In [161…
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
```

In [162…
```
data = pd.read_csv('restaurant-scores-lives-standard.csv',sep=",")
```

In [163…
```
data.shape
```

Out[163…
```
(53973, 23)
```

In [164…
```
data.dtypes
```

Out[164…
```
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 [165…
```
# проверим есть ли пропущенные значения
isnull = data.isnull().sum()
print (isnull)
```

```
business_id                      0
business_name                    0
business_address                 0
business_city                    0
business_state                   0
business_postal_code          1018
business_latitude            19556
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         19594
Fire Prevention Districts    19646
Zip Codes                    19576
Analysis Neighborhoods       19594
dtype: int64
```

Для обработки пропусков возьмём один числовой признак(inspection_score) и категориальный признак (violation_description)

Будем использовать методику импьютации, т.к. были выбраны столбцы с не огромными пропусками данных (максимум 25%)

In [166…
```
dataint = data['inspection_score']
dataint.head()
```

Out[166…
```
0     NaN
1    96.0
2     NaN
3     NaN
4     NaN
Name: inspection_score, dtype: float64
```

In [167…
```
num_cols=[]
for col in data.columns:
    if col=='inspection_score':
        num_cols.append(col)
```

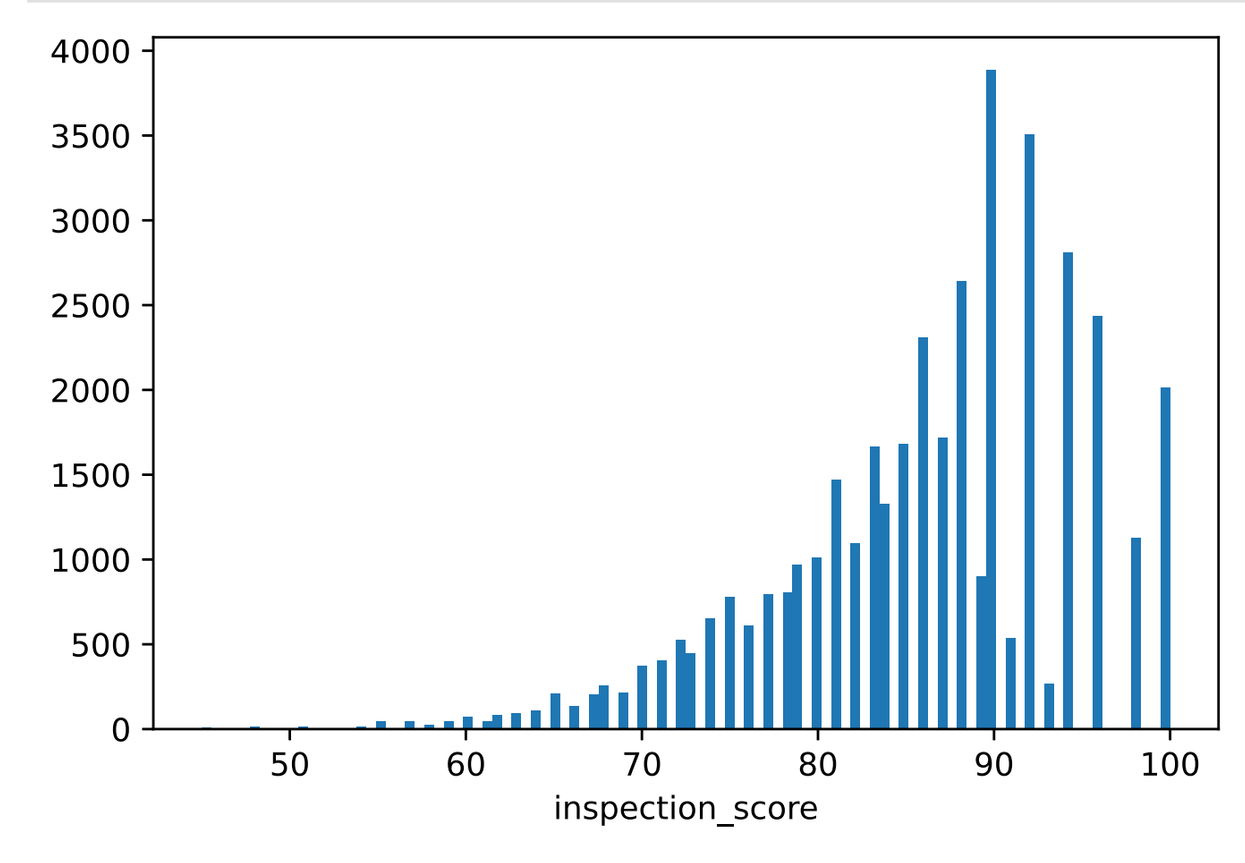
In [168…
```
sort_null_data = data[num_cols]
data_inspection = sort_null_data[['inspection_score']]
```

In [169…
```
from sklearn.impute import SimpleImputer
from sklearn.impute import MissingIndicator
```

In [170…
```
indicator = MissingIndicator()
mask_missing_values_only = indicator.fit_transform(data_inspection)
mask_missing_values_only
```

Out[170…
```
array([[ True],
       [False],
       [ True],
       ...,
       [False],
       [False],
       [False]])
```

In [171…
```
for col in num_cols:
    plt.hist(data[col], 100)
    plt.xlabel(col)
    plt.show()
```



In [172…
```
num_cols_inspection_score = sort_null_data
num_cols_inspection_score.head()
```

Out[172…

	inspection_score
0	NaN
1	96.0
2	NaN
3	NaN
4	NaN

In [173…
```
indicator = MissingIndicator()
mask_missing_values_only = indicator.fit_transform(num_cols_inspection_score)
mask_missing_values_only
```

Out[173…
```
array([[ True],
       [False],
       [ True],
       ...,
       [False],
       [False],
       [False]])
```

In [174…
```
strategies=['mean', 'median', 'most_frequent']
```

In [175…
```
def test_num_impute(strategy_param):
    imp_num = SimpleImputer(strategy=strategy_param)
    data_num_imp = imp_num.fit_transform(num_cols_inspection_score)
    return data_num_imp[mask_missing_values_only]
```

In [176…
```
strategies[0], test_num_impute(strategies[0])
```

Out[176…
```
('mean',
 array([86.22679186, 86.22679186, 86.22679186, ..., 86.22679186,
        86.22679186, 86.22679186]))
```

In [177…
```
strategies[1], test_num_impute(strategies[1])
```

Out[177…
```
('median', array([87., 87., 87., ..., 87., 87., 87.]))
```

In [178…
```
strategies[2], test_num_impute(strategies[2])
```

Out[178…
```
('most_frequent', array([90., 90., 90., ..., 90., 90., 90.]))
```

Возьмём моду для значений пропусков

In [179…
```
imp_num = SimpleImputer(strategy=strategies[2])
data_int_full = imp_num.fit_transform(num_cols_inspection_score)
data_int_full
```

Out[179…
```
array([[90.],
       [96.],
       [90.],
       ...,
       [92.],
       [76.],
       [80.]])
```

In [180…
```
num_cols_inspection_score_new = num_cols_inspection_score
num_cols_inspection_score_new = data_int_full
nmp = num_cols_inspection_score.to_numpy
data.iloc[:,12] = num_cols_inspection_score_new
##data.replace({'inspection_score' : { nmp : num_cols_inspection_score_new}})
data['inspection_score']
```

Out[180…
```
0        90.0
1        96.0
2        90.0
3        90.0
4        90.0
         ...
53968    80.0
53969    90.0
53970    92.0
53971    76.0
53972    80.0
Name: inspection_score, Length: 53973, dtype: float64
```

In [181…
```
isnull = data.isnull().sum()
print (isnull)
```

```
business_id                      0
business_name                    0
business_address                 0
business_city                    0
business_state                   0
business_postal_code          1018
business_latitude            19556
business_longitude           19556
business_location            19556
business_phone_number        36938
inspection_id                    0
inspection_date                  0
inspection_score                 0
inspection_type                  0
violation_id                 12870
violation_description        12870
risk_category                12870
Neighborhoods (old)          19594
Police Districts             19594
Supervisor Districts         19594
Fire Prevention Districts    19646
Zip Codes                    19576
Analysis Neighborhoods       19594
dtype: int64
```

Получается мы заполнили столбец новыми данными

Обработка категориальных признаков

In [182…
```
num_cols=[]
for col in data.columns:
    if col=='violation_description':
        num_cols.append(col)
```

In [183…
```
sort_null_data_obj = data[num_cols]
data_Desc = sort_null_data_obj[['violation_description']]
data_Desc.head()
```

Out[183…

	violation_description
0	NaN
1	Inadequately cleaned or sanitized food contact...
2	NaN
3	NaN
4	High risk vermin infestation

In [184…
```
implicator = SimpleImputer(missing_values=np.nan, strategy='constant', fill_value='NA')
Desc_values = implicator.fit_transform(data_Desc)
Desc_values
```

Out[184…
```
array([['NA'],
       ['Inadequately cleaned or sanitized food contact surfaces'],
       ['NA'],
       ...,
       ['Foods not protected from contamination'],
       ['Inadequate food safety knowledge or lack of certified food safety manager'],
       ['Food safety certificate or food handler card not available']],
      dtype=object)
```

In [185…
```
data_Desc['violation_description'].unique()
```

Out[185…
```
array([nan, 'Inadequately cleaned or sanitized food contact surfaces',
       'High risk vermin infestation',
       'Moderate risk food holding temperature',
       'Improper storage use or identification of toxic substances',
       'Improper or defective plumbing', 'No hot water or running water',
       'Inadequate and inaccessible handwashing facilities',
       'Low risk vermin infestation',
       'Insufficient hot water or running water',
       'Foods not protected from contamination', 'Improper food storage',
       'Unapproved or unmaintained equipment or utensils',
       'Wiping cloths not clean or properly stored or inadequate sanitizer',
       'Food safety certificate or food handler card not available',
       'Improper thawing methods', 'Improper cooling methods',
       'Unclean or degraded floors walls or ceilings',
       'Inadequate food safety knowledge or lack of certified food safety manager',
       'Other low risk violation',
       'Inadequate procedures or records for time as a public health control',
       'Unclean nonfood contact surfaces',
       'High risk food holding temperature',
       'Unclean or unsanitary food contact surfaces',
       'Noncompliance with HAACP plan or variance',
       'Permit license or inspection report not posted',
       'Inadequate dressing rooms or improper storage of personal items',
       'Unapproved  living quarters in food facility',
       'Inadequate or unsanitary refuse containers or area or no garbage service',
       'Inadequate HACCP plan record keeping',
       'Moderate risk vermin infestation',
       'Inadequate warewashing facilities or equipment',
       'Mobile food facility not operating with an approved commissary',
       'Inadequate ventilation or lighting',
       'No person in charge of food facility',
       'Unauthorized or unsafe use of time as a public health control measure',
       'Improper storage of equipment utensils or linens',
       'Unclean unmaintained or improperly constructed toilet facilities',
       'Improper reheating of food', 'Sewage or wastewater contamination',
       'Unclean hands or improper use of gloves',
       'Unpermitted food facility',
       'No thermometers or uncalibrated thermometers',
       'Inadequate sewage or wastewater disposal',
       'Contaminated or adulterated food',
       'Mobile food facility with unapproved operating conditions',
       'Employee eating or smoking',
       'Improper food labeling or menu misrepresentation',
       'Food in poor condition', 'Worker safety hazards',
       'Noncompliance with shell fish tags or display',
       'Other moderate risk violation',
       'Unsanitary employee garments hair or nails',
       'Unapproved food source',
       'Improperly washed fruits and vegetables',
       'No plan review or Building Permit',
       'No restroom facility within 200 feet of mobile food facility',
       'Improperly displayed mobile food permit or signage',
       'Consumer advisory not provided for raw or undercooked foods',
       'Noncompliance with Gulf Coast oyster regulation',
       'Other high risk violation',
       'Reservice of previously served foods',
       'Improper cooking time or temperatures', 'Non service animal',
       'Mobile food facility stored in unapproved location',
       'Discharge from employee nose mouth or eye'], dtype=object)
```

In [186…
```
data_frame = pd.DataFrame({'violation_description': Desc_values.T[0]})
```

In [187…
```
from sklearn.preprocessing import LabelEncoder, OneHotEncoder
```

In [188…
```
data_frame.head(10)
```

Out[188…

	violation_description
0	NA
1	Inadequately cleaned or sanitized food contact...
2	NA
3	NA
4	High risk vermin infestation
5	NA
6	NA
7	Inadequately cleaned or sanitized food contact...
8	Moderate risk food holding temperature
9	NA

In [189…
```
imp2 = SimpleImputer(missing_values=np.nan, strategy='most_frequent')
data_imp2 = imp2.fit_transform(data_Desc)
data_imp2
```

Out[189…
```
array([['Unclean or degraded floors walls or ceilings'],
       ['Inadequately cleaned or sanitized food contact surfaces'],
       ['Unclean or degraded floors walls or ceilings'],
       ...,
       ['Foods not protected from contamination'],
       ['Inadequate food safety knowledge or lack of certified food safety manager'],
       ['Food safety certificate or food handler card not available']],
      dtype=object)
```

In [190…
```
data.iloc[:,15] = data_imp2
data['violation_description']
```

Out[190…
```
0             Unclean or degraded floors walls or ceilings
1        Inadequately cleaned or sanitized food contact...
2             Unclean or degraded floors walls or ceilings
3             Unclean or degraded floors walls or ceilings
4                             High risk vermin infestation
                               ...
53968    Inadequately cleaned or sanitized food contact...
53969         Unclean or degraded floors walls or ceilings
53970               Foods not protected from contamination
53971    Inadequate food safety knowledge or lack of ce...
53972    Food safety certificate or food handler card n...
Name: violation_description, Length: 53973, dtype: object
```

In [191…
```
one = OneHotEncoder()
data_label_hot = one.fit_transform(data_frame)
```

In [192…
```
data_label_hot
```

Out[192…
```
<53973x66 sparse matrix of type '<class 'numpy.float64'>'
        with 53973 stored elements in Compressed Sparse Row format>
```

In [193…
```
data_label_hot.todense()[0:5]
```

Out[193…
```
matrix([[0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
         0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
         0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
         0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
         0., 0.],
        [0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
         0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 1., 0., 0., 0.,
         0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
         0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
         0., 0.],
        [0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
         0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
         0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
         0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
         0., 0.],
        [0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
         0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
         0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
         0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
         0., 0.],
        [0., 0., 0., 0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 0., 0.,
         0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
         0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
         0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
         0., 0.]])
```

Для дальнейшего построения моделей я буду использовать карелирующие признаки, потому что на их основе можно построить более качественные модели машинного обучения. Также приоритет получат те признаки, в которых отсутствует пропуск данных или он минимален.

In [ ]: