.subplots(figsize=(15,9))
sns.heatmap(data.corr(method="pearson"), ax=ax,annot=True, fmt=".2f",
center=0)
```

```
<AxesSubplot:>
```



```
# Разделение выборки на обучающую и тестовую
target = "total (R$)"
xArray = data.drop(target, axis=1)
yArray = data[target]
trainX, testX, trainY, testY = train_test_split(xArray, yArray,
test_size=0.2, random_state=1)
```

```
# Линейная регрессия
LR = LinearRegression()
LR.fit(trainX, trainY)
```

```
LinearRegression()
```

```
R2_LR = r2_score(testY, LR.predict(testX))
RMSE_LR = mean_squared_error(testY, LR.predict(testX), squared=True)
```

```
print("Качество модели по коэф. дет.: {}".format(R2_LR))
print("Корень из средней квадратичной ошибки: {}".format(RMSE_LR))
```

```
Качество модели по коэф. дет.: 0.5751195955306787
Корень из средней квадратичной ошибки: 2188850.908367666
```

```
# Случайный лес
RT = RandomForestRegressor(n_estimators=10, random_state=1)
RT.fit(trainX, trainY)
```

```
RandomForestRegressor(n_estimators=10, random_state=1)
```

```
R2_RT = r2_score(testY, RT.predict(testX))
```

```
RMSE_RT= mean_squared_error(testY, RT.predict(testX), squared=True)
```

```
print("Качество модели по коэф. дет.: {}".format(R2_RT))
print("Корень из средней квадратичной ошибки: {}".format(RMSE_RT))
```

```
Качество модели по коэф. дет.: 0.6358583585661002
Корень из средней квадратичной ошибки: 1875943.804992861
```