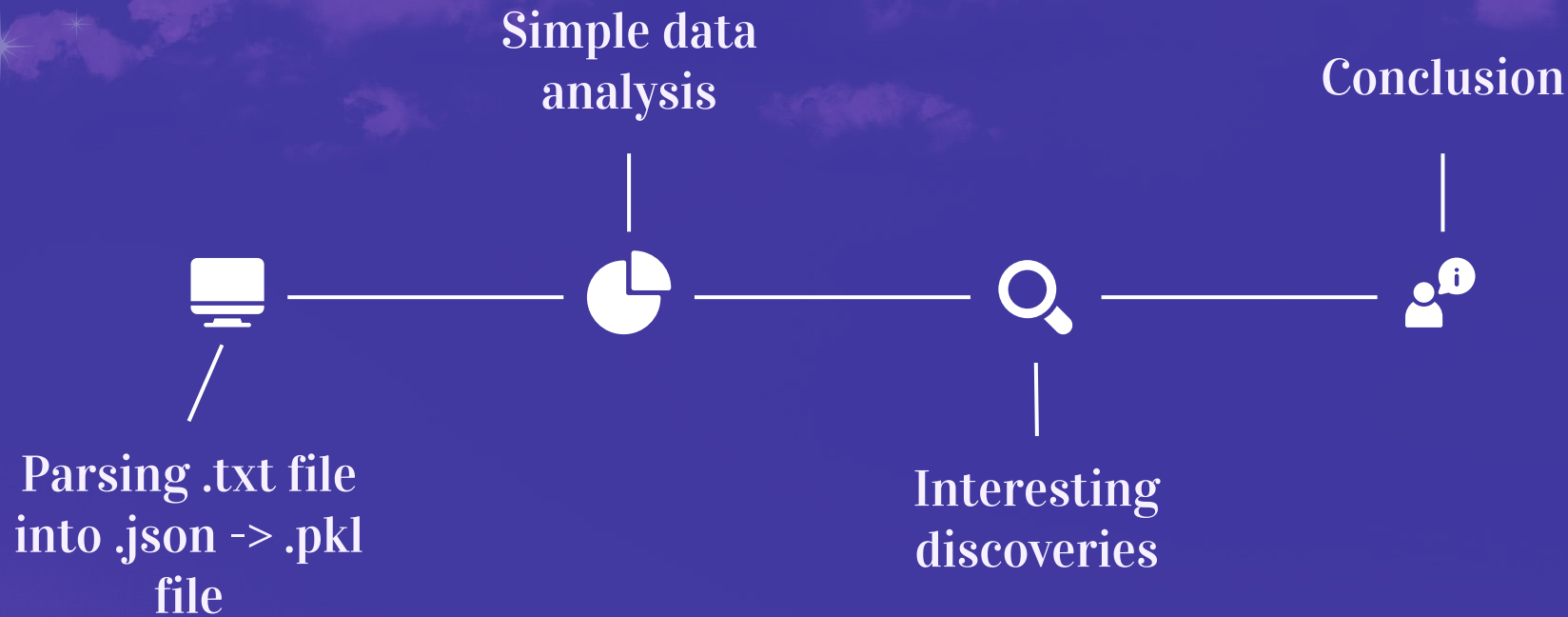




Player Data Behind Sky: Children of the Light

HackMIT '23 Challenge - Kevin Gauld, Jendy Ren, Choi Ying Yau

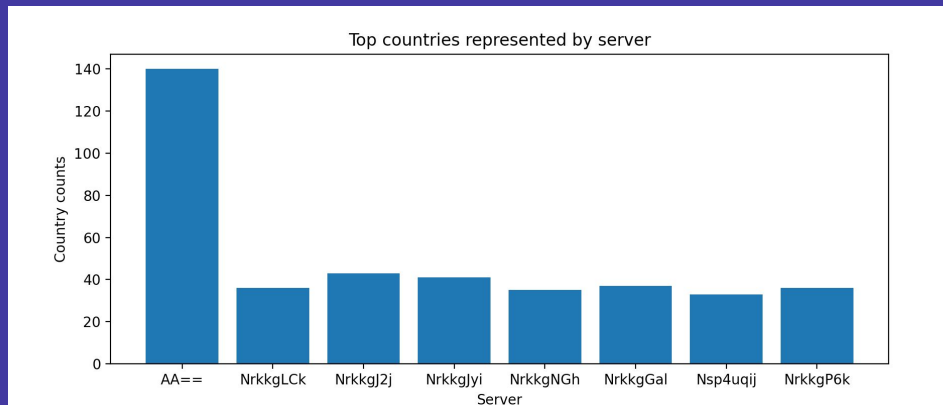
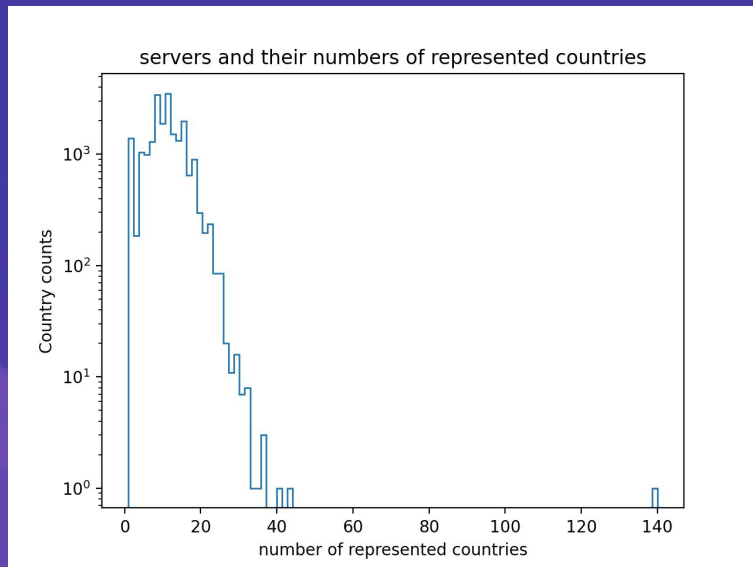
Timeline





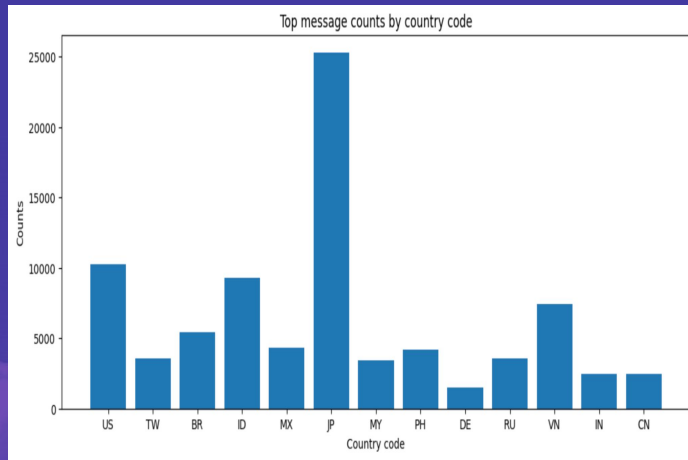
Simple data analysis

Servers w/ most country diversity

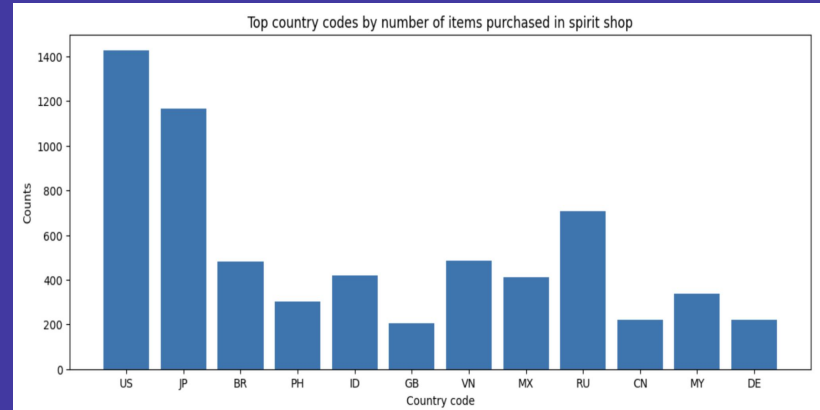


Server AA== has the most diversity in terms of countries out of all 8 servers

User engagement among countries



Users from **Japan** has made a lot of interactions with each other



Top 3 item-purchasing countries:
United States, Japan, and Russia



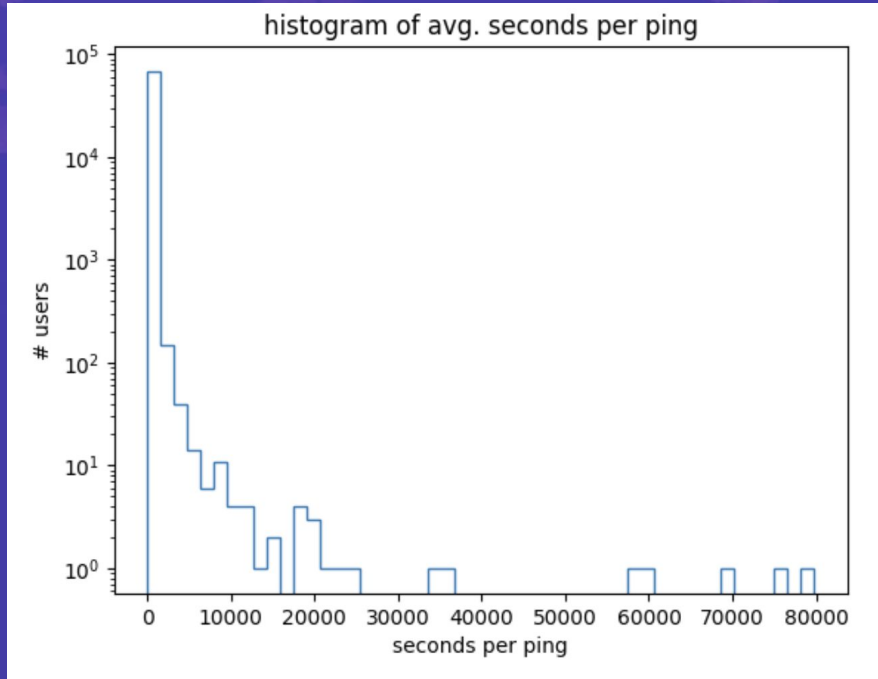
Interesting Discoveries

Teleporting Users?

Over 90% of the dataset had less than 100 secs per ping

Players with high secs per ping signify possible teleportation

- If a player travels a lot instantly, only one ping will register for a large distance that would usually register multiple
- For a long play time with low pings, the two primary possibilities are idling (suspend mode) and teleporting



Observing P#5716

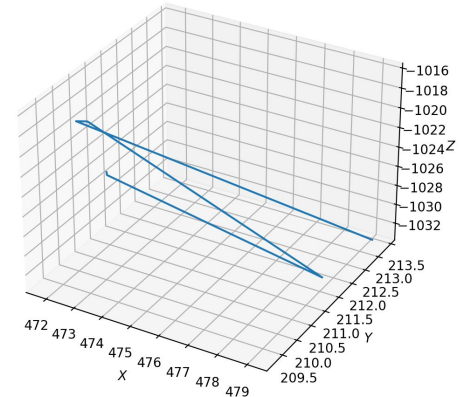
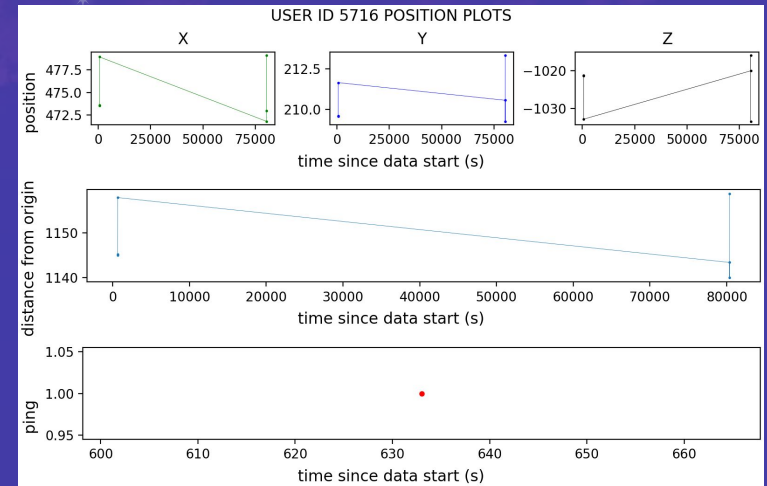
```
[52]: list(sec_per_ping.keys())[np.argmax(list(sec_per_ping.values()))]

[52]: 5716

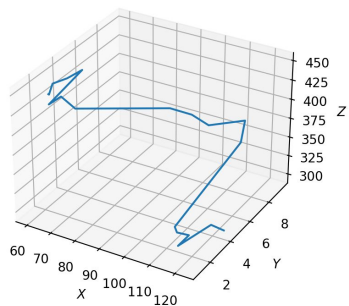
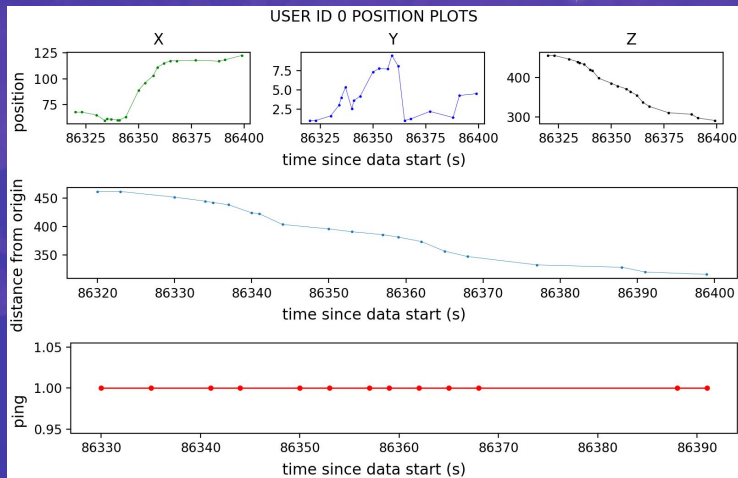
[54]: [x['oneSecondAggregatedEventCounts'] for x in jsdata if x['user_id'] == 5716]

[54]: [{'level_completed': 1,
       {'social_feed_impression': 1},
       {'social_feed_impression': 1, 'milestone_made_5_friends': 1},
       {'level_completed': 1,
        {'milestone_made_5_friends': 1},
        {'ping': 1, 'player_interaction': 1, 'loaded_Dawn': 1, 'level_loaded': 1}]
```

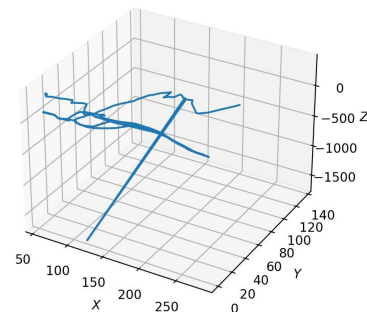
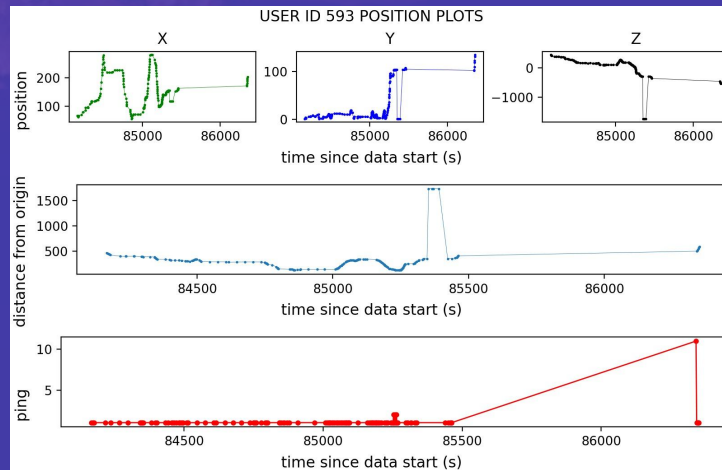
- User #5716 only had 1 ping overall but still moves around the map, seemingly with no updates in between positions
 - Seems to be a sign of teleportation



Normal



Abnormal



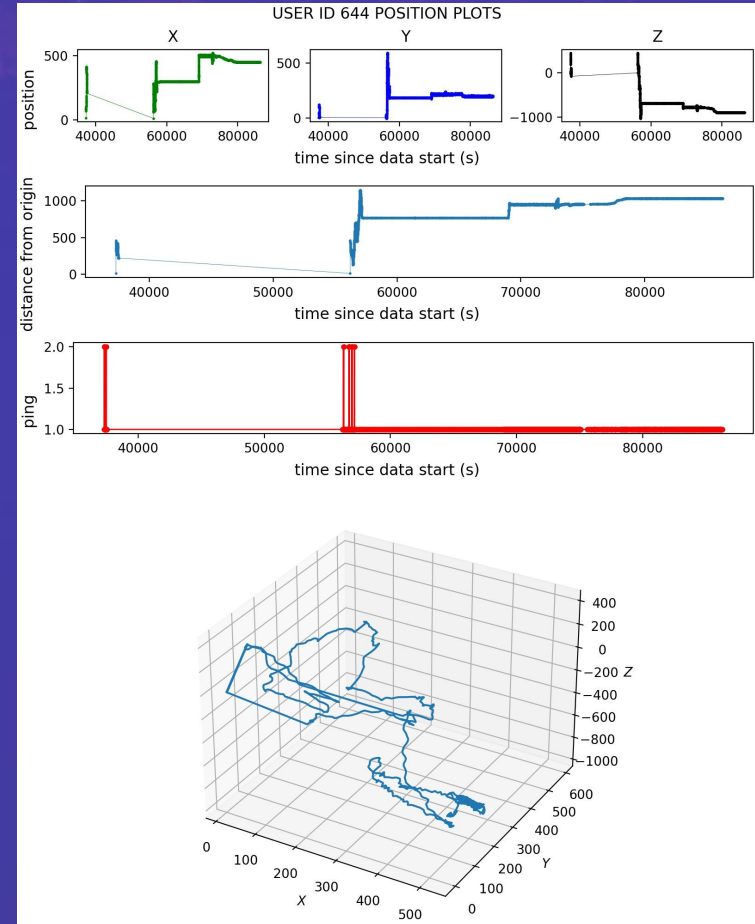
P#644 - High ping count

Things to note:

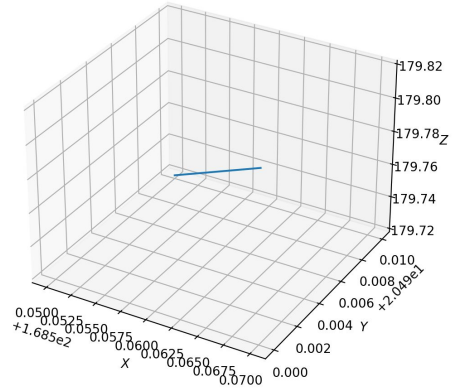
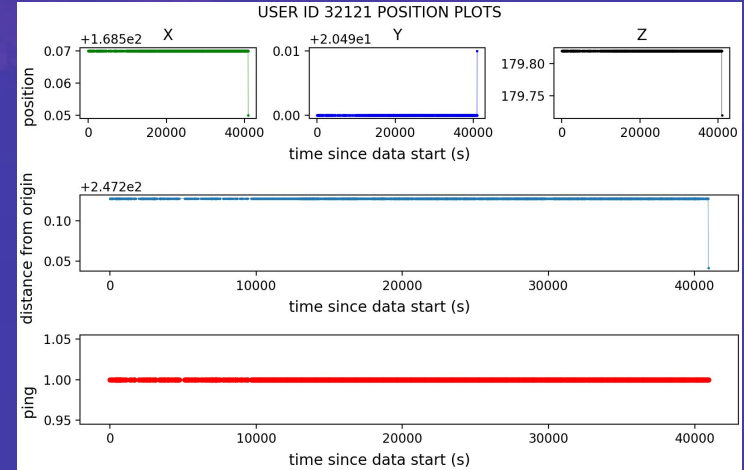
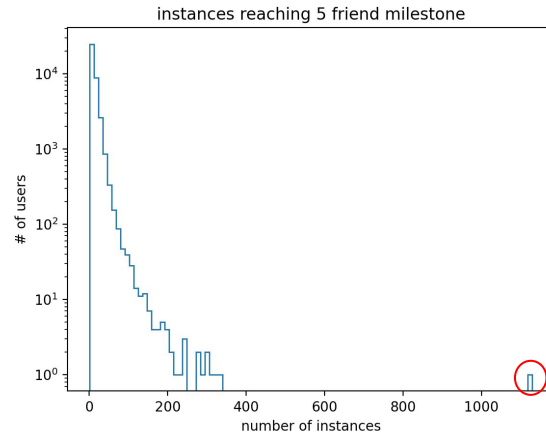
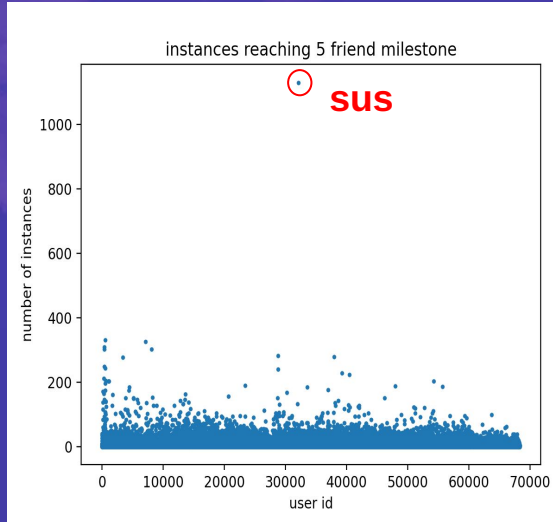
- Highest total # of pings
- Greatly increased speed over a few seconds

Possible indications:

1. Teleportation occurred at points of rapid speed increase
2. User is moving at really high speed at the point of ping spike increase



Extremely social player



Abnormal observation

- User #32121 is the outlier from the previous scatter plot
 - Interestingly, this user has made over ~5000 friends in one game session without moving!
 - “Made 5 Friends” milestone occurs 1129 times in the data
 - Player interactions are much more rare, at only a count of 84
- Total play time seems to be about 41,000 seconds, or about 11 hours
 - However, we see many made 5 friends interactions back to back (i.e. red box)

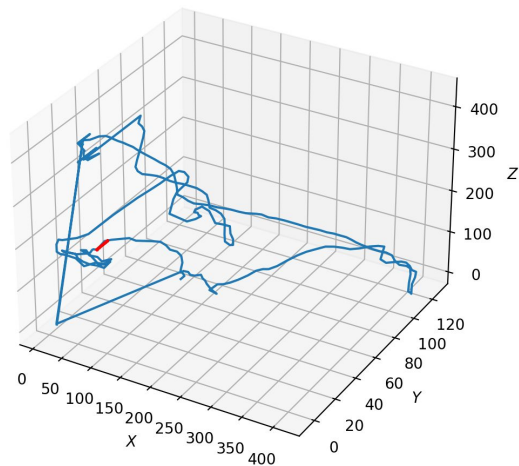
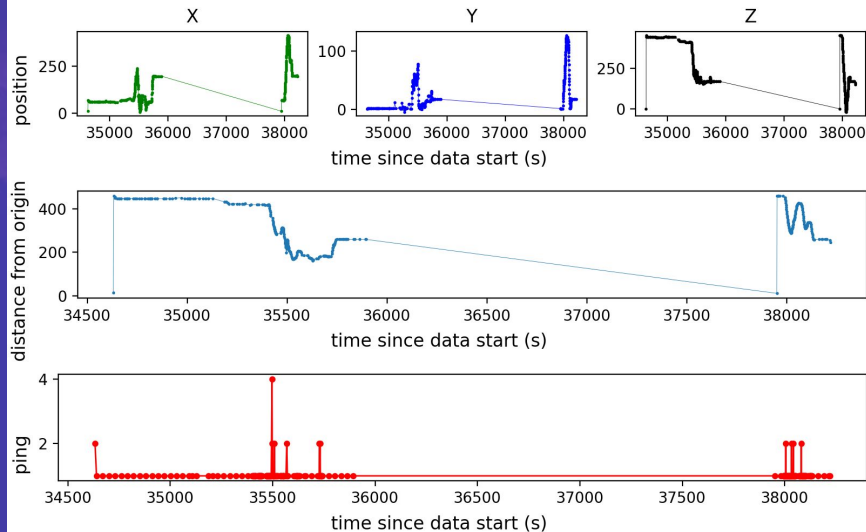
```
(1694618834.0, {'ping': 1}),
(1694618825.0,
 {'ping': 1, 'player_joined': 2, 'milestone_made_5_friends': 1}),
(1694618820.0, {'player_left': 1, 'milestone_made_5_friends': 1}),
(1694618798.0, {'player_joined': 1, 'milestone_made_5_friends': 1}),
(1694618794.0, {'ping': 1}),
(1694618793.0, {'milestone_made_5_friends': 1, 'player_left': 1}),
(1694618764.0, {'ping': 1}),
(1694618759.0, {'milestone_made_5_friends': 1}),
(1694618758.0, {'player_left': 1}),
(1694618734.0, {'ping': 1}),
(1694618718.0, {'milestone_made_5_friends': 1}),
(1694618705.0, {'ping': 1, 'milestone_made_5_friends': 1}),
(1694618696.0, {'milestone_made_5_friends': 1}),
(1694618674.0, {'ping': 1}),
(1694618659.0, {'player_joined': 1, 'milestone_made_5_friends': 1}),
(1694618656.0, {'milestone_made_5_friends': 1}),
(1694618655.0, {'player_left': 1}),
(1694618645.0, {'player_left': 1, 'milestone_made_5_friends': 1}),
(1694618644.0, {'ping': 1}),
(1694618625.0, {'milestone_made_5_friends': 1}),
(1694618614.0, {'ping': 1}),
(1694618612.0, {'milestone_made_5_friends': 1, 'player_joined': 1}),
(1694618599.0, {'milestone_made_5_friends': 1}),
(1694618585.0, {'ping': 1}),
(1694618582.0, {'milestone_made_5_friends': 1}),
(1694618581.0, {'player_joined': 1}),
(1694618579.0, {'milestone_made_5_friends': 1}),
(1694618578.0, {'player_left': 1}),
(1694618554.0, {'ping': 1}),
(1694618544.0, {'player_joined': 1, 'milestone_made_5_friends': 1}),
(1694618530.0, {'player_joined': 1, 'milestone_made_5_friends': 1}),
(1694618524.0, {'ping': 1}),
(1694618522.0, {'milestone_made_5_friends': 1}),
(1694618521.0, {'milestone_made_5_friends': 1}),
(1694618520.0, {'player_left': 1}),
(1694618515.0, {'milestone_made_5_friends': 1}),
(1694618514.0, {'player_left': 1}),
(1694618494.0, {'ping': 1}),
(1694618491.0, {'milestone_made_5_friends': 1}),
(1694618490.0, {'player_joined': 2}),
(1694618487.0, {'milestone_made_5_friends': 1}),
(1694618486.0, {'player_left': 1}),
(1694618469.0, {'player_joined': 1, 'milestone_made_5_friends': 1}),
(1694618464.0, {'ping': 1}),
```

Abnormally High Hand Holds

- User #35307 is an outlier with the most instances of hand holding
 - In the span of ~1 minute, initiated over 100 hand holds, while barely moving

```
(35719.0, {'ping': 1}),
(35717.0, {'hand_held': 17, 'hand_released': 13}),
(35713.0, {'hand_held': 12, 'hand_released': 11}),
(35711.0, {'hand_held': 6, 'hand_released': 5}),
(35710.0, {'hand_released': 10, 'hand_held': 11}),
(35708.0, {'hand_held': 8, 'hand_released': 6}),
(35707.0, {'hand_held': 5, 'hand_released': 4}),
(35706.0, {'hand_held': 4, 'hand_released': 4}),
(35705.0, {'hand_held': 6, 'hand_released': 5}),
(35704.0, {'hand_held': 1, 'hand_released': 1}),
(35703.0, {'hand_held': 1, 'hand_released': 1}),
(35702.0, {'hand_held': 2, 'hand_released': 2}),
(35695.0, {'hand_held': 4, 'hand_released': 4}),
(35692.0, {'hand_released': 6, 'hand_held': 5}),
(35691.0, {'hand_released': 3, 'hand_held': 3}),
(35690.0, {'hand_released': 5, 'hand_held': 5}),
(35689.0, {'ping': 1, 'hand_held': 5, 'hand_released': 4}),
(35688.0, {'hand_held': 2, 'hand_released': 2}),
(35686.0, {'hand_held': 1, 'hand_released': 1}),
(35685.0, {'hand_released': 2, 'hand_held': 2}),
(35684.0, {'hand_released': 4, 'hand_held': 3}),
(35683.0, {'hand_released': 5, 'hand_held': 5}),
(35682.0, {'hand_held': 4, 'hand_released': 3}),
(35667.0, {'hand_held': 1, 'hand_released': 1}),
(35666.0, {'player_left': 1, 'buddy_request': 1}),
(35661.0, {'ping': 1})
```

USER ID 35307 POSITION PLOTS



Conclusions

**Very large
dataset- over
68k users
represented**

From such a huge dataset, we were able to analyze trends to report 6 different anomalous users

**Applications to
the game**

As the game grows in membership, picking out a few cheaters out of the many good users becomes both necessary and challenging

**Future
Adaptations &
Improvements**

Instead of solely looking at the data, look in the context of the level map for movement exploits.

Also, can check if movement along a path is indicative of a bot or human player.

A night sky with a full moon and many stars. The background is a deep blue gradient. A large, bright, glowing circle representing the moon is on the left side. Numerous small, bright white stars are scattered across the sky. In the bottom right corner, there is a dark, jagged silhouette of a mountain range.

Thank You!