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Факультет «Информатика и системы управления»  
Кафедра «Автоматизированные системы обработки информации и управления»



**Отчет**  
**Лабораторная работа № 1**  
**По курсу «Технологии машинного обучения»**  
**«Разведочный анализ данных. Исследование и**  
**визуализация данных»**

**ИСПОЛНИТЕЛЬ:**

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\_\_\_\_\_

"\_\_" \_\_\_\_\_ 2020 г.

**ПРЕПОДАВАТЕЛЬ:**

Гапанюк Ю.Е.

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"\_\_" \_\_\_\_\_ 2020 г.

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Москва 2020

## **1. Цель работы**

Изучение различных методов визуализация данных.

## **2. Описание задания**

- Выбрать набор данных
- Создать ноутбук, который содержит следующие разделы:
  1. Текстовое описание выбранного набора данных
  2. Основные характеристики датасета
  3. Визуальное исследование датасета
  4. Информация о корреляции признаков
- Сформировать отчет и разместить его на своей репозитории GitHub

## **3. Текст программы и экранные формы с примерами**

**выполнения** См. на след. странице

## 1. Текстовое описание выбранного набора данных

Этот набор данных содержит информацию о ранговых играх дольше 10 минут высокого ранга игры League of Legends.

- gameId
- blueWins
- blueWardsPlaced
- blueWardsDestroyed
- blueFirstBlood
- blueKills
- blueDeaths
- blueAssists
- blueEliteMonsters
- blueDragons
- blueHeralds
- blueTowersDestroyed
- blueTotalGold
- blueAvgLevel
- blueTotalExperience
- blueTotalMinionsKilled
- blueTotalJungleMinionsKilled
- blueGoldDiff
- blueExperienceDiff
- blueCSPerMin
- blueGoldPerMin
- redWardsPlaced
- redWardsDestroyed
- redFirstBlood

- redKills
- redDeaths
- redAssists
- redEliteMonsters
- redDragons
- redHeralds
- redTowersDestroyed
- redTotalGold
- redAvgLevel
- redTotalExperience
- redTotalMinionsKilled
- redTotalJungleMinionsKilled
- redGoldDiff
- redExperienceDiff
- redCSPerMin
- redGoldPerMin

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

data = pandas.read_csv('C:/Users/rusta/Desktop/Data/10min.csv')
```

## 2. Основные характеристики датасета

```
[3]: data.head(10)
```

```
[3]:
```

	gameId	blueWins	blueWardsPlaced	blueWardsDestroyed	blueFirstBlood	\
0	4519157822	0	28	2	1	
1	4523371949	0	12	1	0	
2	4521474530	0	15	0	0	
3	4524384067	0	43	1	0	
4	4436033771	0	75	4	0	

5	4475365709	1	18	0	0
6	4493010632	1	18	3	1
7	4496759358	0	16	2	0
8	4443048030	0	16	3	0
9	4509433346	1	13	1	1

	blueKills	blueDeaths	blueAssists	blueEliteMonsters	blueDragons	...	\
0	9	6	11	0	0	...	
1	5	5	5	0	0	...	
2	7	11	4	1	1	...	
3	4	5	5	1	0	...	
4	6	6	6	0	0	...	
5	5	3	6	1	1	...	
6	7	6	7	1	1	...	
7	5	13	3	0	0	...	
8	7	7	8	0	0	...	
9	4	5	5	1	1	...	

	redTowersDestroyed	redTotalGold	redAvgLevel	redTotalExperience	\
0	0	16567	6.8	17047	

1	1	17620	6.8	17438
2	0	17285	6.8	17254
3	0	16478	7.0	17961
4	0	17404	7.0	18313
5	0	15201	7.0	18060
6	0	14463	6.4	15404
7	0	17920	6.6	16938
8	0	18380	7.2	19298
9	0	16605	6.8	18379

	redTotalMinionsKilled	redTotalJungleMinionsKilled	redGoldDiff	\
0	197		55	-643
1	240		52	2908
2	203		28	1172
3	235		47	1321
4	225		67	1004
5	221		59	-698
6	164		35	-2411
7	157		54	2615
8	240		53	1979
9	247		43	1548

	redExperienceDiff	redCSPerMin	redGoldPerMin
0	8	19.7	1656.7
1	1173	24.0	1762.0
2	1033	20.3	1728.5
3	7	23.5	1647.8
4	-230	22.5	1740.4
5	-101	22.1	1520.1
6	-1563	16.4	1446.3
7	800	15.7	1792.0
8	771	24.0	1838.0
9	1574	24.7	1660.5

[10 rows x 40 columns]

```
[4]: data.shape
```

```
[4]: (9879, 40)
```

```
[5]: data.columns
```

```
[5]: Index(['gameId', 'blueWins', 'blueWardsPlaced', 'blueWardsDestroyed',
        'blueFirstBlood', 'blueKills', 'blueDeaths', 'blueAssists',
        'blueEliteMonsters', 'blueDragons', 'blueHeralds',
        'blueTowersDestroyed', 'blueTotalGold', 'blueAvgLevel',
        'blueTotalExperience', 'blueTotalMinionsKilled',
```

```
'blueTotalJungleMinionsKilled', 'blueGoldDiff', 'blueExperienceDiff',  
'blueCSPerMin', 'blueGoldPerMin', 'redWardsPlaced', 'redWardsDestroyed',  
'redFirstBlood', 'redKills', 'redDeaths', 'redAssists',  
'redEliteMonsters', 'redDragons', 'redHeralds', 'redTowersDestroyed',  
'redTotalGold', 'redAvgLevel', 'redTotalExperience',  
'redTotalMinionsKilled', 'redTotalJungleMinionsKilled', 'redGoldDiff',  
'redExperienceDiff', 'redCSPerMin', 'redGoldPerMin'],  
dtype='object')
```

```
[6]: data.dtypes
```

```
[6]: gameId                int64  
blueWins                 int64  
blueWardsPlaced          int64  
blueWardsDestroyed       int64  
blueFirstBlood           int64  
blueKills                int64  
blueDeaths               int64  
blueAssists              int64  
blueEliteMonsters        int64  
blueDragons              int64  
blueHeralds              int64  
blueTowersDestroyed      int64  
blueTotalGold            int64  
blueAvgLevel             float64  
blueTotalExperience      int64  
blueTotalMinionsKilled   int64  
blueTotalJungleMinionsKilled int64  
blueGoldDiff             int64  
blueExperienceDiff       int64  
blueCSPerMin             float64  
blueGoldPerMin           float64  
redWardsPlaced           int64  
redWardsDestroyed        int64  
redFirstBlood            int64  
redKills                 int64  
redDeaths                int64  
redAssists               int64  
redEliteMonsters         int64  
redDragons               int64  
redHeralds               int64  
redTowersDestroyed       int64  
redTotalGold             int64  
redAvgLevel              float64  
redTotalExperience       int64  
redTotalMinionsKilled    int64  
redTotalJungleMinionsKilled int64
```

```
redGoldDiff          int64
redExperienceDiff     int64
redCSPerMin          float64
redGoldPerMin         float64
dtype: object
```

```
[7]: data.describe()
```

```
[7]:
```

	gameId	blueWins	blueWardsPlaced	blueWardsDestroyed	\
count	9.879000e+03	9879.000000	9879.000000	9879.000000	
mean	4.500084e+09	0.499038	22.288288	2.824881	
std	2.757328e+07	0.500024	18.019177	2.174998	
min	4.295358e+09	0.000000	5.000000	0.000000	
25%	4.483301e+09	0.000000	14.000000	1.000000	
50%	4.510920e+09	0.000000	16.000000	3.000000	
75%	4.521733e+09	1.000000	20.000000	4.000000	
max	4.527991e+09	1.000000	250.000000	27.000000	

	blueFirstBlood	blueKills	blueDeaths	blueAssists	\
count	9879.000000	9879.000000	9879.000000	9879.000000	
mean	0.504808	6.183925	6.137666	6.645106	
std	0.500002	3.011028	2.933818	4.064520	
min	0.000000	0.000000	0.000000	0.000000	
25%	0.000000	4.000000	4.000000	4.000000	
50%	1.000000	6.000000	6.000000	6.000000	
75%	1.000000	8.000000	8.000000	9.000000	
max	1.000000	22.000000	22.000000	29.000000	

	blueEliteMonsters	blueDragons	...	redTowersDestroyed	redTotalGold	\
count	9879.000000	9879.000000	...	9879.000000	9879.000000	
mean	0.549954	0.361980	...	0.043021	16489.041401	
std	0.625527	0.480597	...	0.216900	1490.888406	
min	0.000000	0.000000	...	0.000000	11212.000000	
25%	0.000000	0.000000	...	0.000000	15427.500000	
50%	0.000000	0.000000	...	0.000000	16378.000000	
75%	1.000000	1.000000	...	0.000000	17418.500000	
max	2.000000	1.000000	...	2.000000	22732.000000	

	redAvgLevel	redTotalExperience	redTotalMinionsKilled	\
count	9879.000000	9879.000000	9879.000000	
mean	6.925316	17961.730438	217.349226	
std	0.305311	1198.583912	21.911668	
min	4.800000	10465.000000	107.000000	
25%	6.800000	17209.500000	203.000000	
50%	7.000000	17974.000000	218.000000	
75%	7.200000	18764.500000	233.000000	
max	8.200000	22269.000000	289.000000	



	redTotalJungleMinionsKilled	redGoldDiff	redExperienceDiff	\
count	9879.000000	9879.000000	9879.000000	
mean	51.313088	-14.414111	33.620306	
std	10.027885	2453.349179	1920.370438	
min	4.000000	-11467.000000	-8348.000000	
25%	44.000000	-1596.000000	-1212.000000	
50%	51.000000	-14.000000	28.000000	
75%	57.000000	1585.500000	1290.500000	
max	92.000000	10830.000000	9333.000000	

	redCSPerMin	redGoldPerMin
count	9879.000000	9879.000000
mean	21.734923	1648.904140
std	2.191167	149.088841
min	10.700000	1121.200000
25%	20.300000	1542.750000
50%	21.800000	1637.800000
75%	23.300000	1741.850000
max	28.900000	2273.200000

[8 rows x 40 columns]

```
[8]: data['blueWins'].unique()
```

```
[8]: array([0, 1], dtype=int64)
```

```
[35]: #
#
for col in data.columns:
    #
    temp_null_count = data[data[col].isnull()].shape[0]
    print('{} - {}'.format(col, temp_null_count))
```

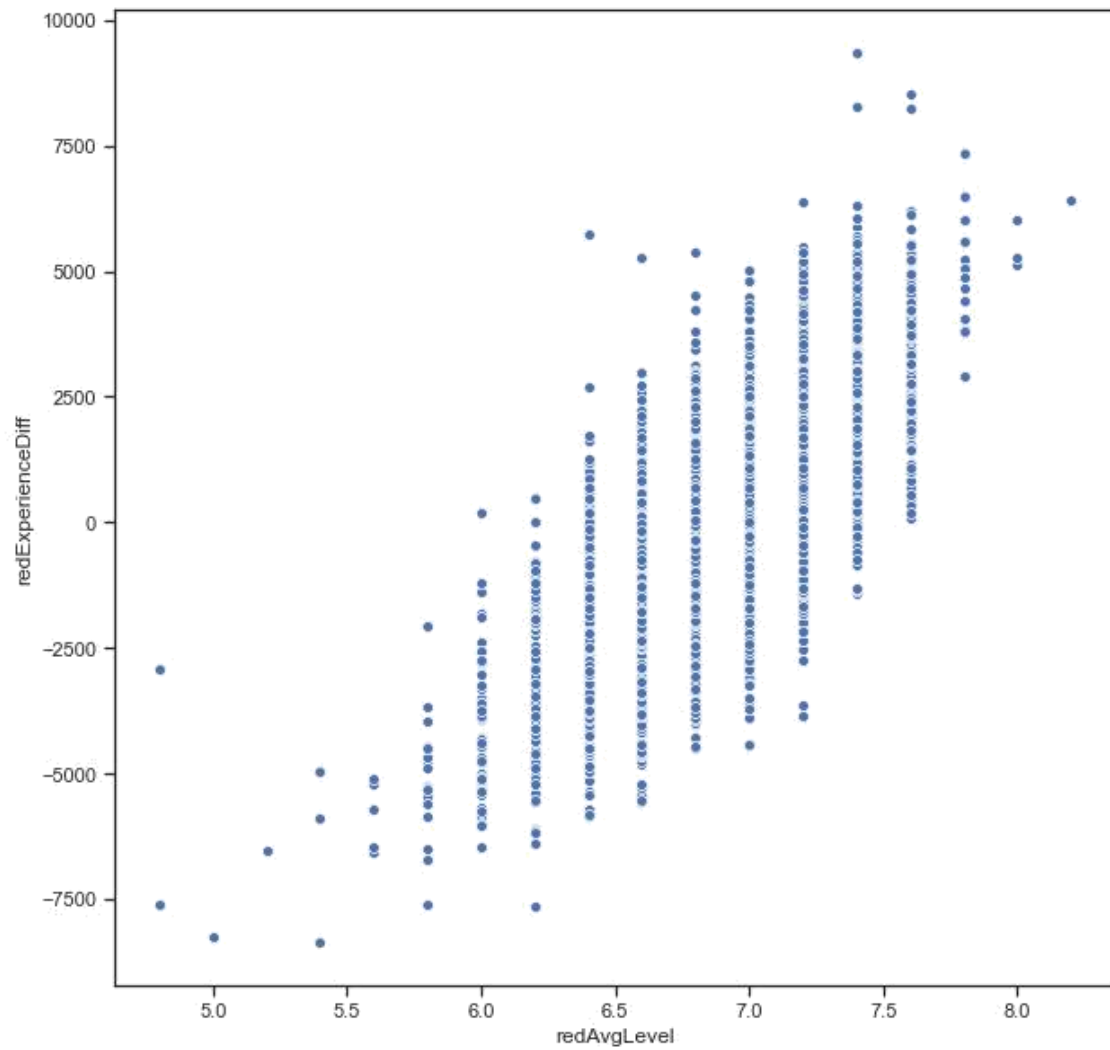
```
gameId - 0
blueWins - 0
blueWardsPlaced - 0
blueWardsDestroyed - 0
blueFirstBlood - 0
blueKills - 0
blueDeaths - 0
blueAssists - 0
blueEliteMonsters - 0
blueDragons - 0
blueHeralds - 0
blueTowersDestroyed - 0
blueTotalGold - 0
```

```
blueAvgLevel - 0
blueTotalExperience - 0
blueTotalMinionsKilled - 0
blueTotalJungleMinionsKilled - 0
blueGoldDiff - 0
blueExperienceDiff - 0
blueCSPerMin - 0
blueGoldPerMin - 0
redWardsPlaced - 0
redWardsDestroyed - 0
redFirstBlood - 0
redKills - 0
redDeaths - 0
redAssists - 0
redEliteMonsters - 0
redDragons - 0
redHeralds - 0
redTowersDestroyed - 0
redTotalGold - 0
redAvgLevel - 0
redTotalExperience - 0
redTotalMinionsKilled - 0
redTotalJungleMinionsKilled - 0
redGoldDiff - 0
redExperienceDiff - 0
redCSPerMin - 0
redGoldPerMin - 0
```

### 3. Визуальное исследование датасета

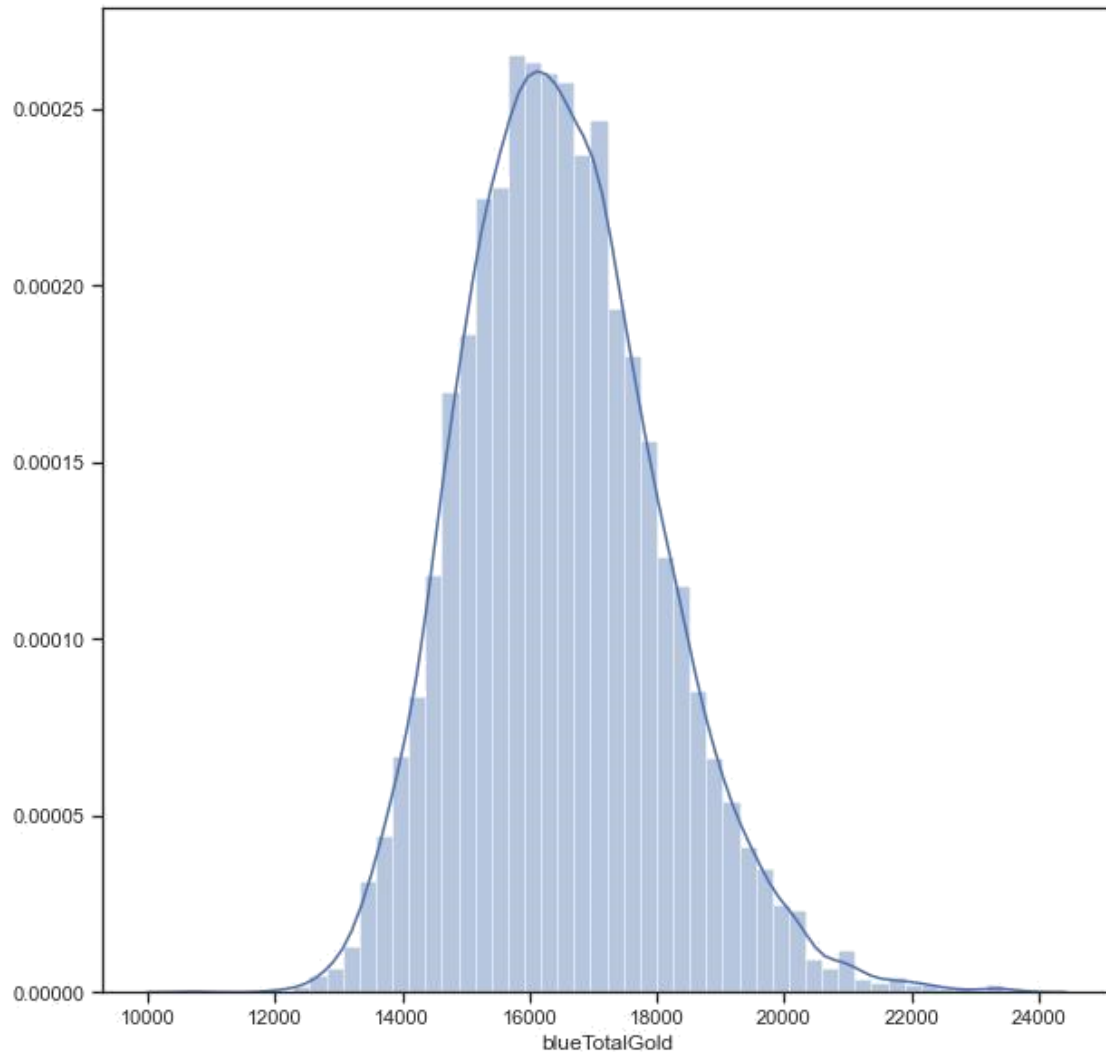
```
[9]: fig, ax = plt.subplots(figsize=(10,10))
     sns.scatterplot(ax=ax, x='redAvgLevel', y='redExperienceDiff', data=data)
```

```
[9]: <matplotlib.axes._subplots.AxesSubplot at 0x24a9b400>
```



```
[10]: fig, ax = plt.subplots(figsize=(10,10))
sns.distplot(data['blueTotalGold'])
```

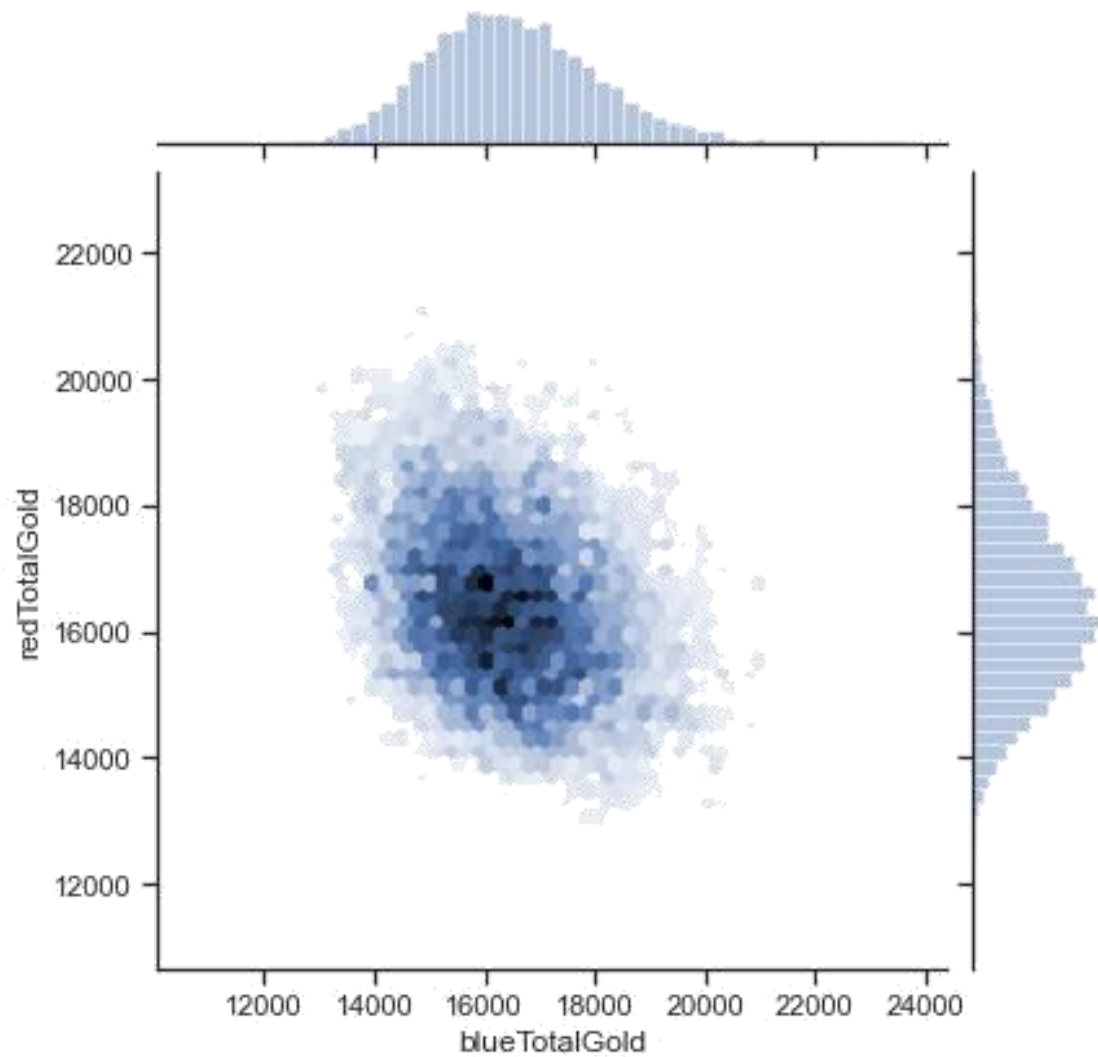
```
[10]: <matplotlib.axes._subplots.AxesSubplot at 0x9dbec8>
```



## Jointplot

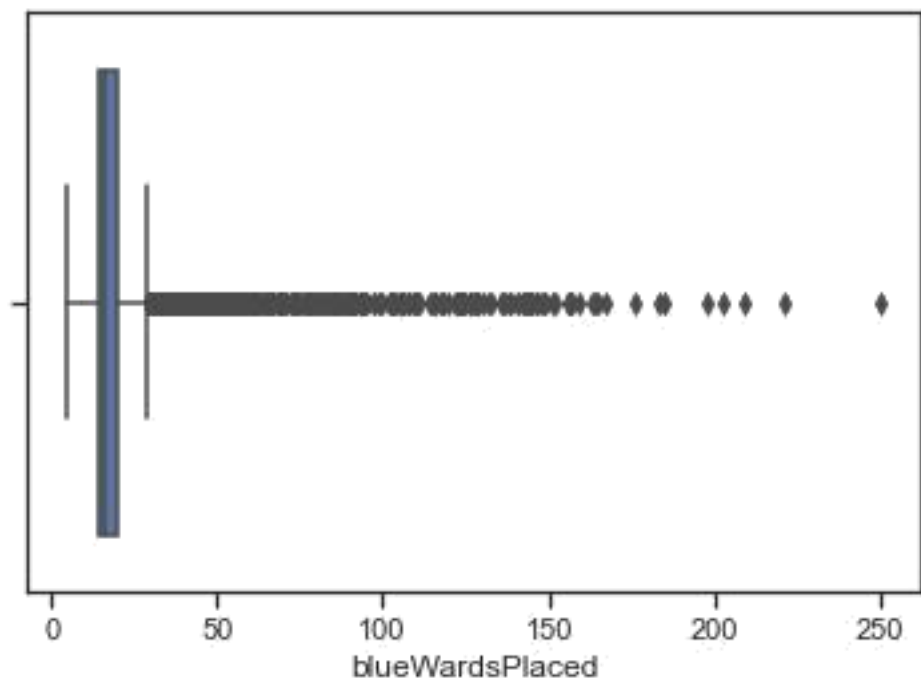
```
[11]: sns.jointplot(x='blueTotalGold', y='redTotalGold', data=data, kind="hex")
```

```
[11]: <seaborn.axisgrid.JointGrid at 0x5b7e370>
```



```
[14]: sns.boxplot(x=data['blueWardsPlaced'])
```

```
[14]: <matplotlib.axes._subplots.AxesSubplot at 0x25b73f88>
```



#### 4. Информация о корреляции признаков

```
[12]: data.corr()
```

```
[12]:
```

	gameId	blueWins	blueWardsPlaced	\
gameId	1.000000	0.000985	0.005361	
blueWins	0.000985	1.000000	0.000087	
blueWardsPlaced	0.005361	0.000087	1.000000	
blueWardsDestroyed	-0.012057	0.044247	0.034447	
blueFirstBlood	-0.011577	0.201769	0.003228	
blueKills	-0.038993	0.337358	0.018138	
blueDeaths	-0.013160	-0.339297	-0.002612	
blueAssists	-0.023329	0.276685	0.033217	
blueEliteMonsters	0.016599	0.221944	0.019892	
blueDragons	0.008962	0.213768	0.017676	
blueHeralds	0.015551	0.092385	0.010104	
blueTowersDestroyed	-0.007467	0.115566	0.009462	

blueTotalGold	-0.033754	0.417213	0.019725
blueAvgLevel	-0.040956	0.357820	0.034349
blueTotalExperience	-0.040852	0.396141	0.031719
blueTotalMinionsKilled	-0.002917	0.224909	-0.033925
blueTotalJungleMinionsKilled	-0.004193	0.131445	0.010501
blueGoldDiff	-0.014670	0.511119	0.015800
blueExperienceDiff	-0.012315	0.489558	0.027943
blueCSPerMin	-0.002917	0.224909	-0.033925
blueGoldPerMin	-0.033754	0.417213	0.019725
redWardsPlaced	0.007405	-0.023671	-0.012906
redWardsDestroyed	-0.001197	-0.055400	0.115549
redFirstBlood	0.011577	-0.201769	-0.003228
redKills	-0.013160	-0.339297	-0.002612
redDeaths	-0.038993	0.337358	0.018138
redAssists	-0.008664	-0.271047	-0.009009
redEliteMonsters	0.017296	-0.221551	-0.022817
redDragons	0.017416	-0.209516	-0.020121
redHeralds	0.006163	-0.097172	-0.011964
redTowersDestroyed	0.003557	-0.103696	-0.008225
redTotalGold	-0.010622	-0.411396	-0.005685
redAvgLevel	-0.012419	-0.352127	-0.008882
redTotalExperience	-0.021187	-0.387588	-0.013000
redTotalMinionsKilled	-0.005118	-0.212171	-0.012395
redTotalJungleMinionsKilled	0.006040	-0.110994	0.001224
redGoldDiff	0.014670	-0.511119	-0.015800
redExperienceDiff	0.012315	-0.489558	-0.027943
redCSPerMin	-0.005118	-0.212171	-0.012395
redGoldPerMin	-0.010622	-0.411396	-0.005685
	blueWardsDestroyed	blueFirstBlood	blueKills \
gameId	-0.012057	-0.011577	-0.038993
blueWins	0.044247	0.201769	0.337358
blueWardsPlaced	0.034447	0.003228	0.018138
blueWardsDestroyed	1.000000	0.017717	0.033748
blueFirstBlood	0.017717	1.000000	0.269425
blueKills	0.033748	0.269425	1.000000
blueDeaths	-0.073182	-0.247929	0.004044
blueAssists	0.067793	0.229485	0.813667
blueEliteMonsters	0.041700	0.151603	0.178540
blueDragons	0.040504	0.134309	0.170436
blueHeralds	0.016940	0.077509	0.076195
blueTowersDestroyed	-0.009150	0.083316	0.180314
blueTotalGold	0.060054	0.312058	0.888751
blueAvgLevel	0.060294	0.177617	0.434867
blueTotalExperience	0.067462	0.190365	0.472155
blueTotalMinionsKilled	0.111028	0.125642	-0.030880
blueTotalJungleMinionsKilled	-0.023452	0.018190	-0.112506

blueGoldDiff	0.078585	0.378511 0.654148
blueExperienceDiff	0.077946	0.240665 0.583730
blueCSPerMin	0.111028	0.125642 -0.030880
blueGoldPerMin	0.060054	0.312058 0.888751
redWardsPlaced	0.135966	-0.019142 -0.034239
redWardsDestroyed	0.123919	-0.043304 -0.092278
redFirstBlood	-0.017717	-1.000000 -0.269425
redKills	-0.073182	-0.247929 0.004044
redDeaths	0.033748	0.269425 1.000000
redAssists	-0.046212	-0.201140 -0.020344
redEliteMonsters	-0.034509	-0.141627 -0.224564
redDragons	-0.034439	-0.135327 -0.207949
redHeralds	-0.012712	-0.060246 -0.104423
redTowersDestroyed	-0.023943	-0.069584 -0.082491
redTotalGold	-0.067467	-0.301479 -0.161127
redAvgLevel	-0.059090	-0.182602 -0.412219
redTotalExperience	-0.057314	-0.194920 -0.462333
redTotalMinionsKilled	0.040023	-0.156711 -0.472203
redTotalJungleMinionsKilled	-0.035732	-0.024559 -0.214454
redGoldDiff	-0.078585	-0.378511 -0.654148
redExperienceDiff	-0.077946	-0.240665 -0.583730
redCSPerMin	0.040023	-0.156711 -0.472203
redGoldPerMin	-0.067467	-0.301479 -0.161127

	blueDeaths	blueAssists	blueEliteMonsters \
gameId	-0.013160	-0.023329	0.016599
blueWins	-0.339297	0.276685	0.221944
blueWardsPlaced	-0.002612	0.033217	0.019892
blueWardsDestroyed	-0.073182	0.067793	0.041700
blueFirstBlood	-0.247929	0.229485	0.151603
blueKills	0.004044	0.813667	0.178540
blueDeaths	1.000000	-0.026372	-0.204764
blueAssists	-0.026372	1.000000	0.149043
blueEliteMonsters	-0.204764	0.149043	1.000000
blueDragons	-0.188852	0.170873	0.781039
blueHeralds	-0.095527	0.028434	0.640271
blueTowersDestroyed	-0.071441	0.123663	0.166644
blueTotalGold	-0.162572	0.748352	0.239396
blueAvgLevel	-0.414755	0.292661	0.203530
blueTotalExperience	-0.460122	0.303022	0.232774
blueTotalMinionsKilled	-0.468560	-0.062035	0.118762
blueTotalJungleMinionsKilled	-0.228102	-0.134023	0.198378
blueGoldDiff	-0.640000	0.549761	0.281464
blueExperienceDiff	-0.577613	0.437002	0.263991
blueCSPerMin	-0.468560	-0.062035	0.118762
blueGoldPerMin	-0.162572	0.748352	0.239396
redWardsPlaced	0.008102	-0.032474	-0.017292



redWardsDestroyed	0.038672	-0.064501	-0.005288
redFirstBlood	0.247929	-0.229485	-0.151603
redKills	1.000000	-0.026372	-0.204764
redDeaths	0.004044	0.813667	0.178540
redAssists	0.804023	-0.007481	-0.156764
redEliteMonsters	0.163340	-0.182985	-0.455139
redDragons	0.150746	-0.189563	-0.471754
redHeralds	0.076639	-0.058074	-0.144104
redTowersDestroyed	0.156780	-0.060880	-0.052029
redTotalGold	0.885728	-0.133948	-0.216616
redAvgLevel	0.433383	-0.356928	-0.169649
redTotalExperience	0.464584	-0.396652	-0.189816
redTotalMinionsKilled	-0.040521	-0.337515	-0.074838
redTotalJungleMinionsKilled	-0.100271	-0.160915	-0.087893
redGoldDiff	0.640000	-0.549761	-0.281464
redExperienceDiff	0.577613	-0.437002	-0.263991
redCSPerMin	-0.040521	-0.337515	-0.074838
redGoldPerMin	0.885728	-0.133948	-0.216616
blueDragons ... redTowersDestroyed \			
gameId	0.008962	...	0.003557
blueWins	0.213768	...	-0.103696
blueWardsPlaced	0.017676	...	-0.008225
blueWardsDestroyed	0.040504	...	-0.023943
blueFirstBlood	0.134309	...	-0.069584
blueKills	0.170436	...	-0.082491
blueDeaths	-0.188852	...	0.156780
blueAssists	0.170873	...	-0.060880
blueEliteMonsters	0.781039	...	-0.052029
blueDragons	1.000000	...	-0.032865
blueHeralds	0.020381	...	-0.042872
blueTowersDestroyed	0.039750	...	0.011738
blueTotalGold	0.186413	...	-0.119579
blueAvgLevel	0.160683	...	-0.183090
blueTotalExperience	0.179083	...	-0.187414
blueTotalMinionsKilled	0.086686	...	-0.145974
blueTotalJungleMinionsKilled	0.159595	...	-0.048078
blueGoldDiff	0.233875	...	-0.273861
blueExperienceDiff	0.211496	...	-0.197678
blueCSPerMin	0.086686	...	-0.145974
blueGoldPerMin	0.186413	...	-0.119579
redWardsPlaced	-0.027102	...	-0.006230
redWardsDestroyed	-0.023049	...	0.003855
redFirstBlood	-0.134309	...	0.069584
redKills	-0.188852	...	0.156780
redDeaths	0.170436	...	-0.082491
redAssists	-0.162406	...	0.107425

redEliteMonsters	-0.506546	...	0.158999
redDragons	-0.631930	...	0.026950
redHeralds	-0.016827	...	0.235475
redTowersDestroyed	-0.032865	...	1.000000
redTotalGold	-0.192871	...	0.327503
redAvgLevel	-0.149806	...	0.113035
redTotalExperience	-0.159485	...	0.129002
redTotalMinionsKilled	-0.059803	...	0.092564
redTotalJungleMinionsKilled	-0.098446	...	0.006374
redGoldDiff	-0.233875	...	0.273861
redExperienceDiff	-0.211496	...	0.197678
redCSPerMin	-0.059803	...	0.092564
redGoldPerMin	-0.192871	...	0.327503
	redTotalGold	redAvgLevel	redTotalExperience \
gameId	-0.010622	-0.012419	-0.021187
blueWins	-0.411396	-0.352127	-0.387588
blueWardsPlaced	-0.005685	-0.008882	-0.013000
blueWardsDestroyed	-0.067467	-0.059090	-0.057314
blueFirstBlood	-0.301479	-0.182602	-0.194920
blueKills	-0.161127	-0.412219	-0.462333
blueDeaths	0.885728	0.433383	0.464584
blueAssists	-0.133948	-0.356928	-0.396652
blueEliteMonsters	-0.216616	-0.169649	-0.189816
blueDragons	-0.192871	-0.149806	-0.159485
blueHeralds	-0.109557	-0.087337	-0.107718
blueTowersDestroyed	-0.122465	-0.204429	-0.210167
blueTotalGold	-0.314212	-0.447049	-0.491268
blueAvgLevel	-0.440031	-0.228466	-0.248941
blueTotalExperience	-0.485059	-0.254508	-0.281446
blueTotalMinionsKilled	-0.447904	-0.142399	-0.144832
blueTotalJungleMinionsKilled	-0.182167	-0.013881	-0.011657
blueGoldDiff	-0.804347	-0.652929	-0.714405
blueExperienceDiff	-0.721190	-0.721925	-0.800089
blueCSPerMin	-0.447904	-0.142399	-0.144832
blueGoldPerMin	-0.314212	-0.447049	-0.491268
redWardsPlaced	0.010666	0.041737	0.036506
redWardsDestroyed	0.070784	0.075537	0.079975
redFirstBlood	0.301479	0.182602	0.194920
redKills	0.885728	0.433383	0.464584
redDeaths	-0.161127	-0.412219	-0.462333
redAssists	0.736215	0.277040	0.279788
redEliteMonsters	0.228861	0.222537	0.244205
redDragons	0.178168	0.191497	0.204941
redHeralds	0.151762	0.123056	0.142024
redTowersDestroyed	0.327503	0.113035	0.129002
redTotalGold	1.000000	0.614025	0.669646

redAvgLevel	0.614025	1.000000	0.901748
redTotalExperience	0.669646	0.901748	1.000000
redTotalMinionsKilled	0.278715	0.489672	0.558985
redTotalJungleMinionsKilled	0.102632	0.382009	0.427214
redGoldDiff	0.804347	0.652929	0.714405
redExperienceDiff	0.721190	0.721925	0.800089
redCSPerMin	0.278715	0.489672	0.558985
redGoldPerMin	1.000000	0.614025	0.669646

	redTotalMinionsKilled \
gameId	-0.005118
blueWins	-0.212171
blueWardsPlaced	-0.012395
blueWardsDestroyed	0.040023
blueFirstBlood	-0.156711
blueKills	-0.472203
blueDeaths	-0.040521
blueAssists	-0.337515
blueEliteMonsters	-0.074838
blueDragons	-0.059803
blueHeralds	-0.046253
blueTowersDestroyed	-0.186879
blueTotalGold	-0.452593
blueAvgLevel	-0.123316
blueTotalExperience	-0.141276
blueTotalMinionsKilled	0.000484
blueTotalJungleMinionsKilled	0.109806
blueGoldDiff	-0.452633
blueExperienceDiff	-0.437205
blueCSPerMin	0.000484
blueGoldPerMin	-0.452593
redWardsPlaced	-0.021842
redWardsDestroyed	0.128062
redFirstBlood	0.156711
redKills	-0.040521
redDeaths	-0.472203
redAssists	-0.078234
redEliteMonsters	0.129705
redDragons	0.103151
redHeralds	0.083087
redTowersDestroyed	0.092564
redTotalGold	0.278715
redAvgLevel	0.489672
redTotalExperience	0.558985
redTotalMinionsKilled	1.000000
redTotalJungleMinionsKilled	0.165652
redGoldDiff	0.452633

redExperienceDiff	0.437205	
redCSPerMin	1.000000	
redGoldPerMin	0.278715	
	redTotalJungleMinionsKilled	redGoldDiff \
gameId	0.006040	0.014670
blueWins	-0.110994	-0.511119
blueWardsPlaced	0.001224	-0.015800
blueWardsDestroyed	-0.035732	-0.078585
blueFirstBlood	-0.024559	-0.378511
blueKills	-0.214454	-0.654148
blueDeaths	-0.100271	0.640000
blueAssists	-0.160915	-0.549761
blueEliteMonsters	-0.087893	-0.281464
blueDragons	-0.098446	-0.233875
blueHeralds	-0.019622	-0.162943
blueTowersDestroyed	-0.038505	-0.294060
blueTotalGold	-0.175275	-0.816803
blueAvgLevel	-0.013128	-0.653538
blueTotalExperience	-0.010528	-0.717968
blueTotalMinionsKilled	0.092225	-0.450497
blueTotalJungleMinionsKilled	-0.026363	-0.167510
blueGoldDiff	-0.172066	-1.000000
blueExperienceDiff	-0.273224	-0.894729
blueCSPerMin	0.092225	-0.450497
blueGoldPerMin	-0.175275	-0.816803
redWardsPlaced	0.004666	0.019042
redWardsDestroyed	-0.009313	0.099725
redFirstBlood	0.024559	0.378511
redKills	-0.100271	0.640000
redDeaths	-0.214454	-0.654148
redAssists	-0.130417	0.528081
redEliteMonsters	0.216969	0.281296
redDragons	0.214187	0.234566
redHeralds	0.083068	0.165611
redTowersDestroyed	0.006374	0.273861
redTotalGold	0.102632	0.804347
redAvgLevel	0.382009	0.652929
redTotalExperience	0.427214	0.714405
redTotalMinionsKilled	0.165652	0.452633
redTotalJungleMinionsKilled	1.000000	0.172066
redGoldDiff	0.172066	1.000000
redExperienceDiff	0.273224	0.894729
redCSPerMin	0.165652	0.452633
redGoldPerMin	0.102632	0.804347
	redExperienceDiff	redCSPerMin redGoldPerMin

gameId	0.012315	-0.005118	-0.010622
blueWins	-0.489558	-0.212171	-0.411396
blueWardsPlaced	-0.027943	-0.012395	-0.005685
blueWardsDestroyed	-0.077946	0.040023	-0.067467
blueFirstBlood	-0.240665	-0.156711	-0.301479
blueKills	-0.583730	-0.472203	-0.161127
blueDeaths	0.577613	-0.040521	0.885728
blueAssists	-0.437002	-0.337515	-0.133948
blueEliteMonsters	-0.263991	-0.074838	-0.216616
blueDragons	-0.211496	-0.059803	-0.192871
blueHeralds	-0.162496	-0.046253	-0.109557
blueTowersDestroyed	-0.218320	-0.186879	-0.122465
blueTotalGold	-0.729345	-0.452593	-0.314212
blueAvgLevel	-0.718822	-0.123316	-0.440031
blueTotalExperience	-0.800815	-0.141276	-0.485059
blueTotalMinionsKilled	-0.447264	0.000484	-0.447904
blueTotalJungleMinionsKilled	-0.265443	0.109806	-0.182167
blueGoldDiff	-0.894729	-0.452633	-0.804347
blueExperienceDiff	-1.000000	-0.437205	-0.721190
blueCSPerMin	-0.447264	0.000484	-0.447904
blueGoldPerMin	-0.729345	-0.452593	-0.314212
redWardsPlaced	0.026556	-0.021842	0.010666
redWardsDestroyed	0.085829	0.128062	0.070784
redFirstBlood	0.240665	0.156711	0.301479
redKills	0.577613	-0.040521	0.885728
redDeaths	-0.583730	-0.472203	-0.161127
redAssists	0.422972	-0.078234	0.736215
redEliteMonsters	0.269283	0.129705	0.228861
redDragons	0.218872	0.103151	0.178168
redHeralds	0.166162	0.083087	0.151762
redTowersDestroyed	0.197678	0.092564	0.327503
redTotalGold	0.721190	0.278715	1.000000
redAvgLevel	0.721925	0.489672	0.614025
redTotalExperience	0.800089	0.558985	0.669646
redTotalMinionsKilled	0.437205	1.000000	0.278715
redTotalJungleMinionsKilled	0.273224	0.165652	0.102632
redGoldDiff	0.894729	0.452633	0.804347
redExperienceDiff	1.000000	0.437205	0.721190
redCSPerMin	0.437205	1.000000	0.278715
redGoldPerMin	0.721190	0.278715	1.000000

[40 rows x 40 columns]

```
[13]: sns.heatmap(data.corr())
```

```
[13]: <matplotlib.axes._subplots.AxesSubplot at 0x167a910>
```

