

Data Cleaning and Analysis Script for CSCI526 ChestNut Game Entropy

```
In [76]: import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
import math
import os

file_name = 'ChestNut_Data_10-17.csv'

line = '\n=====
=====\\n'
```

```
In [77]: df = pd.read_csv(file_name)
```

```
In [78]: df.drop(columns=['Timestamp'], inplace=True)
```

```
In [79]: display(df)
```

	Player ID	Tag	Time
0	638009521531898	lv0-start	638014644449596
1	638009521531898	lv0-start	638014644861436
2	638009521531898	lv0-logo	638014644881033
3	638009521531898	lv0-item-redcube	638014644887376
4	638009521531898	lv0-item-redcube	638014644914952
...
1935	638009521531898	lv0-item-redcube	638016098501890
1936	638009521531898	lv0-item-bluecube	638016098542749
1937	638009521531898	lv0-item-bluecube	638016098547728
1938	638009521531898	lv0-logo	638016098554174
1939	638016150332420	lv1-start	638016150386910

1940 rows × 3 columns

```
In [80]: gb = df.groupby('Player ID')
player_list = [gb.get_group(x) for x in gb.groups]
```

```

In [81]: start_list = ['lv0-start', 'lv1-start', 'lv2-start', 'lv3-start', 'lv4-start']
end_list = ['lv0-success', 'lv1-success', 'lv2-success', 'lv3-success', 'lv4-s
uccess',
            'lv0-death', 'lv1-death', 'lv2-death', 'lv3-death', 'lv4-death',
            'lv0-quit', 'lv1-quit', 'lv2-quit', 'lv3-quit', 'lv4-quit']
pause_list = ['lv0-pause', 'lv1-pause', 'lv2-pause', 'lv3-pause', 'lv4-pause']
resume_list = ['lv0-resume', 'lv1-resume', 'lv2-resume', 'lv3-resume', 'lv4-re
sume']
player_game_list = []

for player_df in player_list:
    #display(player_df)

    #print(player_game_list)
    player_df = player_df.sort_values(['Time'], ascending=True)
    game_list = []
    started = -1
    seq_list = []
    for index, row in player_df.iterrows():
        if row['Tag'] in start_list:
            if started == -1:
                started = start_list.index(row['Tag'])
                seq_list.append([row['Tag'], row['Time']])
            else:
                started = start_list.index(row['Tag'])
                seq_list = []
                seq_list.append([row['Tag'], row['Time']])
        elif row['Tag'] in end_list:
            if started != -1:
                seq_list.append([row['Tag'], row['Time']])
                game_list.append(seq_list)
                seq_list = []
                started = -1
            elif started != -1:
                seq_list.append([row['Tag'], row['Time']])
    #display(row['Tag'])
    player_game_list.append([player_df.iloc[0]['Player ID'], game_list])

```

```
In [82]: level_name = ['Level 0', 'Level 1', 'Level 2', 'Level 3', 'Level 4']

for item in player_game_list:
    print(line)
    print('Player ID: %d'%(item[0]))
    for game in item[1]:
        print('\nPlayed Level %d'%(start_list.index(game[0][0])))
        for cp in game:
            print('%s'%(cp[0]), end='')
        print('\nGame Time: %f'%((game[len(game)-1][1] - game[0][1])/10000))
```

=====

Player ID: 638008528272180

Played Level 0

lv0-start lv0-item-redcube lv0-logo lv0-item-redcube lv0-item-bluecube lv0-item-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-logo lv0-success

Game Time: 30.096000

Played Level 1

lv1-start lv1-item-bluecube lv1-logo lv1-logo lv1-logo lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-bluecube lv1-item-bluecube lv1-item-bluecube lv1-item-key lv1-logo lv1-logo lv1-logo lv1-success

Game Time: 80.944000

Played Level 2

lv2-start lv2-settings lv2-quit

Game Time: 4.425000

Played Level 0

lv0-start lv0-item-redcube lv0-item-redcube lv0-item-bluecube lv0-item-bluecube lv0-item-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-logo lv0-success

Game Time: 25.211000

Played Level 1

lv1-start lv1-settings lv1-quit

Game Time: 4.609000

Played Level 3

lv3-start lv3-item-redcube lv3-item-redcube lv3-cp-1 lv3-item-key lv3-item-redcube lv3-cp-4 lv3-item-key lv3-item-key lv3-item-key lv3-logo lv3-success

Game Time: 91.495000

Played Level 4

lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-cp-1 lv4-item-bluecube lv4-cp-2 lv4-death

Game Time: 25.623000

Played Level 4

lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-death

Game Time: 24.716000

Played Level 4

lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-cp-1 lv4-item-bluecube lv4-item-bluecube lv4-cp-2 lv4-death

Game Time: 47.036000

Played Level 4

lv4-start lv4-cp-0 lv4-death

Game Time: 22.744000

Played Level 0

lv0-start lv0-logo lv0-item-redcube lv0-item-redcube lv0-item-bluecube lv0-item-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-logo lv0-success

Game Time: 31.434000

Played Level 0

lv0-start lv0-logo lv0-item-redcube lv0-item-redcube lv0-item-bluecube lv0-item-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-logo lv0-logo lv0-success
Game Time: 35.126000

Played Level 1

lv1-start lv1-logo lv1-item-bluecube lv1-logo lv1-logo lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-bluecube lv1-item-bluecube lv1-item-key lv1-item-bluecube lv1-logo lv1-success
Game Time: 98.090000

Played Level 2

lv2-start lv2-item-redcube lv2-item-redcube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-key lv2-item-key lv2-item-key lv2-item-bluecube lv2-death
Game Time: 46.209000

Played Level 2

lv2-start lv2-item-redcube lv2-settings lv2-quit
Game Time: 13.988000

Played Level 0

lv0-start lv0-logo lv0-item-redcube lv0-item-redcube lv0-item-bluecube lv0-item-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-logo lv0-success
Game Time: 28.249000

Played Level 1

lv1-start lv1-settings lv1-quit
Game Time: 3.404000

Played Level 0

lv0-start lv0-logo lv0-item-redcube lv0-item-redcube lv0-item-bluecube lv0-item-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-logo lv0-settings lv0-quit
Game Time: 42.026000

Played Level 0

lv0-start lv0-item-redcube lv0-item-redcube lv0-item-bluecube lv0-item-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-logo lv0-success
Game Time: 33.810000

Played Level 0

lv0-start lv0-logo lv0-item-redcube lv0-item-redcube lv0-item-bluecube lv0-item-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-settings lv0-resume lv0-logo lv0-success
Game Time: 67.031000

Played Level 0

lv0-start lv0-item-redcube lv0-item-redcube lv0-item-bluecube lv0-item-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-logo lv0-success
Game Time: 27.127000

Played Level 0

lv0-start lv0-logo lv0-settings lv0-quit

Game Time: 8.770000

Played Level 0

lv0-start lv0-logo lv0-item-redcube lv0-item-redcube lv0-item-bluecube lv0-item-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-success

Game Time: 31.741000

Played Level 0

lv0-start lv0-logo lv0-item-redcube lv0-item-redcube lv0-item-bluecube lv0-item-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-logo lv0-success

Game Time: 31.259000

Played Level 0

lv0-start lv0-settings lv0-quit

Game Time: 4.164000

Played Level 0

lv0-start lv0-item-redcube lv0-logo lv0-item-redcube lv0-item-bluecube lv0-item-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-logo lv0-success

Game Time: 272.573000

Played Level 1

lv1-start lv1-item-bluecube lv1-logo lv1-logo lv1-logo lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-bluecube lv1-item-bluecube lv1-item-bluecube lv1-item-key lv1-logo lv1-logo lv1-logo lv1-success

Game Time: 103.374000

Played Level 2

lv2-start lv2-item-redcube lv2-item-redcube lv2-logo lv2-item-key lv2-cp-2 lv2-logo lv2-item-key lv2-item-key lv2-cp-3 lv2-success

Game Time: 47.116000

Played Level 3

lv3-start lv3-logo lv3-item-bluecube lv3-cp-0 lv3-logo lv3-item-key lv3-logo lv3-cp-2 lv3-item-redcube lv3-item-key lv3-cp-3 lv3-logo lv3-cp-4 lv3-item-key lv3-item-redcube lv3-logo lv3-item-redcube lv3-cp-5 lv3-item-bluecube lv3-item-bluecube lv3-cp-7 lv3-item-bluecube lv3-item-bluecube lv3-item-bluecube lv3-logo lv3-cp-9 lv3-item-key lv3-item-key lv3-item-key lv3-death

Game Time: 127.046000

Played Level 4

lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-death

Game Time: 11.894000

Played Level 3

lv3-start lv3-item-redcube lv3-item-redcube lv3-cp-1 lv3-death

Game Time: 30.388000

Played Level 0

lv0-start lv0-item-redcube lv0-logo lv0-item-redcube lv0-item-bluecube lv0-item-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-logo lv0-success

Game Time: 39.700000

Played Level 1

lv1-start lv1-death

Game Time: 4.921000

Played Level 1
lv1-start lv1-item-bluecube lv1-logo lv1-logo lv1-logo lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-death
Game Time: 91.020000

Played Level 2
lv2-start lv2-item-redcube lv2-item-redcube lv2-cp-1 lv2-success
Game Time: 23.315000

Played Level 2
lv2-start lv2-item-redcube lv2-item-redcube lv2-settings lv2-quit
Game Time: 12.439000

Played Level 2
lv2-start lv2-item-redcube lv2-item-redcube lv2-item-redcube lv2-settings lv2-quit
Game Time: 10.812000

Played Level 2
lv2-start lv2-settings lv2-quit
Game Time: 5.104000

Played Level 2
lv2-start lv2-item-redcube lv2-item-redcube lv2-item-redcube lv2-settings lv2-quit
Game Time: 14.981000

Played Level 2
lv2-start lv2-item-redcube lv2-item-redcube lv2-logo lv2-cp-1 lv2-success
Game Time: 16.622000

Played Level 2
lv2-start lv2-settings lv2-quit
Game Time: 3.116000

Played Level 2
lv2-start lv2-settings lv2-quit
Game Time: 3.812000

Played Level 1
lv1-start lv1-settings lv1-quit
Game Time: 28.439000

=====
=====

Player ID: 638008529129280

Played Level 2
lv2-start lv2-item-redcube lv2-item-redcube lv2-item-redcube lv2-logo lv2-item-key lv2-item-bluecube lv2-item-redcube lv2-death
Game Time: 32.730000

Played Level 2
lv2-start lv2-settings lv2-quit

Game Time: 16.158000

Played Level 0

lv0-start lv0-settings lv0-resume lv0-item-redcube lv0-item-redcube lv0-item-bluecube lv0-item-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-logo lv0-success

Game Time: 41.052000

Played Level 0

lv0-start lv0-settings lv0-resume lv0-logo lv0-item-redcube lv0-item-redcube lv0-item-bluecube lv0-item-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-logo lv0-success

Game Time: 32.141000

Played Level 4

lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-cp-1 lv4-item-bluecube lv4-item-bluecube lv4-item-bluecube lv4-cp-2 lv4-cp-4 lv4-settings lv4-quit

Game Time: 84.172000

Played Level 4

lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-cp-1 lv4-item-bluecube lv4-item-bluecube lv4-item-bluecube lv4-cp-2 lv4-item-key lv4-cp-4 lv4-cp-8 lv4-success

Game Time: 75.805000

=====

Player ID: 638008566103940

Played Level 3

lv3-start lv3-logo lv3-item-bluecube lv3-cp-0 lv3-logo lv3-item-key lv3-logo lv3-cp-2 lv3-item-key lv3-logo lv3-cp-3 lv3-item-bluecube lv3-item-bluecube lv3-item-redcube lv3-item-redcube lv3-cp-4 lv3-item-key lv3-item-redcube lv3-cp-5 lv3-item-bluecube lv3-item-bluecube lv3-cp-7 lv3-item-bluecube lv3-item-bluecube lv3-cp-9 lv3-settings lv3-quit

Game Time: 126.598000

Played Level 3

lv3-start lv3-item-redcube lv3-item-redcube lv3-cp-1 lv3-logo lv3-logo lv3-item-bluecube lv3-cp-2 lv3-item-key lv3-logo lv3-cp-3 lv3-item-bluecube lv3-cp-4 lv3-item-key lv3-cp-5 lv3-item-bluecube lv3-item-bluecube lv3-item-bluecube lv3-cp-7 lv3-item-bluecube lv3-item-bluecube lv3-cp-9 lv3-settings lv3-quit

Game Time: 90.683000

Played Level 3

lv3-start lv3-item-redcube lv3-item-redcube lv3-cp-1 lv3-item-bluecube lv3-item-bluecube lv3-cp-2 lv3-item-redcube lv3-cp-3 lv3-logo lv3-item-key lv3-cp-4 lv3-item-key lv3-logo lv3-cp-5 lv3-item-bluecube lv3-item-bluecube lv3-item-bluecube lv3-cp-7 lv3-item-bluecube lv3-item-bluecube lv3-item-bluecube lv3-cp-9 lv3-cp-11 lv3-logo lv3-item-key lv3-item-key lv3-item-key lv3-cp-9 lv3-logo lv3-cp-11 lv3-logo lv3-success

Game Time: 325.152000

Played Level 0


```
lv2-start lv2-item-redcube lv2-item-redcube lv2-item-bluecube lv2-item-bluecube
lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube
lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube
lv2-item-bluecube lv2-item-redcube lv2-item-redcube lv2-item-redcube lv2-item-redcube
lv2-item-redcube lv2-item-redcube lv2-cp-0 lv2-item-key lv2-death
```

```
lv2-start lv2-item-redcube lv2-item-redcube lv2-item-redcube lv2-item-bluecube
lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-
item-key lv2-item-key lv2-item-key lv2-item-redcube lv2-item-redcube lv2-ite
m-redcube lv2-item-redcube lv2-cp-0 lv2-item-bluecube lv2-item-bluecube lv2-i
tem-bluecube lv2-logo lv2-cp-1 lv2-death
```

```
lv0-start lv0-item-redcube lv0-logo lv0-item-redcube lv0-item-bluecube lv0-it
em-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-logo lv0-success
```

```
lv0-start lv0-logo lv0-item-redcube lv0-item-redcube lv0-item-bluecube lv0-it
em-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-logo lv0-success
```

```
lv3-start lv3-item-redcube lv3-item-redcube lv3-cp-1 lv3-item-key lv3-death
```

```
lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-cp-1 lv4-item-bluecu
be lv4-item-bluecube lv4-item-bluecube lv4-cp-2 lv4-cp-3 lv4-logo lv4-cp-5 lv
4-death
```

```
lv0-start lv0-logo lv0-item-redcube lv0-item-redcube lv0-item-bluecube lv0-it
em-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-success
```

```
lv1-start lv1-settings lv1-quit
```

```
lv1-start lv1-settings lv1-quit
```

Played Level 1

```

Played Level 0
lv0-start lv0-logo lv0-item-redcube lv0-item-redcube lv0-item-bluecube lv0-it
em-bluecube lv0-item-bluecube lv0-logo lv0-settings lv0-quit

```

Game Time: 12.397300

Played Level 0

lv0-start lv0-settings lv0-quit

Game Time: 3.820600

Played Level 0

lv0-start lv0-settings lv0-quit

Game Time: 15.430700

Played Level 0

lv0-start lv0-settings lv0-resume lv0-settings lv0-quit

Game Time: 27.843900

Played Level 0

lv0-start lv0-item-redcube lv0-logo lv0-settings lv0-quit

Game Time: 15.964100

Played Level 2

lv2-start lv2-settings lv2-quit

Game Time: 7.976400

Played Level 0

lv0-start lv0-settings lv0-quit

Game Time: 6.710700

Played Level 3

lv3-start lv3-settings lv3-quit

Game Time: 6.292900

Played Level 1

lv1-start lv1-settings lv1-quit

Game Time: 6.081200

Played Level 1

lv1-start lv1-settings lv1-quit

Game Time: 2.961600

Played Level 1

lv1-start lv1-settings lv1-quit

Game Time: 2.734400

Played Level 1

lv1-start lv1-settings lv1-quit

Game Time: 2.198100

=====
=====

Player ID: 638010164420060

Played Level 1

lv1-start lv1-death

Game Time: 13.443000

Played Level 1

lv1-start lv1-logo lv1-item-bluecube lv1-item-bluecube lv1-logo lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-bluecube lv1-item-bluecube lv1-item-bluecube lv1-item-key lv1-death
Game Time: 94.149000

Played Level 1

lv1-start lv1-item-bluecube lv1-item-bluecube lv1-logo lv1-logo lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-death
Game Time: 64.285000

=====

Player ID: 638010934999710

Played Level 3

lv3-start lv3-logo lv3-item-redcube lv3-item-redcube lv3-cp-1 lv3-logo lv3-item-bluecube lv3-cp-2 lv3-item-redcube lv3-item-redcube lv3-item-key lv3-cp-3 lv3-item-bluecube lv3-item-bluecube lv3-item-bluecube lv3-item-bluecube lv3-cp-4 lv3-item-key lv3-item-redcube lv3-item-redcube lv3-cp-5 lv3-item-bluecube lv3-item-bluecube lv3-cp-6 lv3-logo lv3-item-bluecube lv3-cp-9 lv3-cp-11 lv3-logo lv3-item-key lv3-item-key lv3-item-key lv3-item-redcube lv3-item-redcube lv3-logo lv3-success
Game Time: 171.531000

Played Level 4

lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-cp-1 lv4-death
Game Time: 25.879000

Played Level 4

lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-cp-1 lv4-item-bluecube lv4-item-bluecube lv4-item-bluecube lv4-cp-2 lv4-cp-3 lv4-logo lv4-cp-5 lv4-cp-4 lv4-item-key lv4-logo lv4-cp-5 lv4-cp-6 lv4-item-bluecube lv4-item-bluecube lv4-logo lv4-item-bluecube lv4-item-bluecube lv4-item-key lv4-logo lv4-death
Game Time: 126.259000

Played Level 4

lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-cp-1 lv4-item-bluecube lv4-item-bluecube lv4-item-bluecube lv4-cp-2 lv4-cp-3 lv4-logo lv4-cp-5 lv4-cp-4 lv4-logo lv4-cp-5 lv4-cp-4 lv4-item-key lv4-cp-5 lv4-cp-6 lv4-item-bluecube lv4-item-bluecube lv4-logo lv4-item-bluecube lv4-item-bluecube lv4-item-key lv4-logo lv4-cp-7 lv4-item-redcube lv4-logo lv4-item-redcube lv4-cp-8 lv4-success
Game Time: 201.397000

Played Level 4

lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-cp-1 lv4-logo lv4-item-bluecube lv4-item-bluecube lv4-item-bluecube lv4-cp-2 lv4-item-key lv4-cp-4 lv4-cp-8 lv4-success
Game Time: 62.181000

Played Level 1

lv1-start lv1-item-bluecube lv1-item-bluecube lv1-logo lv1-logo lv1-logo lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-key lv1-item-bluecube lv1-item-bluecube lv1-item-bluecube lv1-logo lv1-logo lv1-s

Game Time: 84.487000

Game Time: 20.478000

Game Time: 114.289000

Game Time: 6.086000

Game Time: 5.610000

Game Time: 32.532000

```
=====
=====
```

Game Time: 34.877000

Game Time: 121.026000

=====

=====

Player ID: 638015242341790

Played Level 1

lv1-start lv1-item-bluecube lv1-item-bluecube lv1-logo lv1-logo lv1-logo lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-key lv1-item-bluecube lv1-item-bluecube lv1-item-bluecube lv1-logo lv1-logo lv1-death
Game Time: 157.450000

Played Level 4

lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-logo lv4-cp-1 lv4-item-bluecube lv4-item-bluecube lv4-item-bluecube lv4-cp-2 lv4-cp-3 lv4-logo lv4-cp-5 lv4-cp-4 lv4-item-key lv4-logo lv4-cp-5 lv4-death
Game Time: 214.733000

=====

=====

Player ID: 638015458740890

Played Level 0

lv0-start lv0-settings lv0-resume lv0-logo lv0-item-redcube lv0-item-redcube lv0-item-bluecube lv0-item-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-logout lv0-settings lv0-quit
Game Time: 119.118000

Played Level 0

lv0-start lv0-settings lv0-quit
Game Time: 389.370000

Played Level 1

lv1-start lv1-item-bluecube lv1-item-bluecube lv1-logo lv1-logo lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-key lv1-item-bluecube lv1-item-bluecube lv1-item-bluecube lv1-settings lv1-quit
Game Time: 84.684000

Played Level 2

lv2-start lv2-item-redcube lv2-item-redcube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-key lv2-item-key lv2-logo lv2-item-key lv2-item-redcube lv2-item-redcube lv2-item-redcube lv2-item-redcube lv2-item-bluecube lv2-cp-0 lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-logo lv2-cp-1 lv2-death
Game Time: 334.470000

Played Level 2

lv2-start lv2-cp-1 lv2-death
Game Time: 26.486000

Played Level 2

lv2-start lv2-cp-1 lv2-settings lv2-quit
Game Time: 26.713000

Played Level 2
lv2-start lv2-cp-1 lv2-death
Game Time: 16.626000

Played Level 2
lv2-start lv2-cp-1 lv2-item-redcube lv2-item-redcube lv2-item-key lv2-logo lv
2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-log
o lv2-item-key lv2-logo lv2-settings lv2-quit
Game Time: 110.316000

Played Level 3
lv3-start lv3-item-redcube lv3-item-redcube lv3-cp-1 lv3-item-bluecube lv3-it
em-bluecube lv3-cp-2 lv3-settings lv3-quit
Game Time: 88.381000

Played Level 3
lv3-start lv3-item-redcube lv3-item-redcube lv3-cp-1 lv3-item-bluecube lv3-it
em-bluecube lv3-cp-2 lv3-cp-3 lv3-logo lv3-item-key lv3-item-redcube lv3-logo
lv3-item-redcube lv3-cp-4 lv3-item-key lv3-cp-5 lv3-item-bluecube lv3-item-bl
uecube lv3-item-bluecube lv3-item-bluecube lv3-cp-7 lv3-item-bluecube lv3-ite
m-bluecube lv3-item-bluecube lv3-item-bluecube lv3-cp-9 lv3-item-key lv3-item
-key lv3-item-key lv3-logo lv3-cp-11 lv3-logo lv3-success
Game Time: 243.653000

Played Level 4
lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-cp-1 lv4-item-bluecu
be lv4-item-bluecube lv4-item-bluecube lv4-cp-2 lv4-cp-3 lv4-logo lv4-cp-5 lv
4-cp-4 lv4-logo lv4-item-key lv4-cp-5 lv4-cp-6 lv4-item-bluecube lv4-item-blu
ecube lv4-logo lv4-item-bluecube lv4-item-bluecube lv4-item-key lv4-logo lv4-
cp-7 lv4-settings lv4-quit
Game Time: 267.413000

Played Level 4
lv4-start lv4-cp-0 lv4-death
Game Time: 7.547000

Played Level 4
lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-cp-1 lv4-item-bluecu
be lv4-item-bluecube lv4-cp-2 lv4-item-key lv4-cp-4 lv4-cp-2 lv4-settings lv4
-quit
Game Time: 63.608000

Played Level 4
lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-cp-1 lv4-cp-2 lv4-cp
-4 lv4-item-key lv4-cp-8 lv4-success
Game Time: 105.764000

Played Level 4
lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-cp-1 lv4-cp-2 lv4-cp
-3 lv4-item-key lv4-cp-8 lv4-success
Game Time: 78.200000

Played Level 1
lv1-start lv1-logo lv1-settings lv1-quit
Game Time: 13.316000

Played Level 1
lv1-start lv1-settings lv1-quit
Game Time: 1.798000

Played Level 2
lv2-start lv2-logo lv2-item-key lv2-death
Game Time: 30.783000

Played Level 2
lv2-start lv2-logo lv2-logo lv2-item-key lv2-item-bluecube lv2-item-bluecube
lv2-item-redcube lv2-item-redcube lv2-item-redcube lv2-item-redcube lv2-item-
bluecube lv2-death
Game Time: 27.557000

Played Level 2
lv2-start lv2-logo lv2-item-redcube lv2-logo lv2-item-key lv2-item-bluecube l
v2-item-bluecube lv2-item-bluecube lv2-item-redcube lv2-item-redcube lv2-deat
h
Game Time: 21.555000

Played Level 2
lv2-start lv2-cp-1 lv2-death
Game Time: 14.296000

Played Level 2
lv2-start lv2-death
Game Time: 10.013000

Played Level 3
lv3-start lv3-item-redcube lv3-item-redcube lv3-cp-1 lv3-item-key lv3-death
Game Time: 27.151000

Played Level 3
lv3-start lv3-item-redcube lv3-item-redcube lv3-cp-1 lv3-item-key lv3-logo lv
3-cp-3 lv3-item-bluecube lv3-item-bluecube lv3-cp-4 lv3-item-key lv3-item-red
cube lv3-logo lv3-cp-5 lv3-item-bluecube lv3-item-bluecube lv3-cp-7 lv3-item-
bluecube lv3-item-bluecube lv3-cp-9 lv3-settings lv3-quit
Game Time: 81.433000

Played Level 4
lv4-start lv4-cp-0 lv4-death
Game Time: 8.989000

Played Level 4
lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-cp-1 lv4-cp-2 lv4-cp
-4 lv4-death
Game Time: 54.145000

=====
=====

Player ID: 638015621814150

Played Level 0
lv0-start lv0-logo lv0-item-redcube lv0-item-redcube lv0-item-bluecube lv0-it

em-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-logo lv0-success
Game Time: 65.027000

Played Level 1

lv1-start lv1-item-bluecube lv1-item-bluecube lv1-logo lv1-logo lv1-logo lv1-
item-redcube lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-death
Game Time: 109.720000

=====
=====

Player ID: 638016042300280

Played Level 0

lv0-start lv0-item-redcube lv0-logo lv0-item-redcube lv0-item-bluecube lv0-it
em-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-logo lv0-logo lv0-success
Game Time: 29.931000

=====
=====

Player ID: 638016082720520

Played Level 2

lv2-start lv2-death
Game Time: 23.711000

Played Level 0

lv0-start lv0-logo lv0-item-redcube lv0-item-redcube lv0-item-bluecube lv0-it
em-bluecube lv0-item-bluecube lv0-logo lv0-logo lv0-success
Game Time: 97.388000

Played Level 1

lv1-start lv1-item-bluecube lv1-item-bluecube lv1-logo lv1-logo lv1-item-redc
ube lv1-death
Game Time: 75.609000

Played Level 1

lv1-start lv1-item-bluecube lv1-item-bluecube lv1-logo lv1-logo lv1-logo lv1-
item-redcube lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-death
Game Time: 58.062000

Played Level 1

lv1-start lv1-item-bluecube lv1-item-bluecube lv1-logo lv1-logo lv1-item-redc
ube lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-key lv1-item-
bluecube lv1-item-bluecube lv1-death
Game Time: 95.578000

Played Level 1

lv1-start lv1-item-bluecube lv1-item-bluecube lv1-logo lv1-logo lv1-item-redc
ube lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-key lv1-death
Game Time: 75.344000

Played Level 1

lv1-start lv1-item-bluecube lv1-item-bluecube lv1-logo lv1-logo lv1-logo lv1-
item-redcube lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-blue

cube lv1-death
Game Time: 96.042000

Played Level 1
lv1-start lv1-item-bluecube lv1-item-bluecube lv1-logo lv1-logo lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-bluecube lv1-death
Game Time: 59.478000

Played Level 1
lv1-start lv1-item-bluecube lv1-item-bluecube lv1-logo lv1-logo lv1-logo lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-redcube lv1-item-bluecube lv1-item-bluecube lv1-item-bluecube lv1-item-key lv1-logo lv1-logo lv1-success
Game Time: 98.642000

Played Level 2
lv2-start lv2-logo lv2-item-redcube lv2-item-bluecube lv2-item-redcube lv2-cp-2 lv2-item-redcube lv2-item-key lv2-logo lv2-item-key lv2-death
Game Time: 125.010000

Played Level 2
lv2-start lv2-item-redcube lv2-item-redcube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-key lv2-item-key lv2-item-key lv2-item-bluecube lv2-item-redcube lv2-item-redcube lv2-cp-0 lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-death
Game Time: 134.443000

Played Level 2
lv2-start lv2-item-redcube lv2-item-redcube lv2-item-bluecube lv2-item-bluecube lv2-item-bluecube lv2-item-key lv2-item-key lv2-item-key lv2-item-redcube lv2-item-redcube lv2-cp-0 lv2-logo lv2-cp-1 lv2-logo lv2-death
Game Time: 161.745000

Played Level 2
lv2-start lv2-logo lv2-item-key lv2-item-redcube lv2-item-bluecube lv2-item-redcube lv2-cp-2 lv2-item-redcube lv2-item-key lv2-logo lv2-death
Game Time: 75.578000

Played Level 2
lv2-start lv2-logo lv2-item-redcube lv2-item-redcube lv2-logo lv2-item-redcube lv2-cp-2 lv2-item-key lv2-item-bluecube lv2-item-redcube lv2-item-key lv2-logo lv2-item-key lv2-cp-3 lv2-item-key lv2-logo lv2-item-bluecube lv2-logo lv2-cp-5 lv2-success
Game Time: 177.127000

Played Level 3
lv3-start lv3-logo lv3-item-bluecube lv3-cp-0 lv3-item-key lv3-logo lv3-logo lv3-cp-2 lv3-item-key lv3-logo lv3-item-redcube lv3-cp-3 lv3-cp-5 lv3-item-redcube lv3-cp-4 lv3-item-key lv3-logo lv3-logo lv3-cp-5 lv3-item-bluecube lv3-item-bluecube lv3-cp-7 lv3-item-bluecube lv3-item-bluecube lv3-logo lv3-item-bluecube lv3-cp-9 lv3-cp-11 lv3-logo lv3-logo lv3-item-key lv3-item-key lv3-item-key lv3-logo lv3-success
Game Time: 361.461000

Played Level 4

```
lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-cp-1 lv4-item-bluecube lv4-cp-2 lv4-death
Game Time: 179.448000
```

Played Level 4

```
lv4-start lv4-cp-0 lv4-item-redcube lv4-item-redcube lv4-cp-1 lv4-item-bluecube lv4-item-bluecube lv4-cp-2 lv4-cp-4 lv4-item-key lv4-log
o lv4-cp-7 lv4-cp-8 lv4-success
Game Time: 134.006000
```

```
=====
=====
```

Player ID: 638016150332420



```
In [83]: sorted_data = [[[],[],[],[],[],[],[],[],[],[],[],[],[],[],[],[]]
#sorted_data schema: [#level:[ #succes:[, #died:[, #quit:[ ] ] ]

for item in player_game_list:
    #print(line)
    #print('Player ID: %d'%(item[0]))
    for game in item[1]:
        pause_time = 0
        pause_start = 0
        pause = False
        for cp in game:
            if cp[0] in pause_list:
                pause_start = cp[1]
                pause = True
            elif pause and (cp[0] in resume_list or cp[0] in end_list):
                pause_time += cp[1] - pause_start
                pause = False

        game_time = ((game[len(game)-1][1] - game[0][1]) - pause_time)/10000
        level = start_list.index(game[0][0])
        ending = int(end_list.index(game[len(game)-1][0]) / 5)
        #print(game_time)
        #print(pause_time)
        #print('level %d, ending %d'%(level,ending))
        sorted_data[level][ending].append([game, game_time])
```

```

In [131]: level_labels = ['Level 0', 'Level 1', 'Level 2', 'Level 3', 'Level 4']
def game_statPainter(labels, sub_labels, data, title, unit, sub_color = None,
x_rotation = 0, label_format = '%d'):
    label_size = 12
    font_size = 18
    title_size = 22
    bar_count = len(data[0])

    if bar_count != len(sub_labels):
        print('Wrong Input Size!')
        return

    bar_width = 0.7 / bar_count

    x = np.arange(len(labels)) # the label locations
    fig, ax = plt.subplots(figsize=(15, 10))
    for i in range(bar_count):
        single_bar_data = [data_list[i] for data_list in data]
        offset = -0.35 + i*bar_width + (bar_width/2)
        if sub_color != None:
            rects = ax.bar(x+offset , single_bar_data, bar_width, label=sub_labels[i], color = sub_color[i])
        else:
            rects = ax.bar(x+offset , single_bar_data, bar_width, label=sub_labels[i])
        if x_rotation != 0:
            ax.bar_label(rects, fmt = label_format, padding=3, fontsize = label_size, rotation='vertical')
        else:
            ax.bar_label(rects, fmt = label_format, padding=3, fontsize = label_size)

    ax.set_ylabel(unit, fontsize = font_size)
    ax.set_title(title, fontsize = title_size)
    if x_rotation != 0:
        ax.set_xticks(x, ha="right", rotation = x_rotation, rotation_mode="anchor")
    plt.xticks(rotation=x_rotation)
    else:
        ax.set_xticks(x)
    ax.set_xticklabels(labels)
    ax.tick_params(axis='both', which='both', labelsize=font_size)
    plt.margins(y=0.2)
    ax.legend(fontsize = font_size)
    #fig.tight_layout()
    plt.show()

```

```

In [85]: def pie_plot(labels, data, title, explode = None, colors = None):
    if len(labels) != len(data):
        print('Size mismatch!')
        return
    if explode == None:
        explode = [0.0 for l in labels]

    # Wedge properties
    wp = { 'linewidth' : 1, 'edgecolor' : "green" }

    # Creating autocpt arguments
    def func(pct, allvalues):
        absolute = int(pct / 100.*np.sum(allvalues))
        return "{:.1f}%\n({:d})".format(pct, absolute)

    # Creating plot
    fig, ax = plt.subplots(figsize =(10, 7))
    wedges, texts, autotexts = ax.pie(data,
                                     autopct = lambda pct: func(pct, data),
                                     explode = explode,
                                     labels = labels,
                                     shadow = True,
                                     colors = colors,
                                     startangle = 90,
                                     wedgeprops = wp)

    # Adding Legend
    ax.legend(wedges, labels,
              loc ="center left",
              bbox_to_anchor =(1, 0, 0.5, 1))

    plt.setp(autotexts, size = 12)
    ax.set_title(title)

    # show plot
    plt.show()

```

```

In [88]: avg_play_time = []
        for i in range(5):
            avg_play_time.append([0,0,0])

        #succes:[], #died:[], #quit:[]

        for lv in range(5):
            for i in range(3):
                sum = 0
                counter = 0
                for item in sorted_data[lv][i]:
                    counter += 1
                    sum += item[1]
                if counter == 0:
                    avg_time = 0
                else:
                    avg_time = sum / counter
                avg_play_time[lv][i] = avg_time
                print('Average level game time for %d level%d is %fS'%(i, lv, avg_time
            ))
        print(avg_play_time)

```

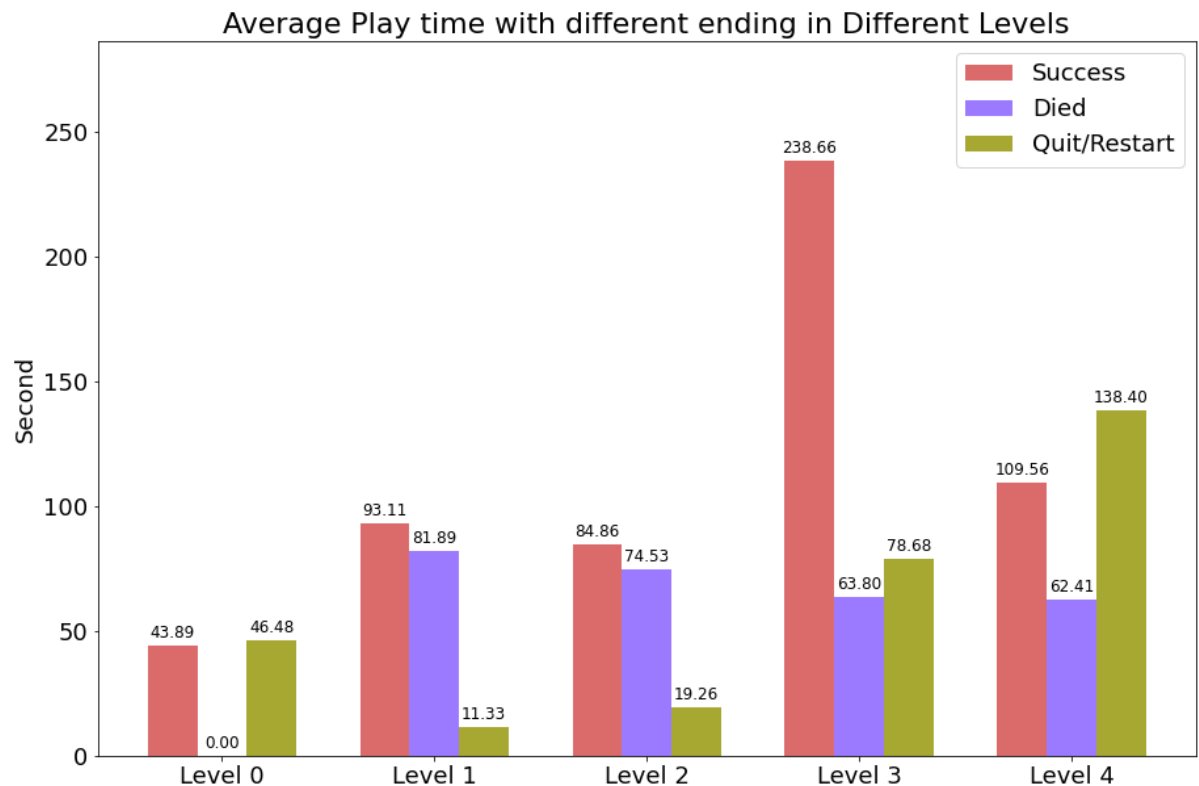
```

Average level game time for 0 level0 is 43.892791S
Average level game time for 1 level0 is 0.000000S
Average level game time for 2 level0 is 46.475180S
Average level game time for 0 level1 is 93.107400S
Average level game time for 1 level1 is 81.885400S
Average level game time for 2 level1 is 11.325227S
Average level game time for 0 level2 is 84.860757S
Average level game time for 1 level2 is 74.527706S
Average level game time for 2 level2 is 19.255262S
Average level game time for 0 level3 is 238.658400S
Average level game time for 1 level3 is 63.800340S
Average level game time for 2 level3 is 78.677580S
Average level game time for 0 level4 is 109.558833S
Average level game time for 1 level4 is 62.406677S
Average level game time for 2 level4 is 138.397667S
[[43.89279062499999, 0, 46.47518], [93.1074, 81.88539999999999, 11.3252266666
66664], [84.86075714285714, 74.52770588235295, 19.25526153846154], [238.65839
999999997, 63.800340000000006, 78.67758], [109.55883333333333, 62.40667692307
692, 138.39766666666668]]

```

```
In [89]: game_statPainter(level_labels, ['Success', 'Died', 'Quit/Restart'],
                        avg_play_time, 'Average Play time with different ending in
                        Different Levels', 'Second',
                        sub_color=['#db6b6b', '#9c7aff', '#a6a832'], label_format= '
                        %.2f')
```

0
0
0



```
In [94]: for level in sorted_data:
        sum = 0
        counter = 0
        for item in level[1]:
            counter += 1
            sum += item[1]
        if counter == 0:
            avg_time = 0
        else:
            avg_time = sum / counter
        print('Average level game time for level%d is %fS'%(sorted_data.index(level), avg_time))
```

Average level game time for level0 is 0.000000S
 Average level game time for level1 is 81.885400S
 Average level game time for level2 is 74.527706S
 Average level game time for level3 is 63.800340S
 Average level game time for level4 is 62.406677S


```
In [95]: for level in sorted_data:
    sum = 0
    counter = 0
    for item in level[2]:
        counter += 1
        sum += item[1]
    if counter == 0:
        avg_time = 0
    else:
        avg_time = sum / counter
    print('Average level game time for level%d is %fS'%(sorted_data.index(level), avg_time))
```

```
Average level game time for level0 is 46.475180S
Average level game time for level1 is 11.325227S
Average level game time for level2 is 19.255262S
Average level game time for level3 is 78.677580S
Average level game time for level4 is 138.397667S
```

Collected Items

```
In [114]: #item_count format: #Level:[ #red, #blue, #key ] cp format lv#-item-redcube
item_count = []

for i in range(5):
    item_count.append([0,0,0,0])

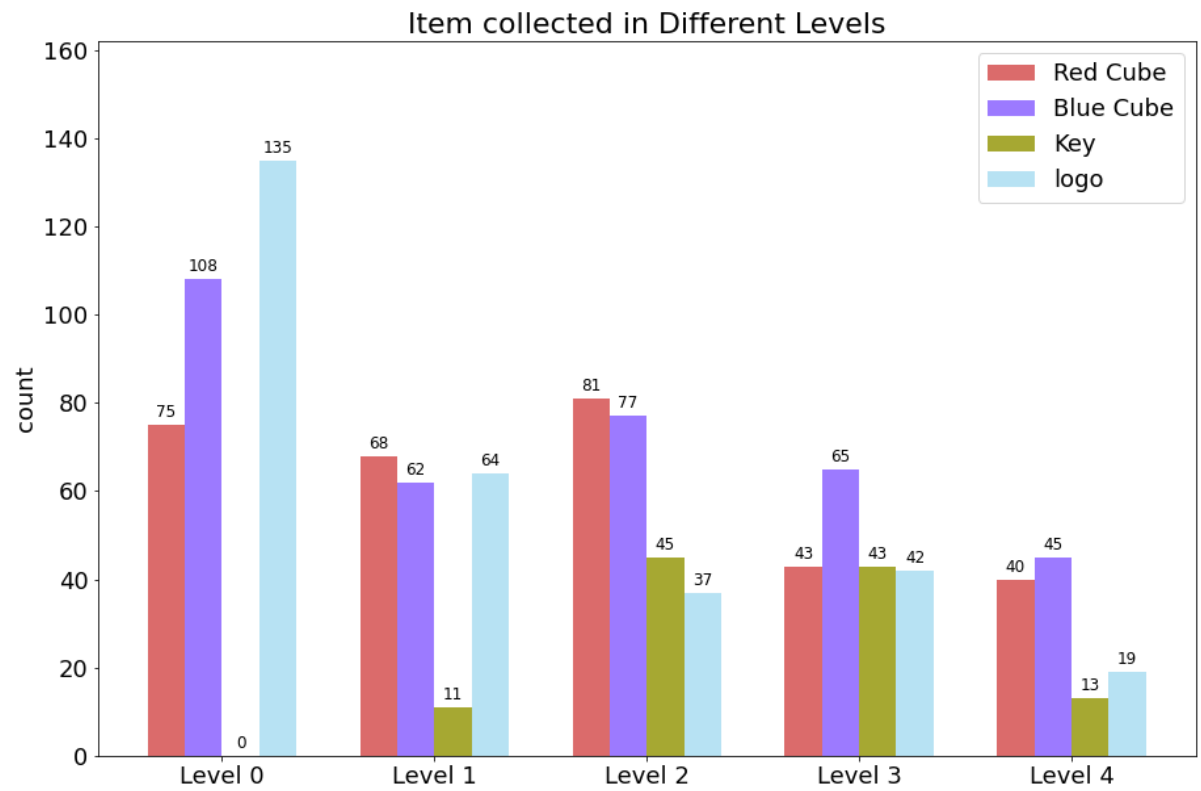
for i in range(len(sorted_data)):
    for game_list in sorted_data[i]:
        for game_data in game_list:
            for check_pts in game_data[0]:
                if 'redcube' in check_pts[0]:
                    item_count[int(check_pts[0][2])][0] += 1
                elif 'bluecube' in check_pts[0]:
                    item_count[int(check_pts[0][2])][1] += 1
                elif 'key' in check_pts[0]:
                    item_count[int(check_pts[0][2])][2] += 1
                elif 'logo' in check_pts[0]:
                    item_count[int(check_pts[0][2])][3] += 1

print(item_count )
```

```
[[75, 108, 0, 135], [68, 62, 11, 64], [81, 77, 45, 37], [43, 65, 43, 42], [4
0, 45, 13, 19]]
```

```
In [116]: game_statPainter(level_labels, ['Red Cube', 'Blue Cube', 'Key', 'logo'],
                             item_count, 'Item collected in Different Levels', 'count', s
                             ub_color=['#db6b6b', '#9c7aff', '#a6a832', '#b7e2f3'])
```

0
0
0
0
0



```
In [127]: #item_count format: #level:[ #red, #blue, #key ] cp format lv#-item-redcube
succ_item_count = []
```

```
#sorted_data schema: [#level:[ #succes:[], #died:[], #quit:[] ] ]
```

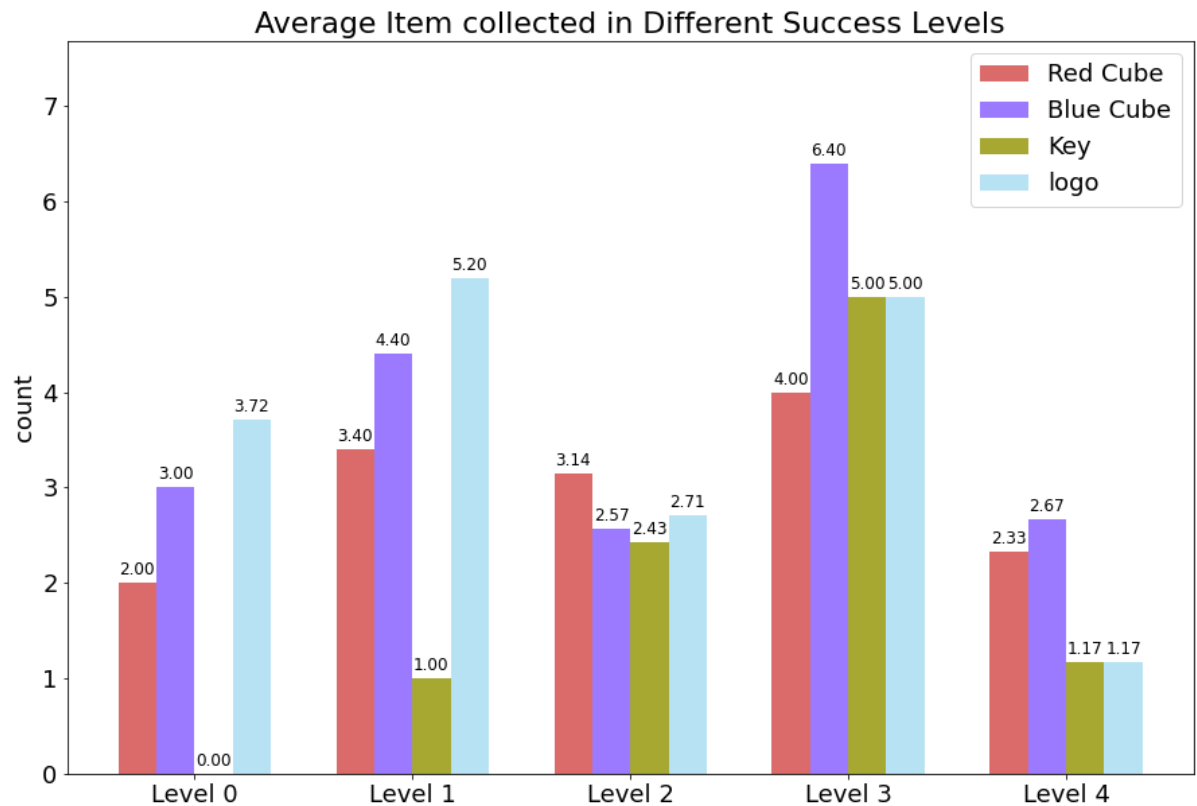
```
for i in range(5):
    succ_item_count.append([0,0,0,0])

for i in range(len(sorted_data)):
    success_time = len(sorted_data[i][0])
    for game_data in sorted_data[i][0]:
        for check_pts in game_data[0]:
            if 'redcube' in check_pts[0]:
                succ_item_count[int(check_pts[0][2])][0] += 1
            elif 'bluecube' in check_pts[0]:
                succ_item_count[int(check_pts[0][2])][1] += 1
            elif 'key' in check_pts[0]:
                succ_item_count[int(check_pts[0][2])][2] += 1
            elif 'log' in check_pts[0]:
                succ_item_count[int(check_pts[0][2])][3] += 1

for i in range(5):
    for j in range(4):
        succ_item_count[i][j] /= len(sorted_data[i][0])
print(succ_item_count)
```

```
[[2.0, 3.0, 0.0, 3.71875], [3.4, 4.4, 1.0, 5.2], [3.142857142857143, 2.571428
5714285716, 2.4285714285714284, 2.7142857142857144], [4.0, 6.4, 5.0, 5.0],
[2.3333333333333335, 2.6666666666666665, 1.1666666666666667, 1.16666666666666
67]]
```

```
In [132]: game_statPainter(level_labels, ['Red Cube', 'Blue Cube', 'Key', 'logo'],
                             succ_item_count, 'Average Item collected in Different Success Levels', 'count', sub_color=['#db6b6b', '#9c7aff', '#a6a832', '#b7e2f3'], label_format='%.2f')
```



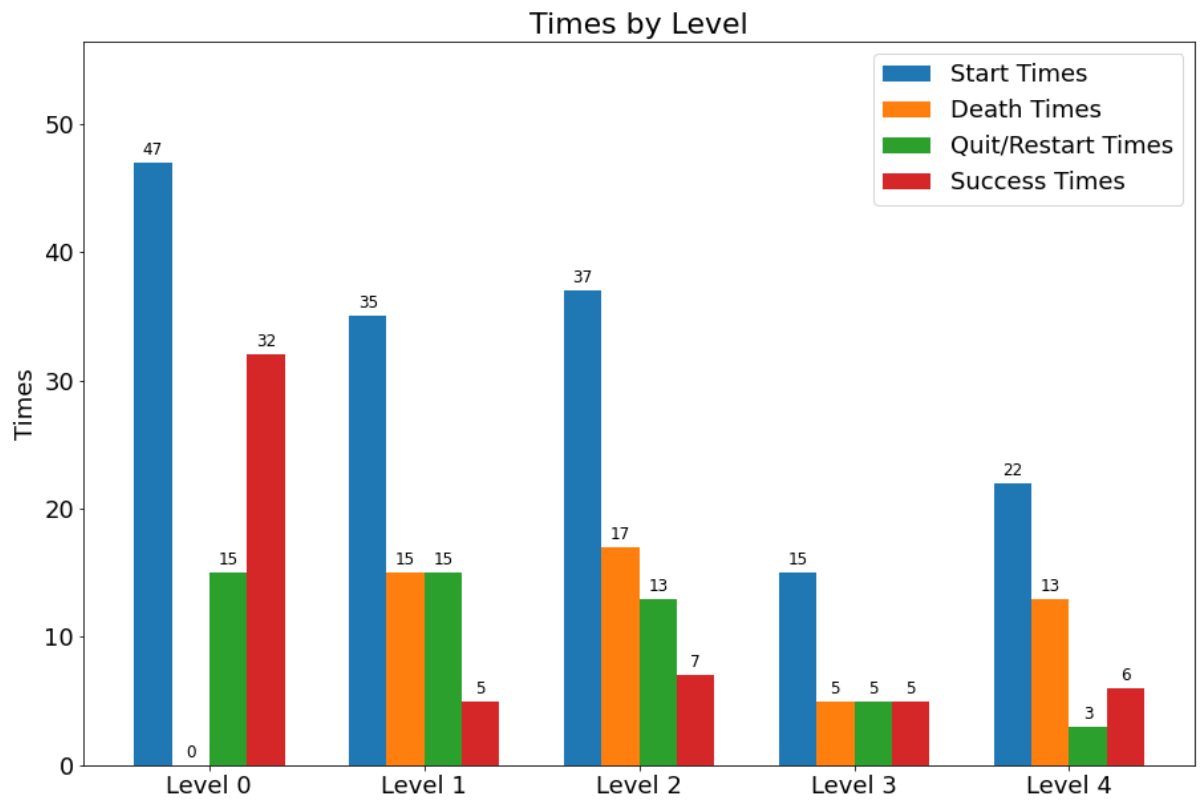
Game Play Stat

```
In [100]: #Statistics format: #Level:[ #Start Count, #Death Count, #Quit Count, #Success Count ]
statistics = []

for i in range(len(sorted_data)):
    succ_count = len(sorted_data[i][0])
    died_count = len(sorted_data[i][1])
    quit_count = len(sorted_data[i][2])
    statistics.append([succ_count + died_count + quit_count, died_count, quit_count, succ_count])
```

```
In [101]: game_statPainter(level_labels, ['Start Times', 'Death Times', 'Quit/Restart Times', 'Success Times'],
                        statistics, 'Times by Level', 'Times')
```

0
0
0
0



Check Point Stat

```

In [102]: #level_cp_stat format: #level:[ #cp1_count, .... ] cp format lv#-cp-#
level_cp_stat = []

for i in range(5):
    level_cp_stat.append([])

for i in range(len(sorted_data)):
    for game_list in sorted_data[i]:
        for game_data in game_list:
            for check_pts in game_data[0]:
                if 'cp' in check_pts[0]:
                    cp_num = int(check_pts[0][-1])
                    lv_num = int(check_pts[0][2])
                    if len(level_cp_stat[lv_num]) < cp_num+1:
                        for i in range(cp_num - len(level_cp_stat[lv_num]) + 1
):
                            level_cp_stat[lv_num].append(0)
                            level_cp_stat[lv_num][cp_num] += 1

print(level_cp_stat)

```

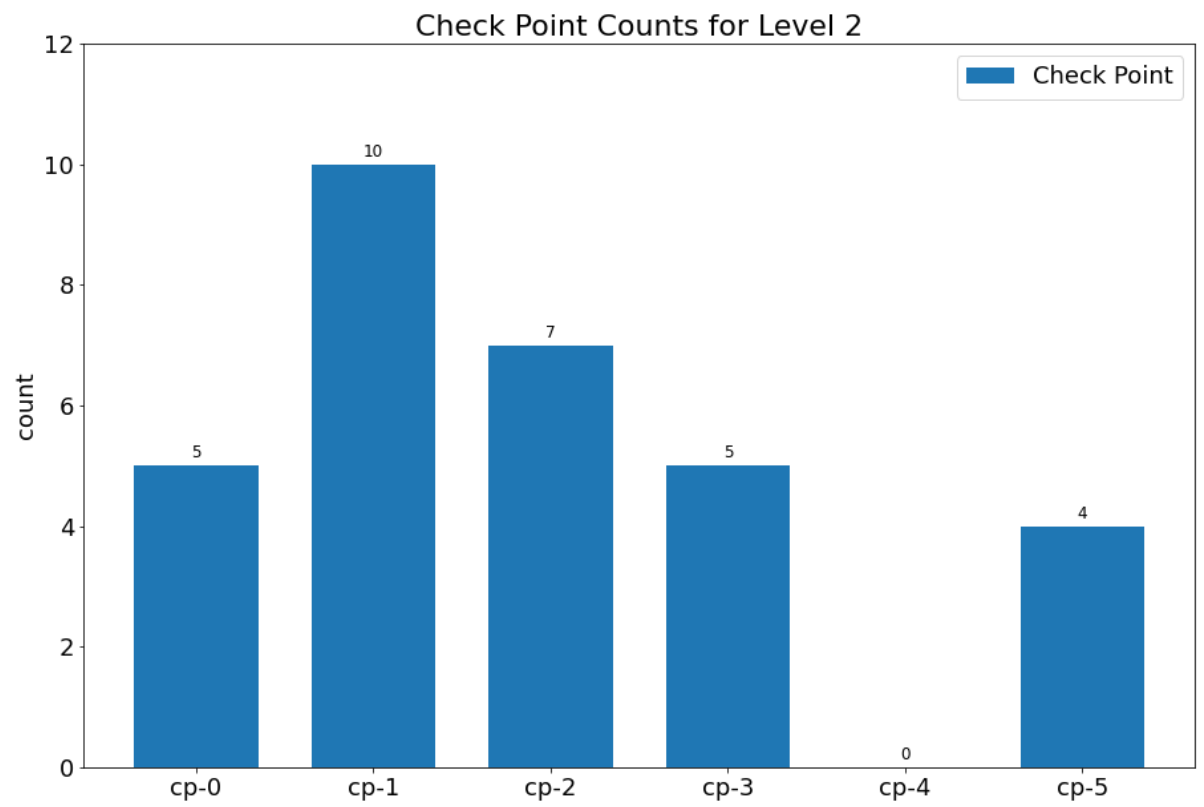
```

[[], [], [5, 10, 7, 5, 0, 4], [3, 16, 9, 8, 10, 10, 2, 7, 0, 10], [22, 17, 1
7, 6, 12, 10, 3, 3, 6]]

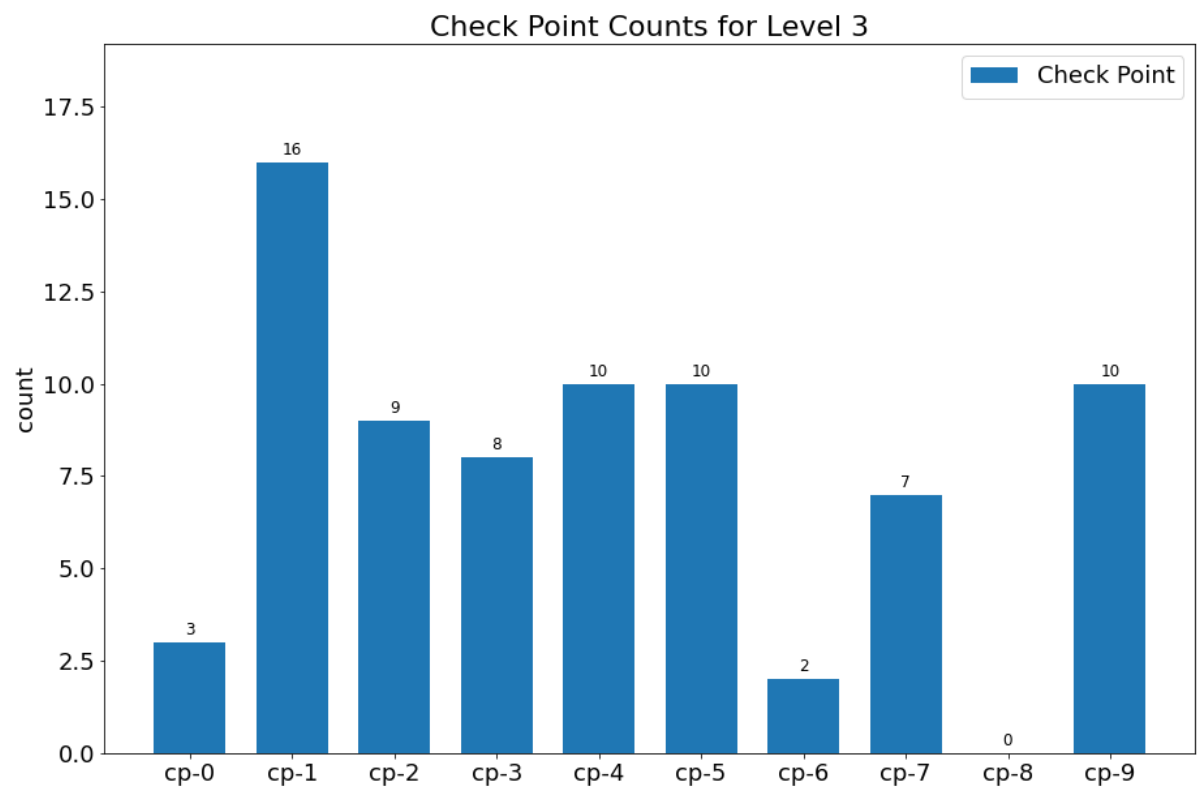
```

```
In [104]: for i in range(2,5):
            game_statPainter(['cp-'+str(i) for i in range(len(level_cp_stat[i]))], [
            'Check Point'],
                               [[count] for count in level_cp_stat[i]], 'Check Point Co
            unt for Level ' + str(i), 'count')
```

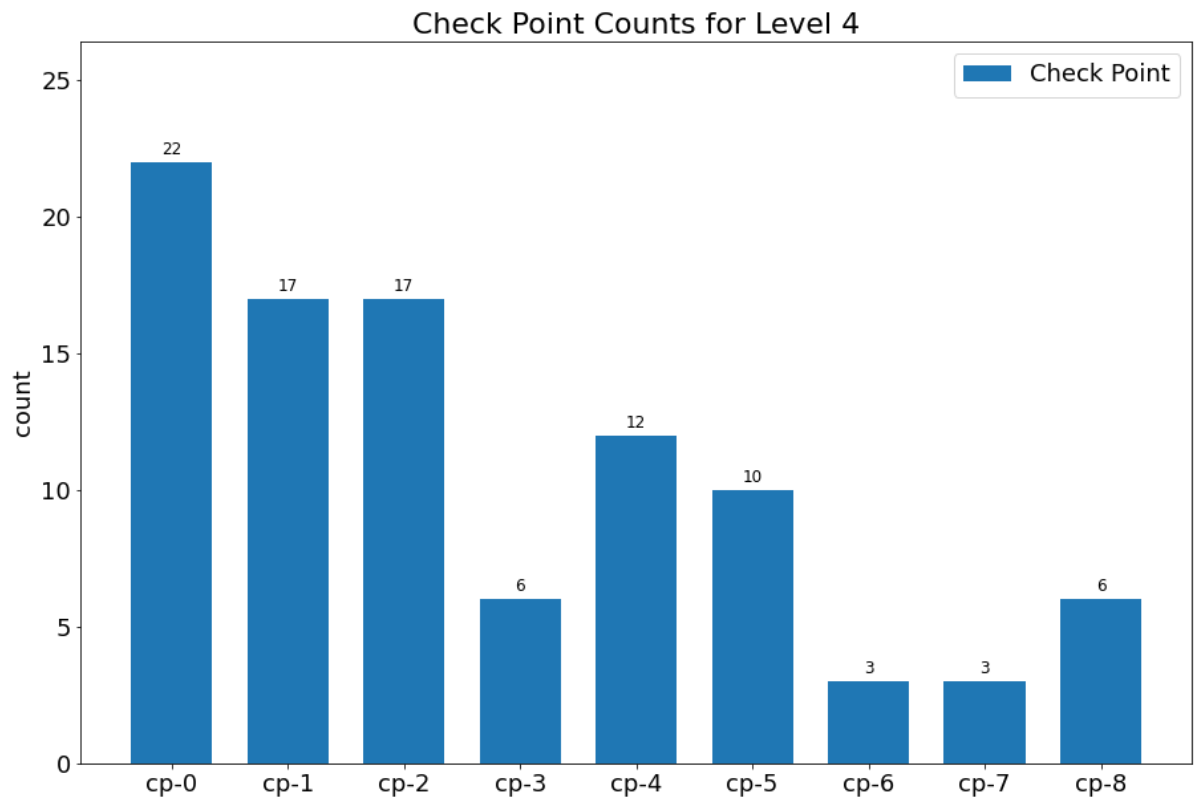
0



0



0

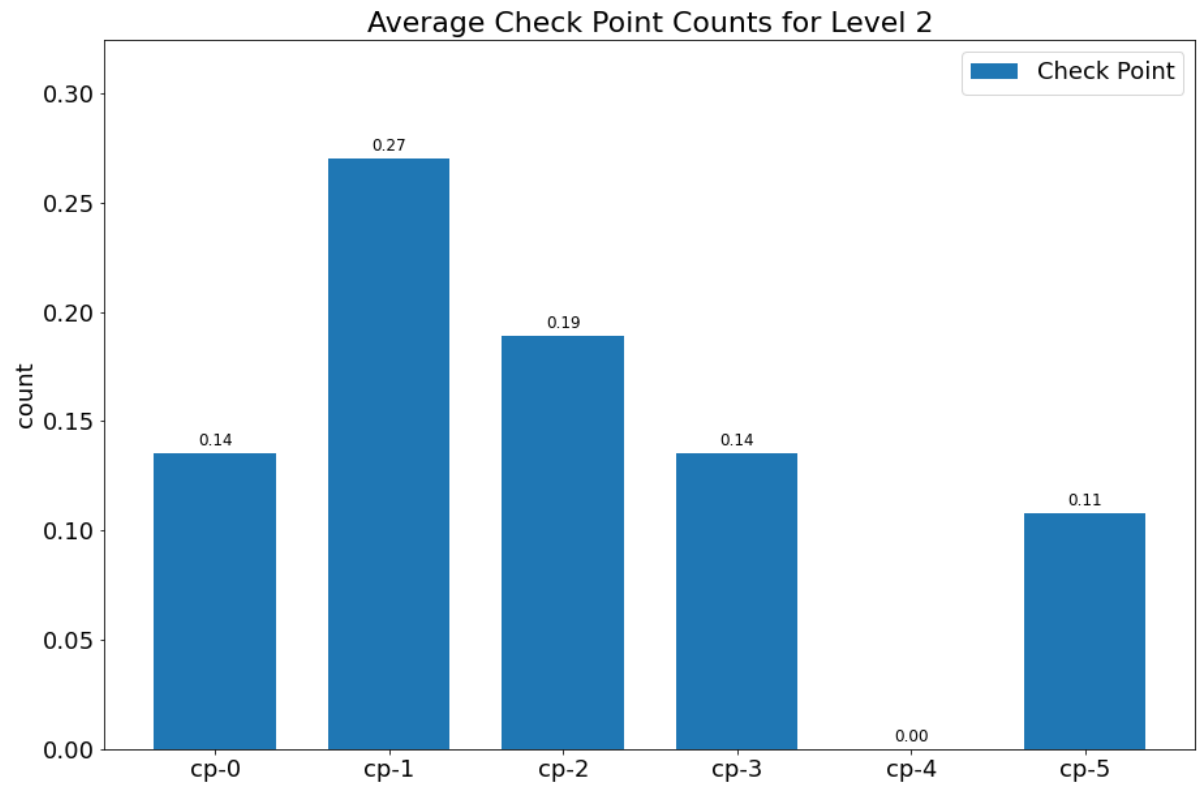


```
In [105]: avg_level_cp_stat = []
for i in range(len(level_cp_stat)):
    avg_count = []
    for cp_count in level_cp_stat[i]:
        avg_count.append(cp_count / statistics[i][0])
    avg_level_cp_stat.append(avg_count)
print(avg_level_cp_stat)
```

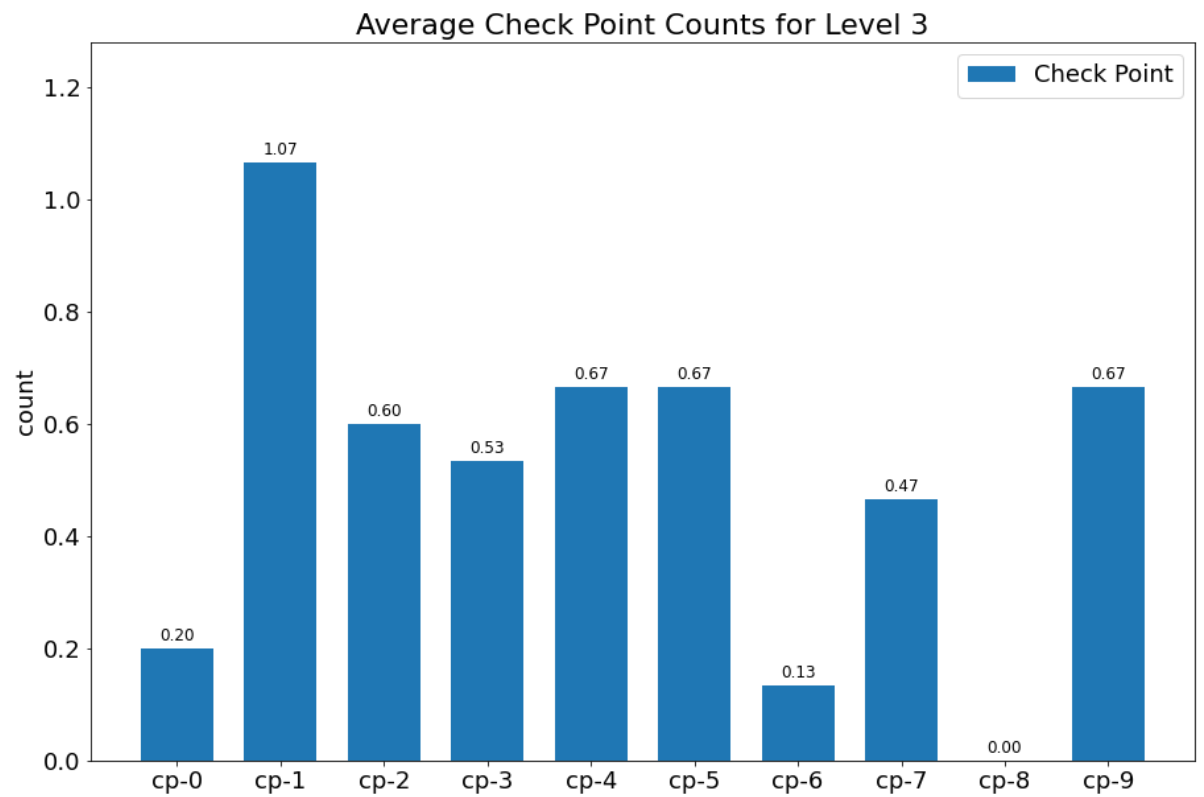
```
[[], [], [0.13513513513513514, 0.2702702702702703, 0.1891891891891892, 0.13513513513513514, 0.0, 0.10810810810810811], [0.2, 1.0666666666666667, 0.6, 0.5333333333333333, 0.6666666666666666, 0.6666666666666666, 0.13333333333333333, 0.4666666666666667, 0.0, 0.6666666666666666], [1.0, 0.7727272727272727, 0.7727272727272727, 0.2727272727272727, 0.5454545454545454, 0.4545454545454545, 0.13636363636363635, 0.13636363636363635, 0.2727272727272727]]
```

```
In [107]: for i in range(2,5):
           game_statPainter(['cp-'+str(i) for i in range(len(level_cp_stat[i]))], [
           'Check Point'],
                           [[count] for count in avg_level_cp_stat[i]], 'Average Ch
           eck Point Counts for Level ' + str(i), 'count', label_format='%.2f')
```

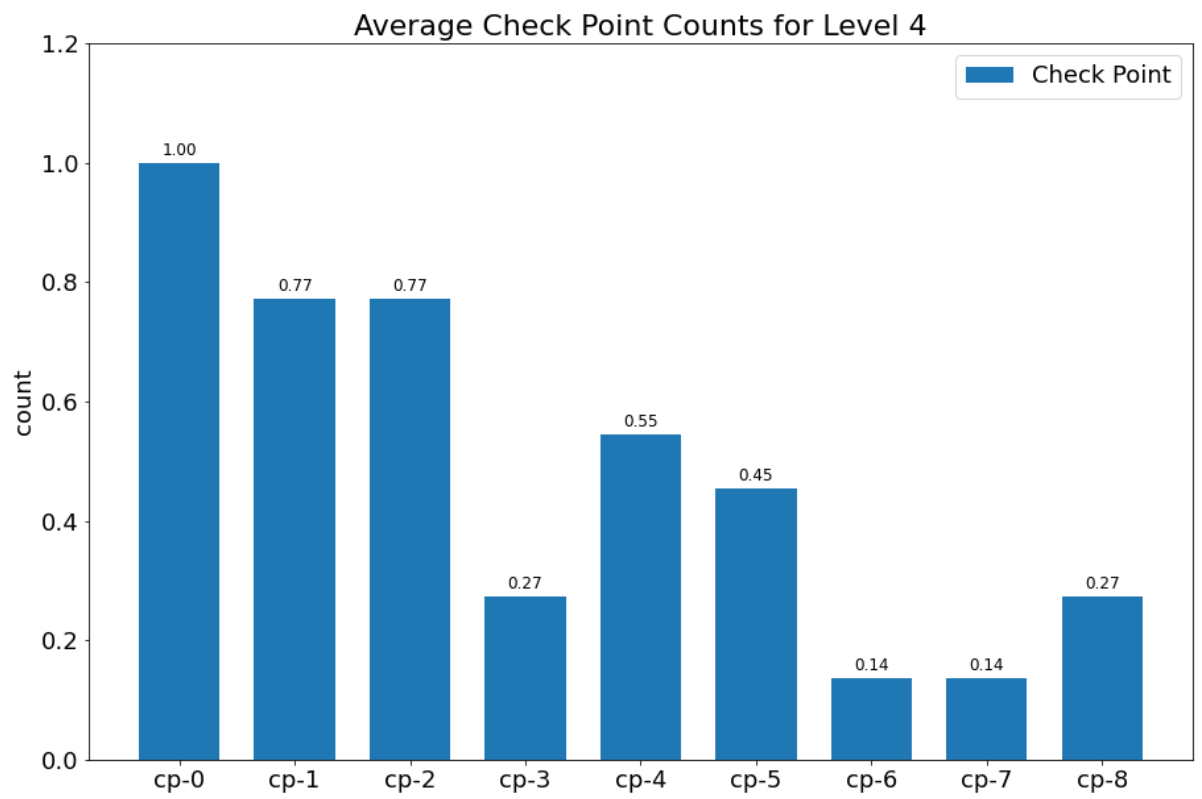
0



0



0



Period Stat

[illegible]

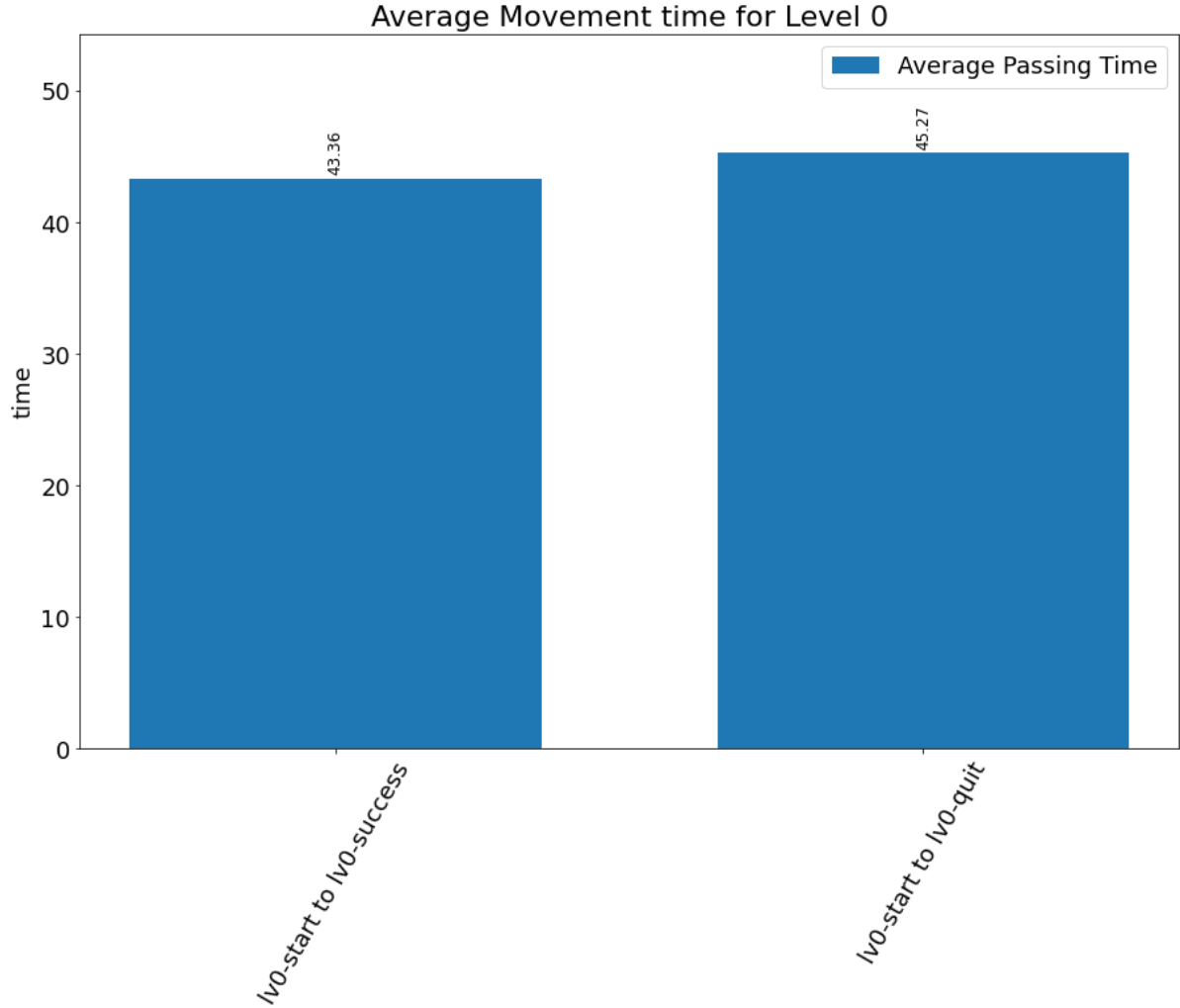
```

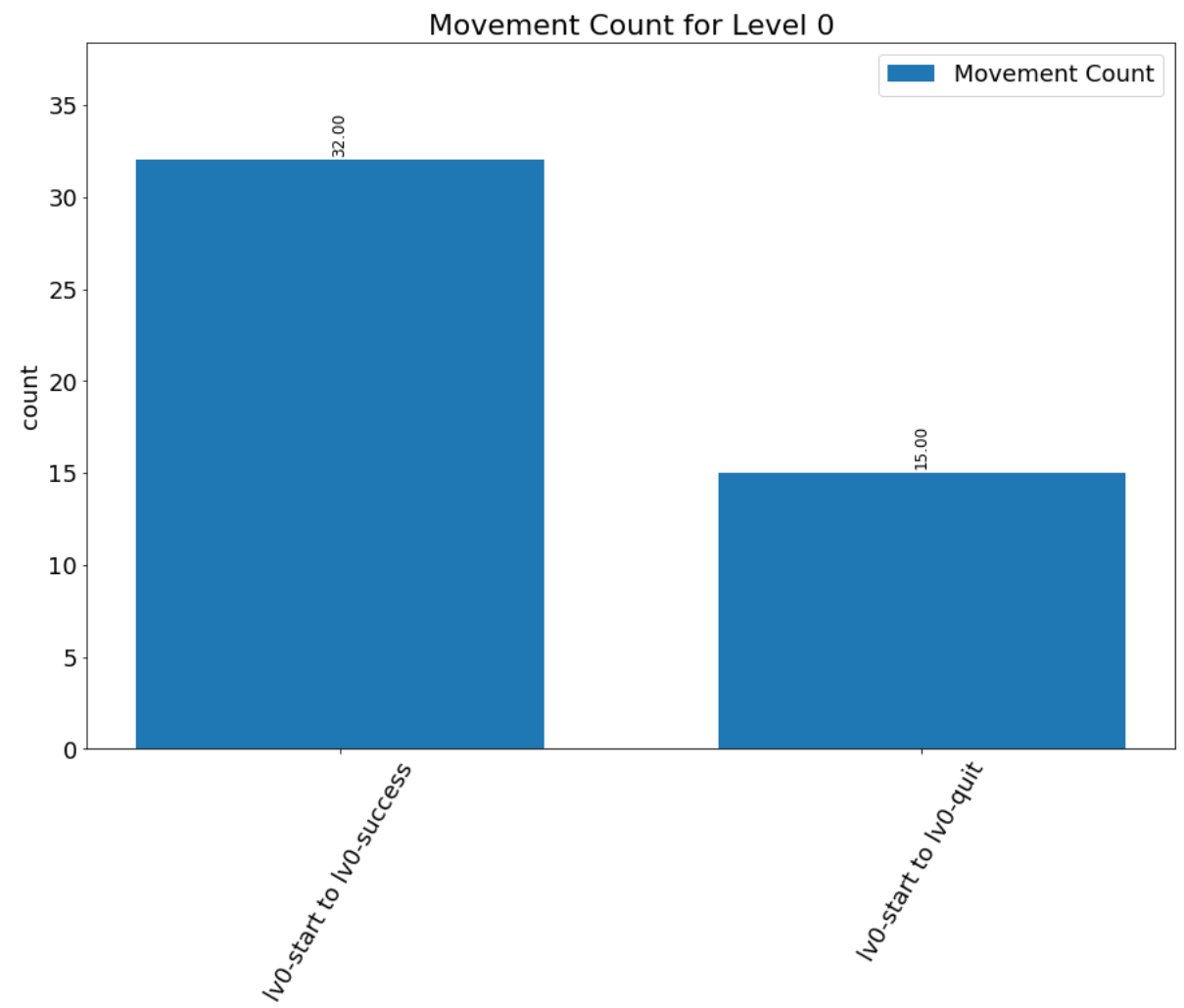
In [109]: level_movement_label = []
level_movement_time_avg = []
level_movement_count = []

for i in range(5):
    level_movement_label.append([])
    level_movement_time_avg.append([])
    level_movement_count.append([])
    for movement, time_list in movement_dict[i].items():
        time_sum = 0
        for time in time_list:
            time_sum += time
        level_movement_label[i].append(movement[0] + ' to ' + movement[1])
        level_movement_time_avg[i].append(time_sum / len(time_list) / 10000)
        level_movement_count[i].append(len(time_list))

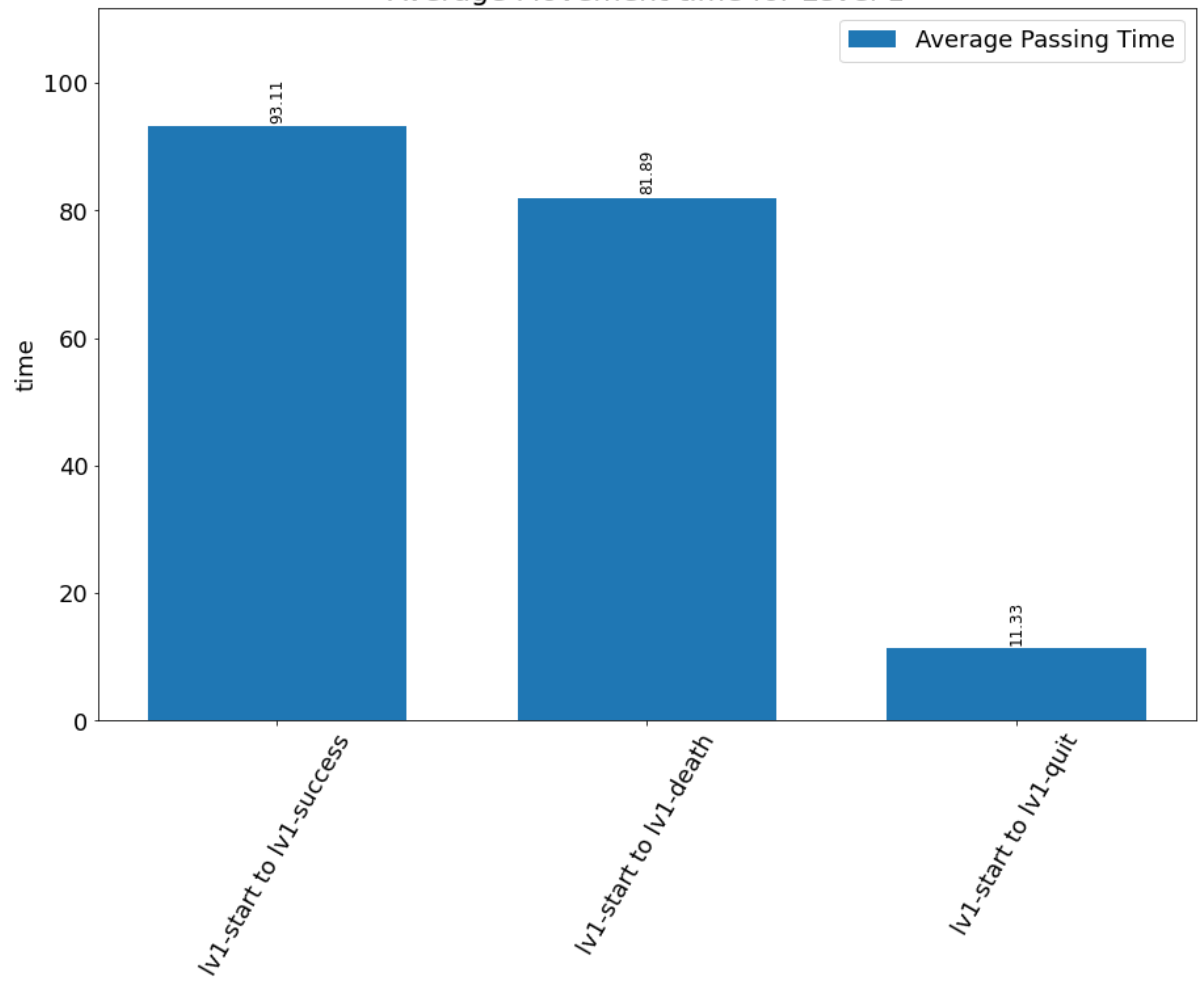
for i in range(5):
    game_statPainter(level_movement_label[i], ['Average Passing Time'],
                    [[number] for number in level_movement_time_avg[i]], 'Average Movement time for Level ' + str(i), 'time', x_rotation= 60, label_format= '%.2f')
    game_statPainter(level_movement_label[i], ['Movement Count'],
                    [[number] for number in level_movement_count[i]], 'Movement Count for Level ' + str(i), 'count', x_rotation= 60, label_format= '%.2f')

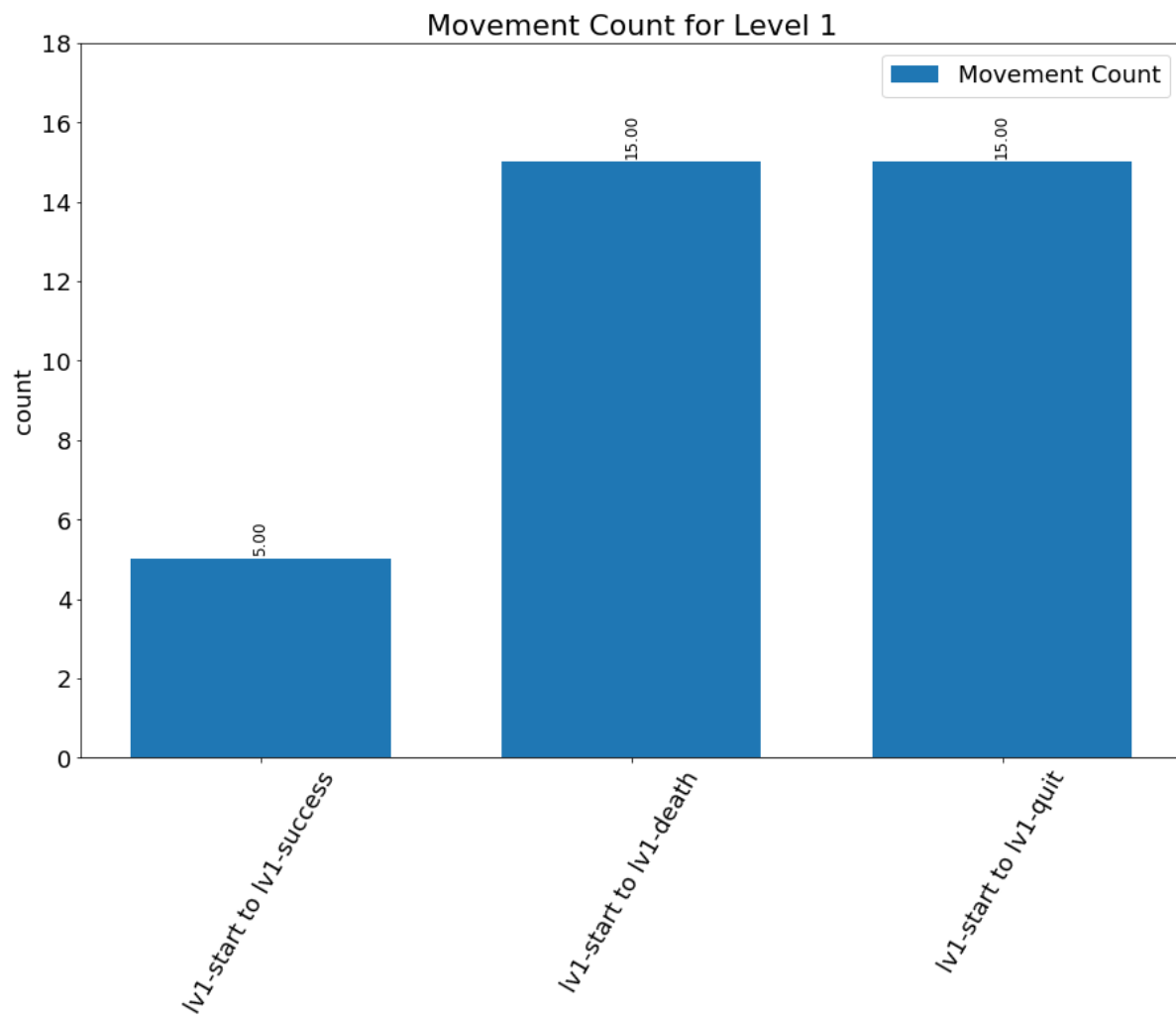
```

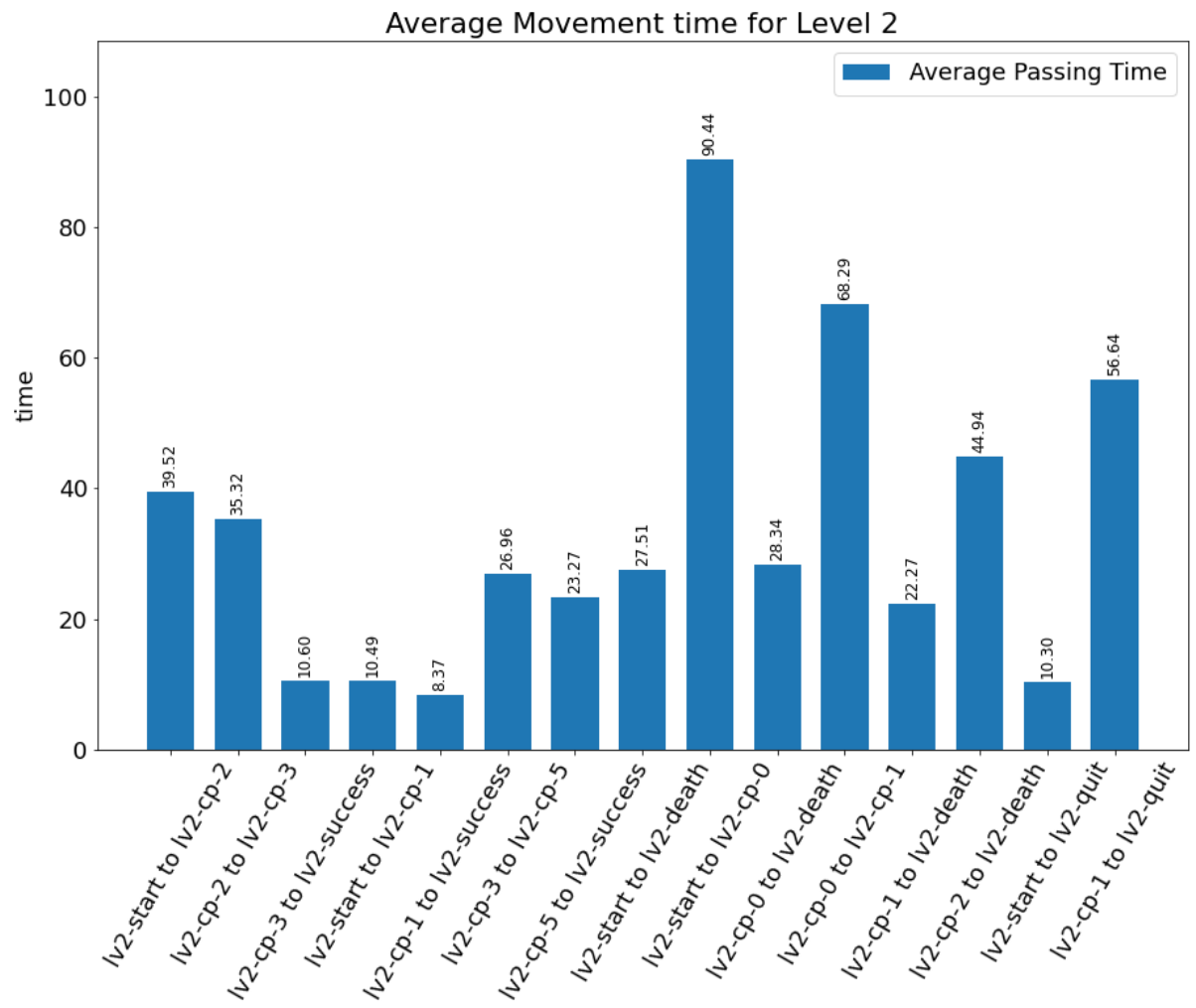




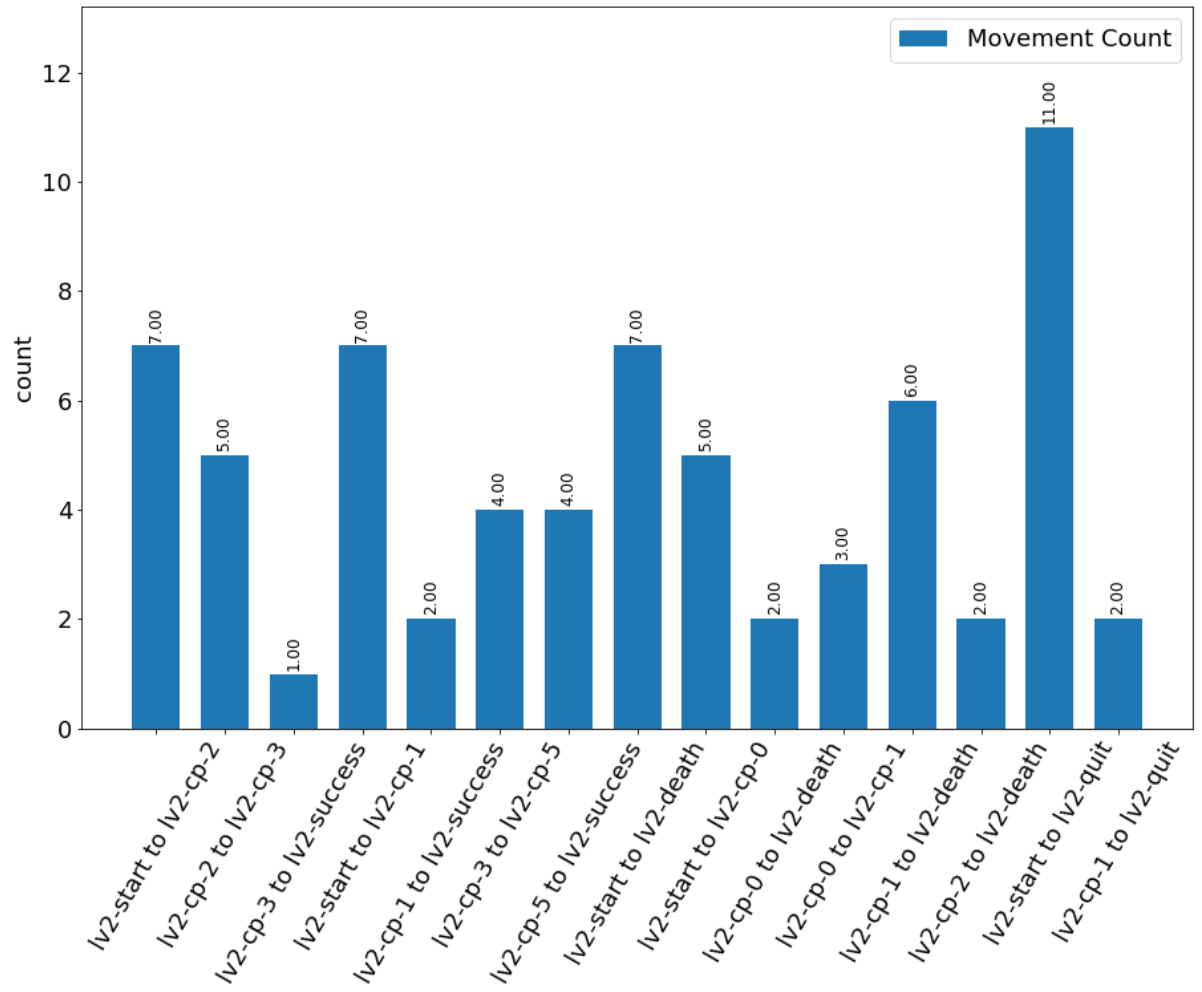
Average Movement time for Level 1

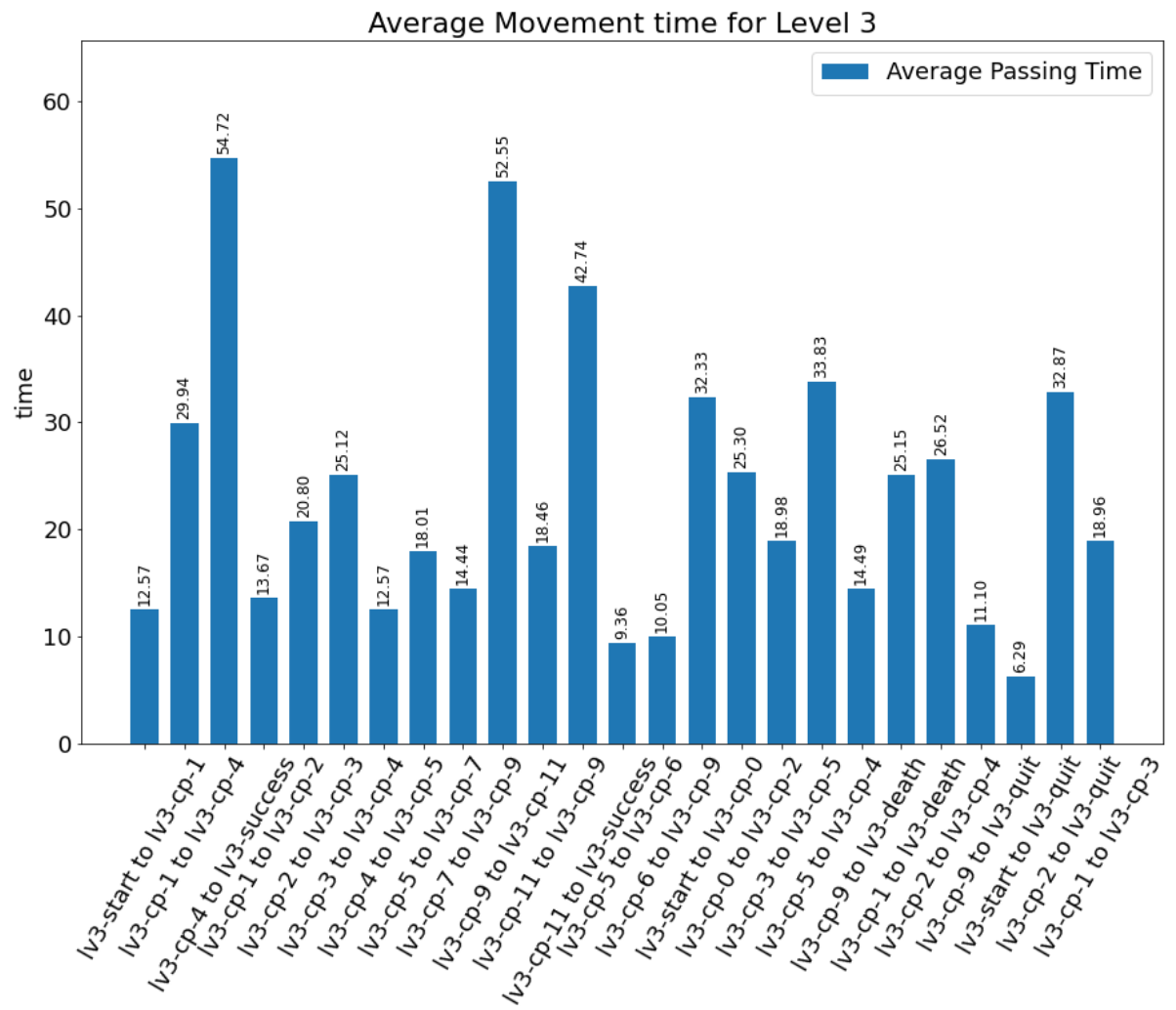


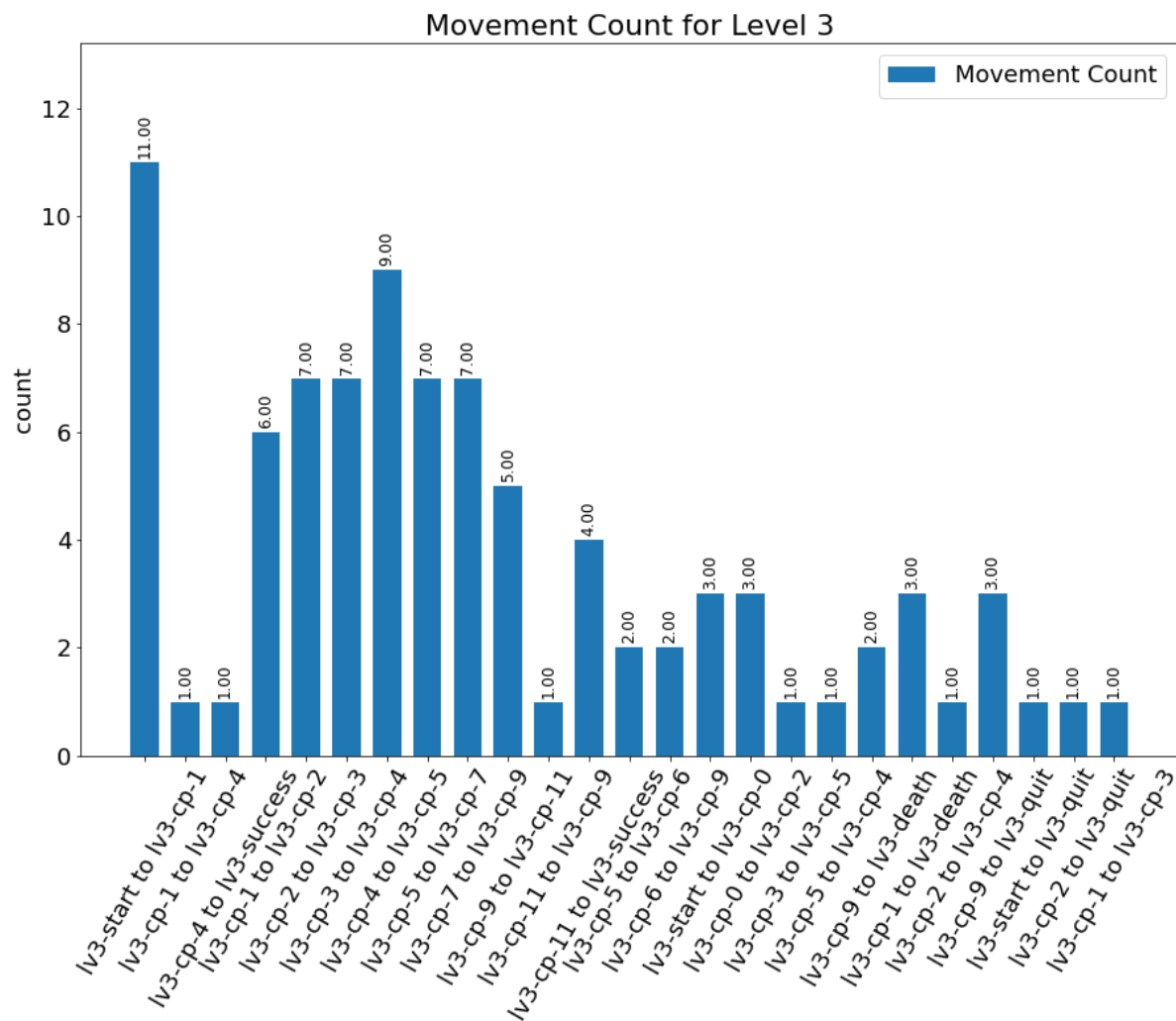




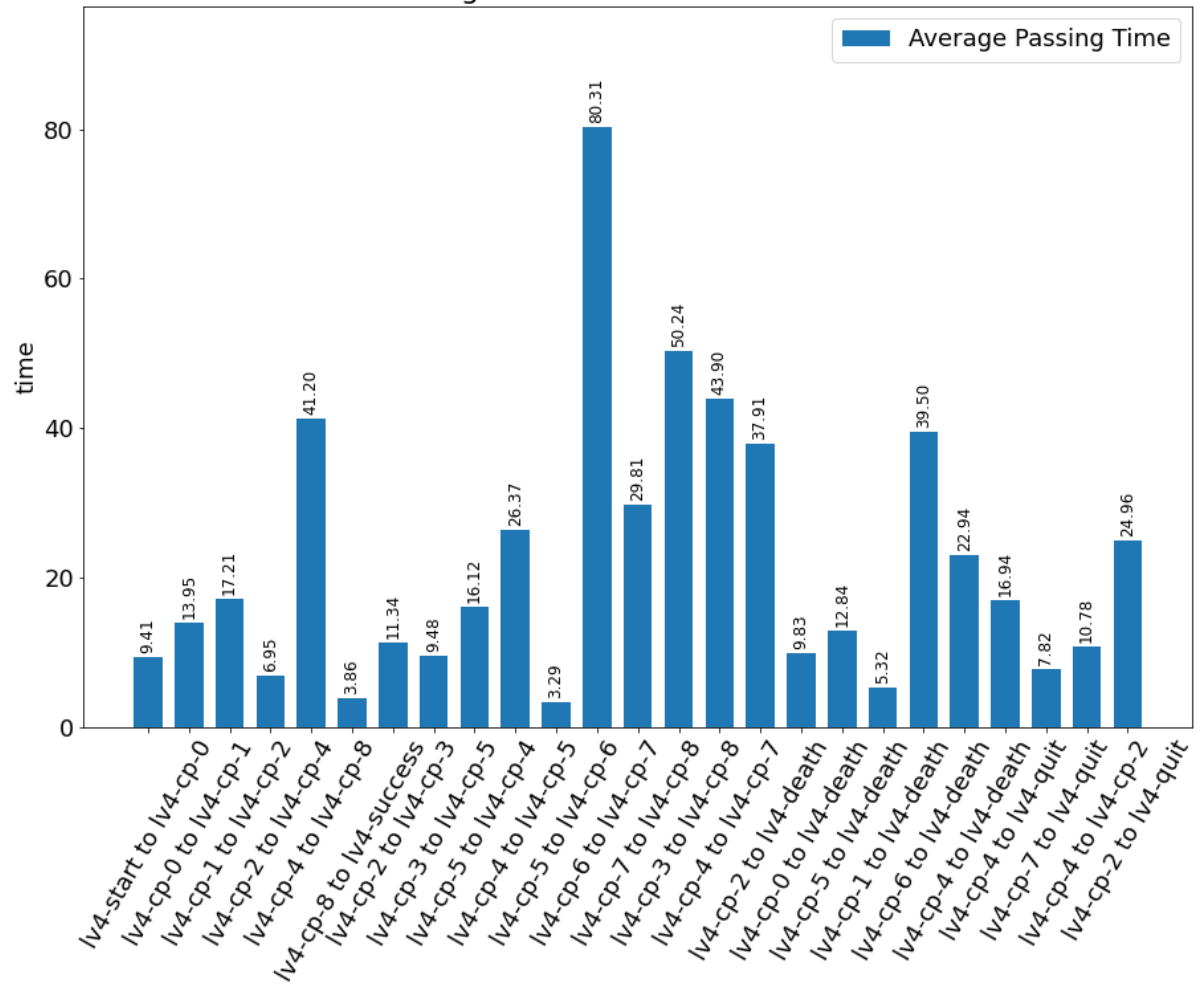
Movement Count for Level 2

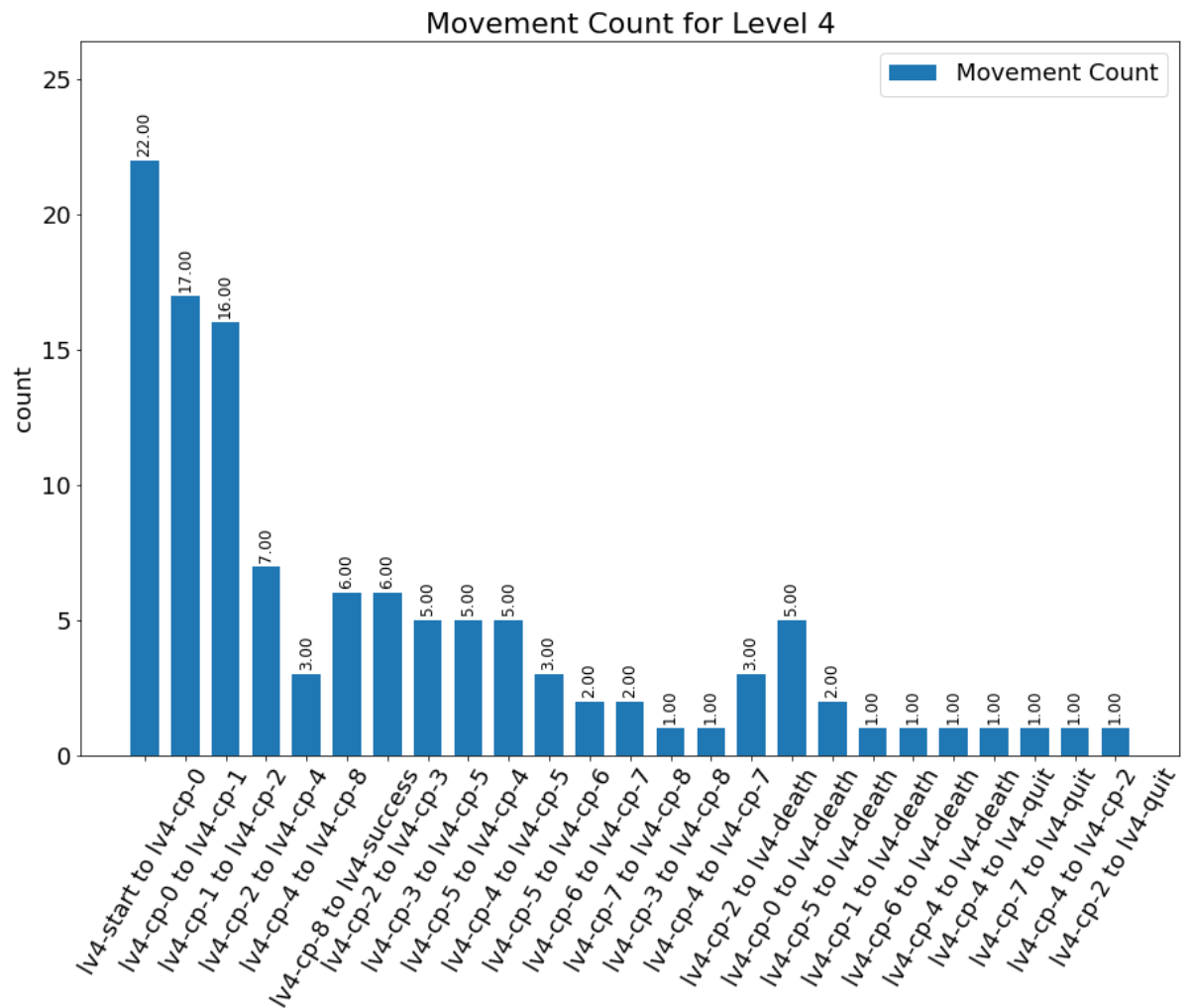






Average Movement time for Level 4



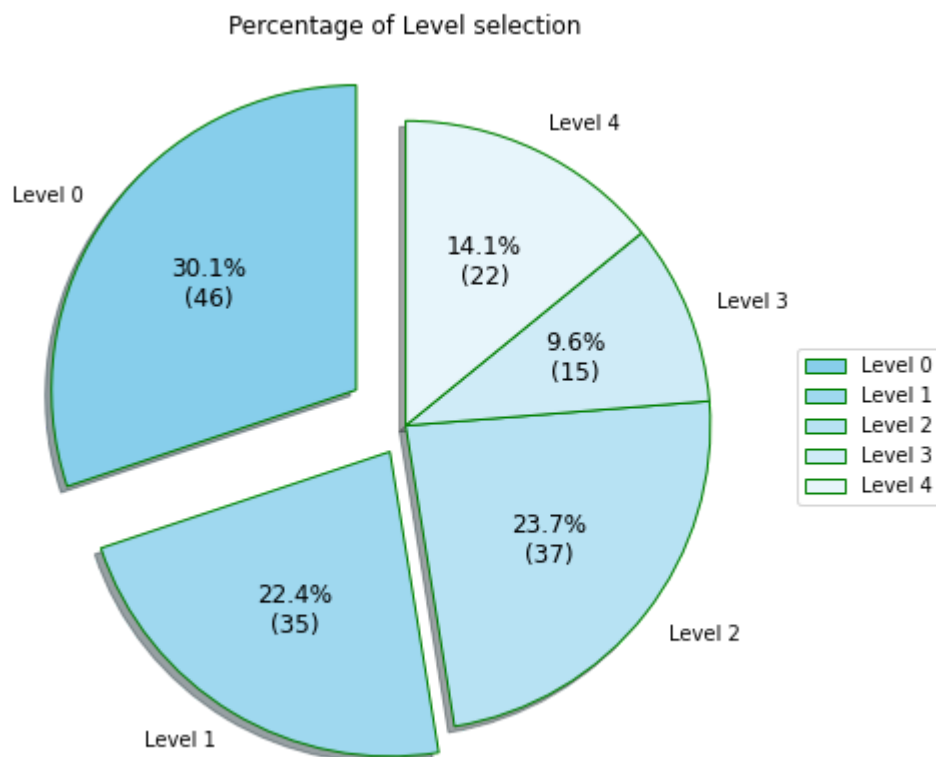


```
In [112]: selection_pie = []
for level in sorted_data:
    selection_pie.append(len(level[0])+len(level[1])+len(level[2]))
print(selection_pie)
```

```
[47, 35, 37, 15, 22]
```



```
In [117]: pie_plot(['Level 0', 'Level 1', 'Level 2', 'Level 3', 'Level 4'],
                    selection_pie, 'Percentage of Level selection',
                    explode = [0.2,0.1,0.0,0.0,0.0],
                    colors = ['#87ceeb', '#9fd8ef', '#b7e2f3', '#cfebf7', '#e7f5fb'])
```



```
In [ ]: pie_plot(['Level 0', 'Level 1', 'Level 2', 'Level 3', 'Level 4'], selection_pie, 'Percentage of Level selection', colors = ['#0044ff', '#0066ff', '#3388ff', '#55aaff', '#77ccff'])
```

```
In [133]: #item_count format: #level:[ #red, #blue, #key ] cp format lv#-item-redcube
completion_count = []
```

```
for i in range(5):
    completion_count.append([])

for i in range(5):
    for game_play in sorted_data[i][0]:
        logo_count = 0
        for check_pts in game_play[0]:
            if 'logo' in check_pts[0]:
                logo_count += 1
        completion_count[i].append(logo_count)

print(completion_count)

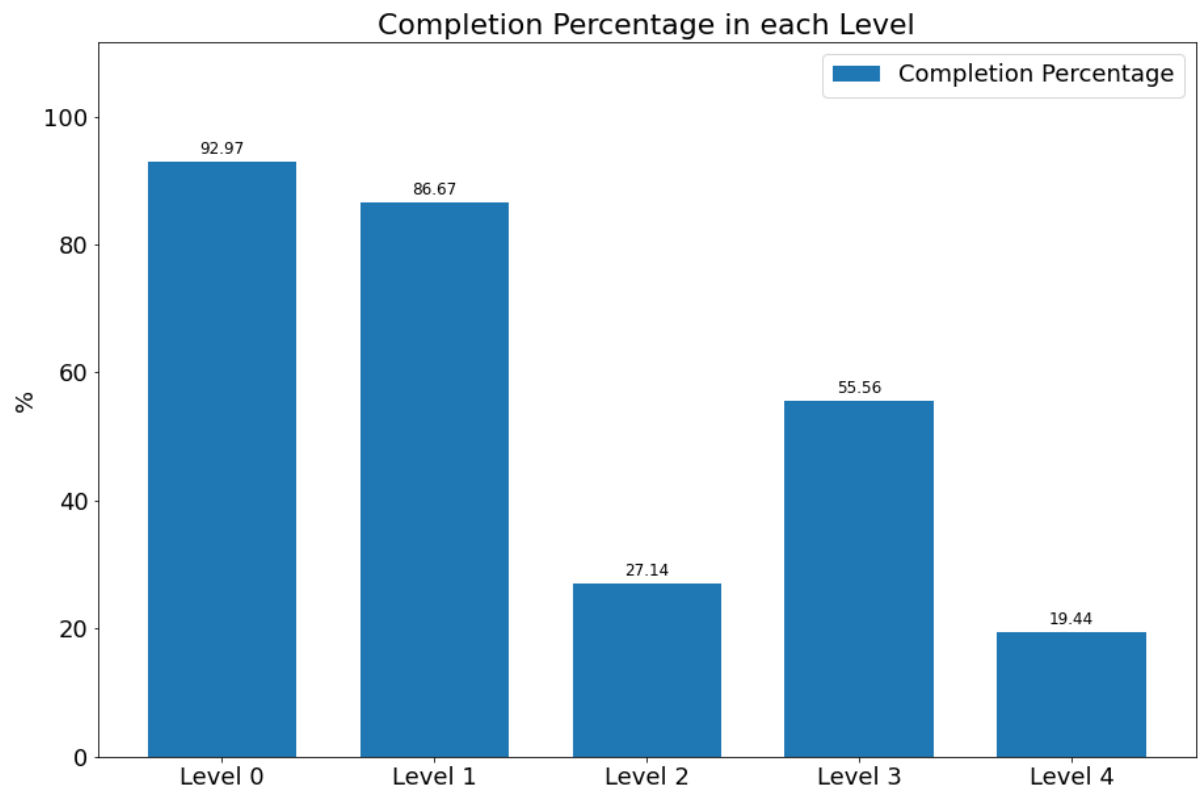
logo_max = [4,6,10,9,6]

completion_avg = []
for i in range(5):
    counter = 0
    comp_sum = 0
    for logo_num in completion_count[i]:
        comp_sum += logo_num/logo_max[i]
        counter += 1
    if counter == 0:
        comp_avg = 0
    else:
        comp_avg = comp_sum / counter
    completion_avg.append(comp_avg)

print(completion_avg)
```

```
[[4, 3, 4, 5, 4, 3, 4, 3, 3, 4, 4, 4, 3, 4, 3, 5, 3, 4, 4, 3, 4, 4, 4, 4, 2,
4, 4, 3, 4, 4, 5, 3], [6, 4, 6, 5, 5], [2, 0, 1, 3, 3, 5, 5], [1, 5, 5, 4, 1
0], [0, 5, 1, 0, 0, 1]]
[0.9296875, 0.8666666666666666, 0.27142857142857146, 0.5555555555555556, 0.19
44444444444444445]
```

```
In [135]: game_statPainter(level_labels, ['Completion Percentage'],  
[[number*100] for number in completion_avg], 'Completion  
Percentage in each Level', '%', label_format= '%.2f')
```



```
In [ ]:
```