РК ИУ5

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_err
or, r2_score
```

In [2]:

```
data = pd.read_csv('restaurant-scores-lives-standard.csv')
```

In [3]:

```
data['business_latitude'] = data['business_latitude'].replace(0,np.nan)
data['business_latitude'] = data['business_latitude'].fillna(data['business_latitude'].me
an())
data['Zip Codes'] = data['Zip Codes'].replace(0,np.nan)
data['Zip Codes'] = data['Zip Codes'].fillna(data['Zip Codes'].mean())
data['Supervisor Districts'] = data['Supervisor Districts'].replace(0,np.nan)
data['Supervisor Districts'] = data['Supervisor Districts'].fillna(data['Supervisor Dist
ricts'].mean())
```

In [4]:

```
data.head()
```

Out[4]:

	business_id	business_name	business_address	business_city	business_state	business_postal_code	business_latitude	bus
0	101192	Cochinita #2	2 Marina Blvd Fort Mason	San Francisco	CA	NaN	37.771619	
1	97975	BREADBELLY	1408 Clement St	San Francisco	CA	94118	37.771619	
2	92982	Great Gold Restaurant	3161 24th St.	San Francisco	CA	94110	37.771619	
3	101389	HOMAGE	214 CALIFORNIA ST	San Francisco	CA	94111	37.771619	
4	85986	Pronto Pizza	798 Eddy St	San Francisco	CA	94109	37.771619	

5 rows × 23 columns

In [5]:

```
data.dtypes
```

Out[5]:

```
business_id                      int64
business_name                   object
business_address                object
business_city                   object
business_state                  object
business_postal_code            object
business_latitude              float64
business_longitude             float64
business_location               object
business_phone_number          float64
inspection_id                   object
inspection_date                 object
inspection_score               float64
inspection_type                 object
violation_id                    object
violation_description           object
risk_category                   object
Neighborhoods (old)            float64
Police Districts               float64
Supervisor Districts           float64
Fire Prevention Districts      float64
Zip Codes                      float64
Analysis Neighborhoods         float64
dtype: object
```

In [6]:

```
data.isnull().sum()
# проверим есть ли пропущенные значения
```

Out[6]:

```
business_id                      0
business_name                    0
business_address                 0
business_city                    0
business_state                   0
business_postal_code          1018
business_latitude                0
business_longitude           19556
business_location            19556
business_phone_number        36938
inspection_id                    0
inspection_date                  0
inspection_score             13610
inspection_type                  0
violation_id                 12870
violation_description        12870
risk_category                12870
Neighborhoods (old)          19594
Police Districts             19594
Supervisor Districts             0
Fire Prevention Districts    19646
Zip Codes                        0
Analysis Neighborhoods       19594
dtype: int64
```

In [7]:

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 53973 entries, 0 to 53972
Data columns (total 23 columns):
 #   Column                     Non-Null Count  Dtype
---  ------                     --------------  -----
 0   business_id                53973 non-null  int64
 1   business_name              53973 non-null  object
 2   business_address           53973 non-null  object
 3   business_city              53973 non-null  object
```

```
 4   business_state            53973 non-null  object
 5   business_postal_code      52955 non-null  object
 6   business_latitude         53973 non-null  float64
 7   business_longitude        34417 non-null  float64
 8   business_location         34417 non-null  object
 9   business_phone_number     17035 non-null  float64
 10  inspection_id             53973 non-null  object
 11  inspection_date           53973 non-null  object
 12  inspection_score          40363 non-null  float64
 13  inspection_type           53973 non-null  object
 14  violation_id              41103 non-null  object
 15  violation_description     41103 non-null  object
 16  risk_category             41103 non-null  object
 17  Neighborhoods (old)       34379 non-null  float64
 18  Police Districts          34379 non-null  float64
 19  Supervisor Districts      53973 non-null  float64
 20  Fire Prevention Districts 34327 non-null  float64
 21  Zip Codes                 53973 non-null  float64
 22  Analysis Neighborhoods    34379 non-null  float64
dtypes: float64(10), int64(1), object(12)
memory usage: 9.5+ MB
```

In [8]:

```
data.head()
```

Out[8]:

	business_id	business_name	business_address	business_city	business_state	business_postal_code	business_latitude	bus
0	101192	Cochinita #2	2 Marina Blvd Fort Mason	San Francisco	CA	NaN	37.771619	
1	97975	BREADBELLY	1408 Clement St	San Francisco	CA	94118	37.771619	
2	92982	Great Gold Restaurant	3161 24th St.	San Francisco	CA	94110	37.771619	
3	101389	HOMAGE	214 CALIFORNIA ST	San Francisco	CA	94111	37.771619	
4	85986	Pronto Pizza	798 Eddy St	San Francisco	CA	94109	37.771619	

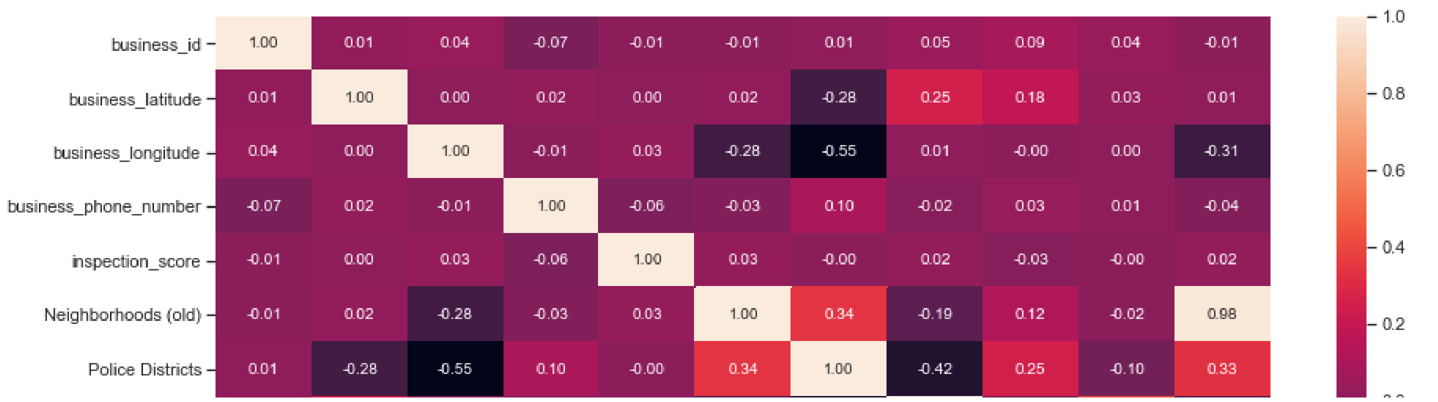
5 rows × 23 columns

In [9]:

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

Out[9]:

<AxesSubplot:>



In [10]:

```
X = data[["business_latitude","Zip Codes"]].astype(int)
Y = data["Supervisor Districts"].astype(int)
print('Входные данные:\n\n', X.head(), '\n\nВыходные данные:\n\n', Y.head())
```

```
Входные данные:

    business_latitude  Zip Codes
0                  37      20035
1                  37      20035
2                  37      20035
3                  37      20035
4                  37      20035

Выходные данные:

 0    7
1    7
2    7
3    7
4    7
Name: Supervisor Districts, dtype: int64
```

In [11]:

```
X_train,  X_test,  Y_train,  Y_test = train_test_split(X,  Y, random_state = 0, test_siz
e = 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:

        business_latitude  Zip Codes
24563                  37         56
19664                  37      28858
37837                  37      28858
33205                  37      20035
42332                  37      28859

Входные параметры тестовой выборки:

        business_latitude  Zip Codes
26331                  37      28859
23548                  37      28859
51798                  37      28862
34929                  37      20035
13447                  37      20035

Выходные параметры обучающей выборки:

 24563    11
19664     1
37837    10
33205     7
```

```
42332     7
Name: Supervisor Districts, dtype: int64

Выходные параметры тестовой выборки:

 26331     7
23548     7
51798     5
34929     7
13447     7
Name: Supervisor Districts, dtype: int64
```

In [12]:

```
from sklearn.svm import SVC , LinearSVC
from sklearn.pipeline import make_pipeline
from matplotlib import pyplot as plt
from sklearn.preprocessing import StandardScaler
```

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)
```

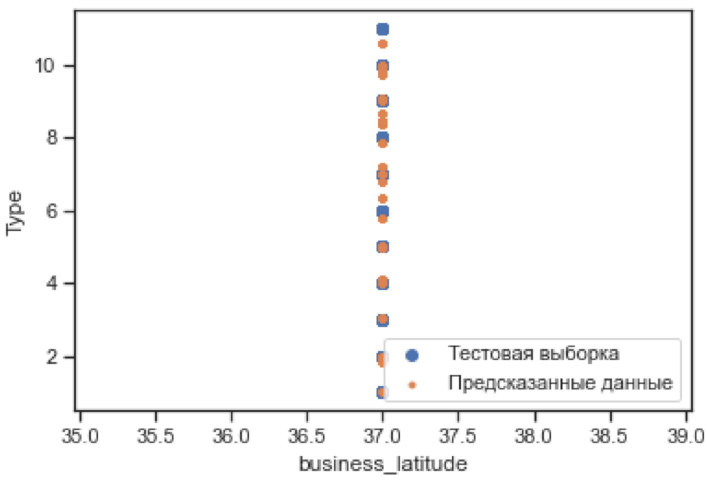
In [15]:

```
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: 0.5076807798166314
Средняя квадратичная ошибка: 1.757219197347261
Median absolute error: 0.06266219287253794
Коэффициент детерминации: 0.7249758023646331
```

In [16]:

```
plt.scatter(X_test.business_latitude, Y_test,    marker = 'o', label = 'Тестовая выборка
')
plt.scatter(X_test.business_latitude, Y_predict, marker = '.', label = 'Предсказанные да
нные')
plt.legend(loc = 'lower right')
plt.xlabel('business_latitude')
plt.ylabel('Type')
plt.show()
```



In [17]:

```
svc = clf = make_pipeline(StandardScaler(), SVC(gamma='auto'))
svc.fit(X_train,Y_train)
```

Out[17]:

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

In [18]:

```
pred_y = svc.predict(X_test)
```

In [19]:

```
plt.scatter(X_test.business_latitude, Y_test,    marker = 's', label = 'Тестовая выборка
')
plt.scatter(X_test.business_latitude, pred_y, marker = '.', label = 'Предсказанные данны
е')
plt.legend (loc = 'lower right')
plt.xlabel ('business_latitude')
plt.ylabel ('Type')
plt.show()
```