Уралова, ИУ5-65Б, РК №1

```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
sns.set(style="ticks")

data = pd.read_csv('FIFA 2018 Statistics.csv', sep=",")

data.shape
```

```
(128, 27)
```

```
data.dtypes
```

```
Date                          object
Team                          object
Opponent                      object
Goal Scored                    int64
Ball Possession %              int64
Attempts                       int64
On-Target                      int64
Off-Target                     int64
Blocked                        int64
Corners                        int64
Offsides                       int64
Free Kicks                     int64
Saves                          int64
Pass Accuracy %                int64
Passes                         int64
Distance Covered (Kms)         int64
Fouls Committed                int64
Yellow Card                    int64
Yellow & Red                   int64
Red                            int64
Man of the Match              object
1st Goal                     float64
Round                         object
PSO                           object
Goals in PSO                   int64
Own goals                    float64
Own goal Time                float64
dtype: object
```

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

```
Date                          0
Team                          0
Opponent                      0
```

```
Goal Scored                 0
Ball Possession %           0
Attempts                    0
On-Target                   0
Off-Target                  0
Blocked                     0
Corners                     0
Offsides                    0
Free Kicks                  0
Saves                       0
Pass Accuracy %             0
Passes                      0
Distance Covered (Kms)      0
Fouls Committed             0
Yellow Card                 0
Yellow & Red                0
Red                         0
Man of the Match            0
1st Goal                   34
Round                       0
PSO                         0
Goals in PSO                0
Own goals                 116
Own goal Time             116
dtype: int64
```

```
data.head()
```

```
         Date          Team      Opponent  Goal Scored  Ball
Possession %  \
0  14-06-2018        Russia  Saudi Arabia            5
40
1  14-06-2018  Saudi Arabia        Russia            0
60
2  15-06-2018         Egypt       Uruguay            0
43
3  15-06-2018       Uruguay         Egypt            1
57
4  15-06-2018       Morocco          Iran            0
64

   Attempts  On-Target  Off-Target  Blocked  Corners  ...  Yellow Card
\
0        13          7           3        3        6  ...            0

1         6          0           3        3        2  ...            0

2         8          3           3        2        0  ...            2

3        14          4           6        4        5  ...            0
```

```
4        13          3           6        4        5  ...            1


   Yellow & Red  Red  Man of the Match  1st Goal        Round  PSO  \
0             0    0               Yes      12.0  Group Stage   No
1             0    0                No       NaN  Group Stage   No
2             0    0                No       NaN  Group Stage   No
3             0    0               Yes      89.0  Group Stage   No
4             0    0                No       NaN  Group Stage   No

   Goals in PSO  Own goals  Own goal Time
0             0        NaN            NaN
1             0        NaN            NaN
2             0        NaN            NaN
3             0        NaN            NaN
4             0        1.0           90.0

[5 rows x 27 columns]
```

```
total_count = data.shape[0]
print('Всего строк: {}'.format(total_count))
```

```
Всего строк: 128
```

```
# Выберем числовые колонки с пропущенными значениями
# Цикл по колонкам датасета
num_cols = []
for col in data.columns:
    # Количество пустых значений
    temp_null_count = data[data[col].isnull()].shape[0]
    dt = str(data[col].dtype)
    if temp_null_count>0 and (dt=='float64' or dt=='int64'):
        num_cols.append(col)
        temp_perc = round((temp_null_count / total_count) * 100.0, 2)
        print('Колонка {}. Тип данных {}. Количество пустых значений
{}, {}%.'.format(col, dt, temp_null_count, temp_perc))
```

```
Колонка 1st Goal. Тип данных float64. Количество пустых значений 34,
26.56%.
Колонка Own goals. Тип данных float64. Количество пустых значений 116,
90.62%.
Колонка Own goal Time. Тип данных float64. Количество пустых значений
116, 90.62%.
```

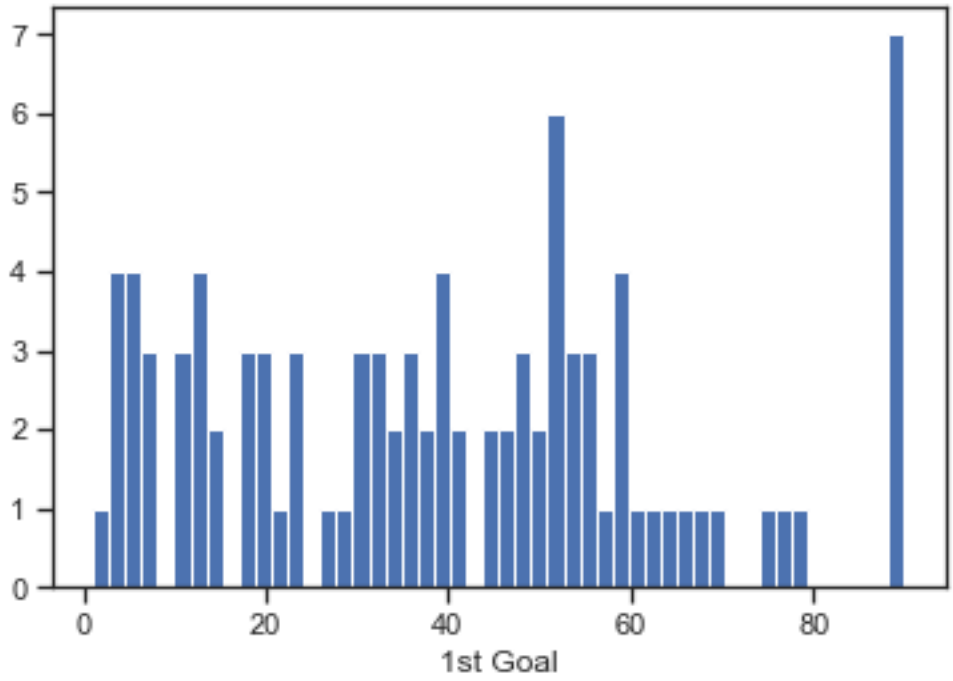
```
data_num = data[num_cols]
data_num
```

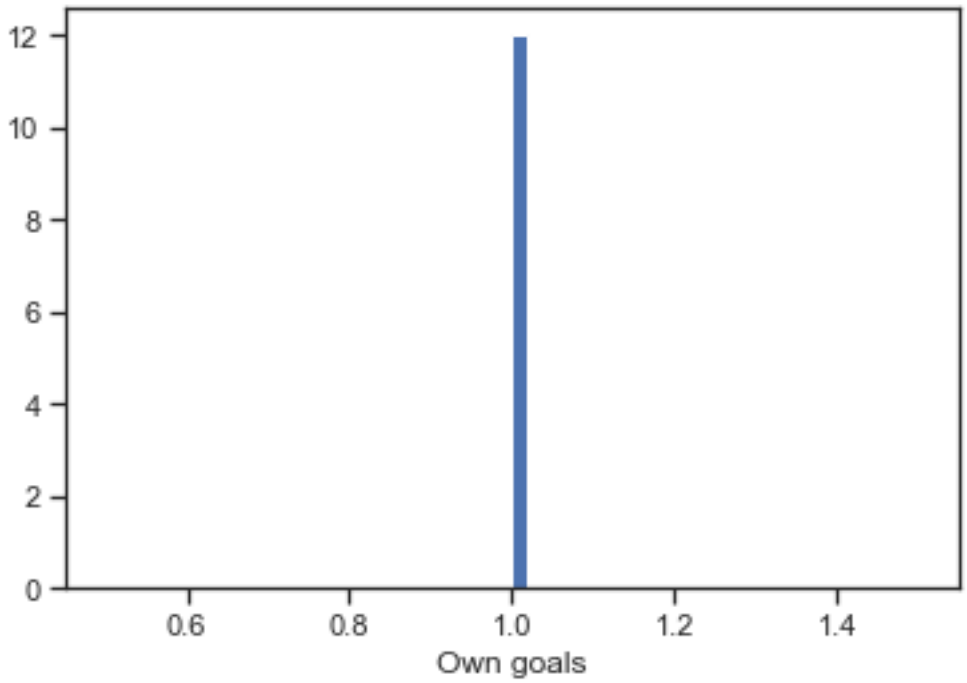
```
     1st Goal  Own goals  Own goal Time
0        12.0        NaN            NaN
1         NaN        NaN            NaN
```

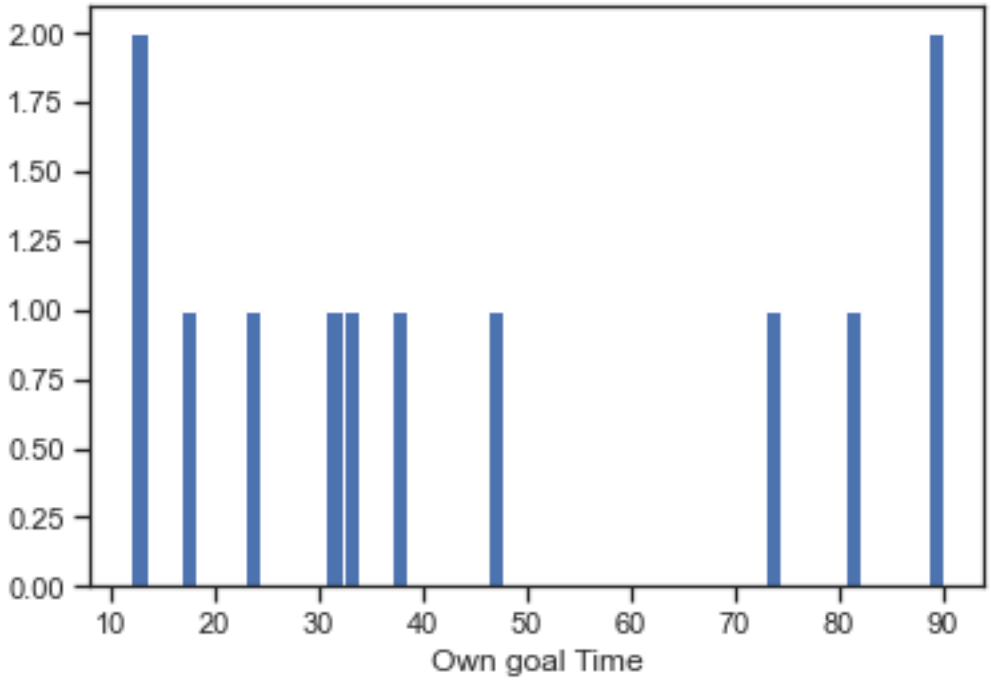
```
2          NaN        NaN            NaN
3         89.0        NaN            NaN
4          NaN        1.0           90.0
..         ...        ...            ...
123        5.0        NaN            NaN
124        4.0        NaN            NaN
125        NaN        NaN            NaN
126       18.0        1.0           18.0
127       28.0        NaN            NaN

[128 rows x 3 columns]
```

```python
for col in data_num:
    plt.hist(data[col], 50)
    plt.xlabel(col)
    plt.show()
```








```
# Будем рассматривать 1st Goal, так как в двух других признаках
процент пропусков около 90%
data_num_1stGoal = data_num[['1st Goal']]
data_num_1stGoal.head()
```

```
   1st Goal
0      12.0
1       NaN
```

```
2       NaN
3      89.0
4       NaN
```

```
from sklearn.impute import SimpleImputer
from sklearn.impute import MissingIndicator
```

```
indicator = MissingIndicator()
mask_missing_values_only = indicator.fit_transform(data_num_1stGoal)
mask_missing_values_only
```

```
array([[False],
       [ True],
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```

```
strategies=['mean', 'median', 'most_frequent']
```

```
def test_num_impute(strategy_param):
    imp_num = SimpleImputer(strategy=strategy_param)
    data_num_imp = imp_num.fit_transform(data_num_1stGoal)
    return data_num_imp[mask_missing_values_only]
```

```
strategies[0], test_num_impute(strategies[0])
```

```
('mean',
 array([39.45744681, 39.45744681, 39.45744681, 39.45744681,
39.45744681,
```

```
        39.45744681, 39.45744681, 39.45744681, 39.45744681,
39.45744681,
        39.45744681, 39.45744681, 39.45744681, 39.45744681,
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        39.45744681, 39.45744681, 39.45744681, 39.45744681,
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        39.45744681, 39.45744681, 39.45744681, 39.45744681,
39.45744681,
        39.45744681, 39.45744681, 39.45744681, 39.45744681]))
```

```
strategies[1], test_num_impute(strategies[1])
```

```
('median',
 array([39., 39., 39., 39., 39., 39., 39., 39., 39., 39., 39., 39.,
39.,
        39., 39., 39., 39., 39., 39., 39., 39., 39., 39., 39., 39.,
39.,
        39., 39., 39., 39., 39., 39., 39., 39.]))
```

```
strategies[2], test_num_impute(strategies[2])
```

```
('most_frequent',
 array([90., 90., 90., 90., 90., 90., 90., 90., 90., 90., 90., 90.,
90.,
        90., 90., 90., 90., 90., 90., 90., 90., 90., 90., 90., 90.,
90.,
        90., 90., 90., 90., 90., 90., 90., 90.]))
```

```
# Более сложная функция, которая позволяет задавать колонку и вид
импьютации
def test_num_impute_col(dataset, column, strategy_param):
    temp_data = dataset[[column]]

    indicator = MissingIndicator()
    mask_missing_values_only = indicator.fit_transform(temp_data)

    imp_num = SimpleImputer(strategy=strategy_param)
    data_num_imp = imp_num.fit_transform(temp_data)

    filled_data = data_num_imp[mask_missing_values_only]

    return column, strategy_param, filled_data.size, filled_data[0],
filled_data[filled_data.size-1]
```

```
data[['1st Goal']].describe()
```

```
        1st Goal
count  94.000000
mean   39.457447
std    24.496506
```

```
min     1.000000
25%    18.250000
50%    39.000000
75%    54.750000
max    90.000000
```

```
test_num_impute_col(data, '1st Goal', strategies[0])
```

```
('1st Goal', 'mean', 34, 39.45744680851064, 39.45744680851064)
```

```
test_num_impute_col(data, '1st Goal', strategies[1])
```

```
('1st Goal', 'median', 34, 39.0, 39.0)
```

```
test_num_impute_col(data, '1st Goal', strategies[2])
```

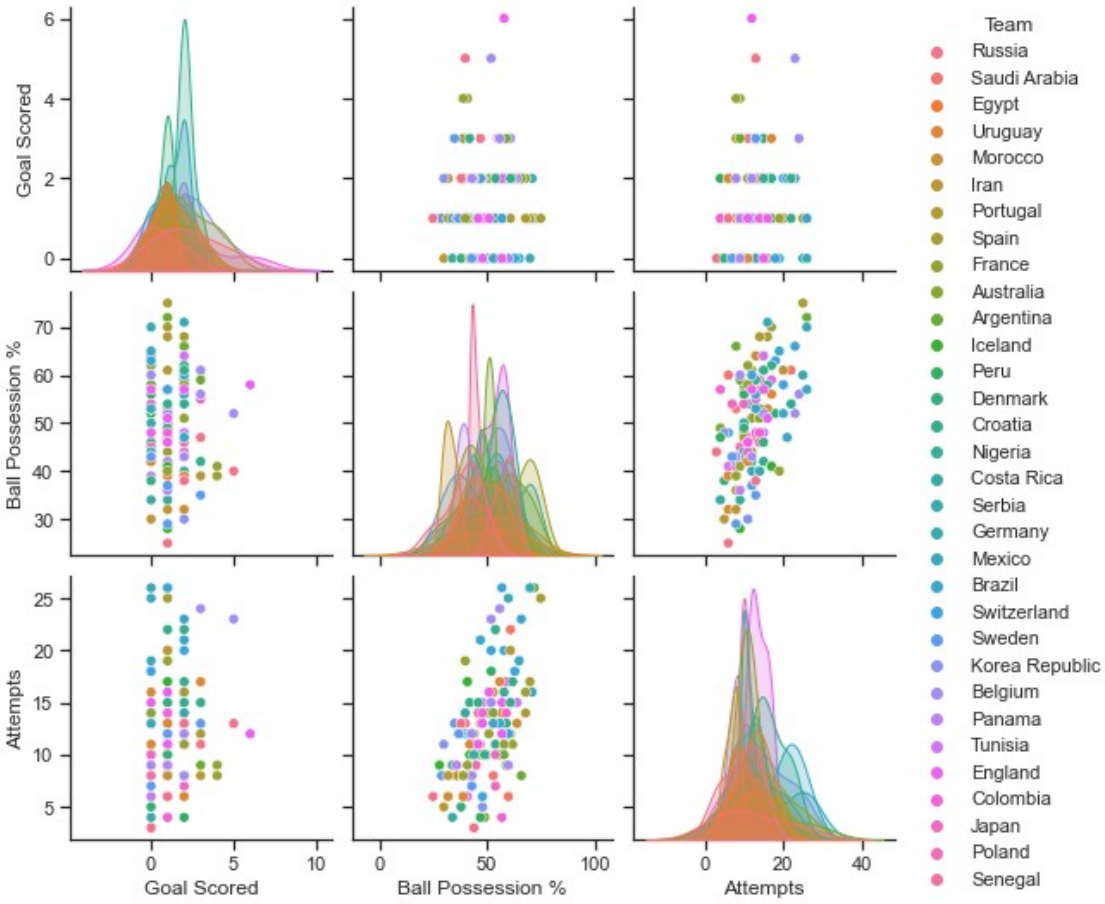
```
('1st Goal', 'most_frequent', 34, 90.0, 90.0)
```

```
#Выберем категориальные колонки с пропущенными значениями
# Цикл по колонкам датасета
cat_cols = []
for col in data.columns:
    # Количество пустых значений
    temp_null_count = data[data[col].isnull()].shape[0]
    dt = str(data[col].dtype)
    if temp_null_count>0 and (dt=='object'):
        cat_cols.append(col)
        temp_perc = round((temp_null_count / total_count) * 100.0, 2)
        print('Колонка {}. Тип данных {}. Количество пустых значений
{}, {}%.'.format(col, dt, temp_null_count, temp_perc))
```

В данном наборе данных нет категориального признака с пропущенными значениями, поэтому обработать пропуски категориального признака не получится.

```
sns.pairplot(
    data,
    x_vars=["Goal Scored", "Ball Possession %", "Attempts"],
    y_vars=["Goal Scored", "Ball Possession %", "Attempts"],
    hue = 'Team'
)
```

```
<seaborn.axisgrid.PairGrid at 0x1a660a70880>
```


Goal Scored
Ball Possession %
Attempts
Goal Scored
Ball Possession %
Attempts
Team
Russia
Saudi Arabia
Egypt
Uruguay
Morocco
Iran
Portugal
Spain
France
Australia
Argentina
Iceland
Peru
Denmark
Croatia
Nigeria
Costa Rica
Serbia
Germany
Mexico
Brazil
Switzerland
Sweden
Korea Republic
Belgium
Panama
Tunisia
England
Colombia
Japan
Poland
Senegal