Barracks to Win Relation

April 24, 2022

Barracks are buildings that spawn Lane Creeps and are defended by Tier 3 towers. There are two barracks for each lane. The time of destruction of barracks can be a helpful marker to predict the outcome of the match, as whichever team gets the first barracks kill demonstrates better teamwork, and also gets an advantage as it gets easier control over lanes as well as limits the farming capabilities of the opposing heros.

[11]:

```python
# Import libraries
import pandas as pd
import seaborn as sns
import numpy as np
import matplotlib.pyplot as plt
```

[2]:

```python
# Load datasets
matches = pd.read_csv('datasets/dota-2-matches/match.csv')
objectives = pd.read_csv('datasets/dota-2-matches/objectives.csv')
```

[3]:

```python
data = matches.set_index('match_id').join(objectives.set_index('match_id'),␣
  ↪on='match_id')
data.head()
```

[3]:

```
          start_time  duration  tower_status_radiant  tower_status_dire  \
match_id
0         1446750112      2375                  1982                  4
0         1446750112      2375                  1982                  4
0         1446750112      2375                  1982                  4
0         1446750112      2375                  1982                  4
0         1446750112      2375                  1982                  4

          barracks_status_dire  barracks_status_radiant  first_blood_time  \
match_id
0                            3                       63                 1
0                            3                       63                 1
0                            3                       63                 1
0                            3                       63                 1
0                            3                       63                 1

          game_mode  radiant_win  negative_votes  positive_votes  cluster  \
match_id
```

```
0                22         True                 0                1       155
0                22         True                 0                1       155
0                22         True                 0                1       155
0                22         True                 0                1       155
0                22         True                 0                1       155

          key  player1  player2  slot                    subtype  team    time  \
match_id
0         NaN      0.0      6.0   0.0   CHAT_MESSAGE_FIRSTBLOOD   NaN     1.0
0         NaN      3.0     -1.0   3.0   CHAT_MESSAGE_TOWER_KILL   2.0   894.0
0         NaN      2.0     -1.0   NaN  CHAT_MESSAGE_ROSHAN_KILL   2.0   925.0
0         NaN      1.0     -1.0   1.0        CHAT_MESSAGE_AEGIS   NaN   925.0
0         NaN      7.0     -1.0   7.0   CHAT_MESSAGE_TOWER_KILL   3.0  1016.0

          value
match_id
0         309.0
0           2.0
0         200.0
0           0.0
0           3.0
```

Barracks kills are marked by messages that pop up in chat. To get the time of the first baracks killed, we take the first time this message popped up in game.

[4]:

```
result = data[data['subtype']=='CHAT_MESSAGE_BARRACKS_KILL'].
  ↪sort_values('time').groupby(by='match_id').head(1)
result.head()
```

[4]:

```
          start_time  duration  tower_status_radiant  tower_status_dire  \
match_id
31538     1447626141       478                  2047                455
2080      1447338670       441                  2047               2040
41434     1447736988       714                  2046                  7
25291     1447580270       739                  1983                452
12058     1447452445       635                   452               2047

          barracks_status_dire  barracks_status_radiant  first_blood_time  \
match_id
31538                       51                       63                16
2080                        60                       63                 9
41434                        3                       63                 0
25291                       51                       63                31
12058                       63                       51                 0

          game_mode  radiant_win  negative_votes  positive_votes  cluster  \
match_id
31538            22         True               0               0      132
```

```
2080               2         True               0               0      133
41434             22         True               0               0      204
25291             22         True               0               0      123
12058             22        False               0               0      204

            key  player1  player2  slot                     subtype  team  \
match_id
31538       4.0     -1.0     -1.0   NaN  CHAT_MESSAGE_BARRACKS_KILL   NaN
2080       16.0     -1.0     -1.0   NaN  CHAT_MESSAGE_BARRACKS_KILL   NaN
41434       4.0     -1.0     -1.0   NaN  CHAT_MESSAGE_BARRACKS_KILL   NaN
25291       4.0     -1.0     -1.0   NaN  CHAT_MESSAGE_BARRACKS_KILL   NaN
12058     256.0     -1.0     -1.0   NaN  CHAT_MESSAGE_BARRACKS_KILL   NaN

           time  value
match_id
31538     317.0    4.0
2080      404.0   16.0
41434     430.0    4.0
25291     482.0    4.0
12058     497.0  256.0
```

A particular teams tower status is given as an 8-bit unsigned integer. The rightmost 6 bits represent the barracks belonging to that team - https://wiki.teamfortress.com/wiki/WebAPI/GetMatchDetails#Barracks_Status

[5]:
```
# Get the team that first killed barracks
result['first_barracks_kill'] = np.where(result['key'] <= 2**5, 'radiant',␣
 ↪'dire')

result_filtered = result[['time', 'radiant_win', 'first_barracks_kill']].copy()
result_filtered.sample(10)
```

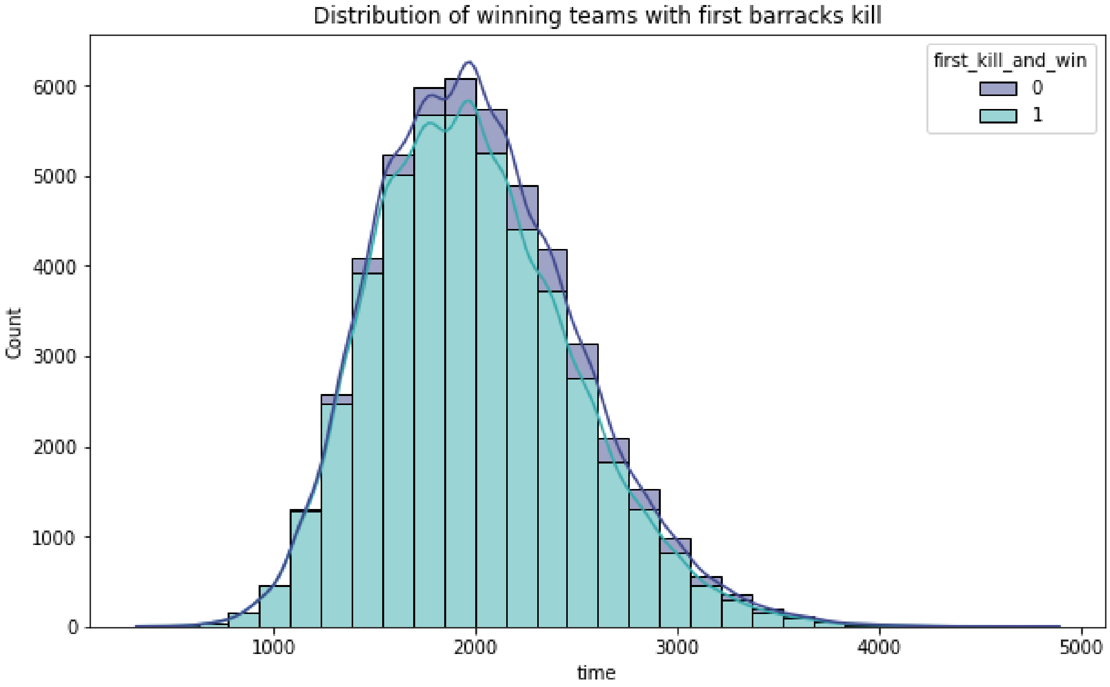
[5]:
```
            time  radiant_win first_barracks_kill
match_id
512       1390.0        False                dire
19622     2562.0        False                dire
9869      2135.0        False                dire
14828     1922.0        False                dire
43100     1782.0         True             radiant
990       2373.0        False                dire
10886     2514.0        False                dire
28518     1531.0        False                dire
4559      3018.0         True             radiant
6819      1760.0         True             radiant
```

We can see that even in a random sample, the number of teams that won and first killed barracks is very high.

```
[8]: # Add 1 and 0 based on team getting first barracks kill and winning and losing
     result_filtered["first_kill_and_win"] = np.where(
         (result_filtered['radiant_win']) & (result_filtered['first_barracks_kill']␣
       ↪== 'radiant') |
         (result_filtered['radiant_win']==False) &␣
       ↪(result_filtered['first_barracks_kill'] == 'dire'), 1, 0)
```

```
[14]: # Plot distributions
      fig = plt.figure(figsize=(10,6))
      plt.title("Distribution of winning teams with first barracks kill")
      sns.histplot(x='time',
                   data=result_filtered,
                   stat='count',
                   multiple='stack',
                   hue='first_kill_and_win',
                   bins=30,
                   element='bars',
                   palette='mako',
                   kde=True
                  )
```

```
[14]: <AxesSubplot:title={'center':'Distribution of winning teams with first barracks
      kill'}, xlabel='time', ylabel='Count'>
```



We can see that the correlation actually holds true, the first team to take down the opponent's barracks has a much higher chance of winning. We can also observe that the correlation is stronger for early game, and becomes weaker as time goes on.