
Ubisoft Game Data Analysis

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Problem Definition

Identifying Cheating

Cheating can be defined as an intentional deviation from intended behavior with the intent of personal gain. Without knowledge of intended behaviors, the behavior of the majority can be defined as what is normally intended.

Understanding the Game

Preliminary Analysis

Game Genre

Single player RPG.

100 unique players.

Roughly equivalent game time.

Logged Events

completed_mission	
fight	
level_up	
shop_buy	
shop_sell	

Logged Statistics

Level
XP
Gold
Strength
Wisdom

Conclusion

The limited number of logged events and statistics as well as the single player nature narrows down the possibility for cheating. One possible cheating activity is for players to identify exploits within the game mechanics and repeatedly use them to their advantage in improving their statistics.

Identifying Cheating

Outlier Behavior : Initial Hypothesis

Studying the behavior of top ranked players could lead to identification of cheating activities.

Identifying Cheating

Outlier Behavior : Initial Hypothesis

Gold 2 outliers - One is shared with other stats

XP No outliers

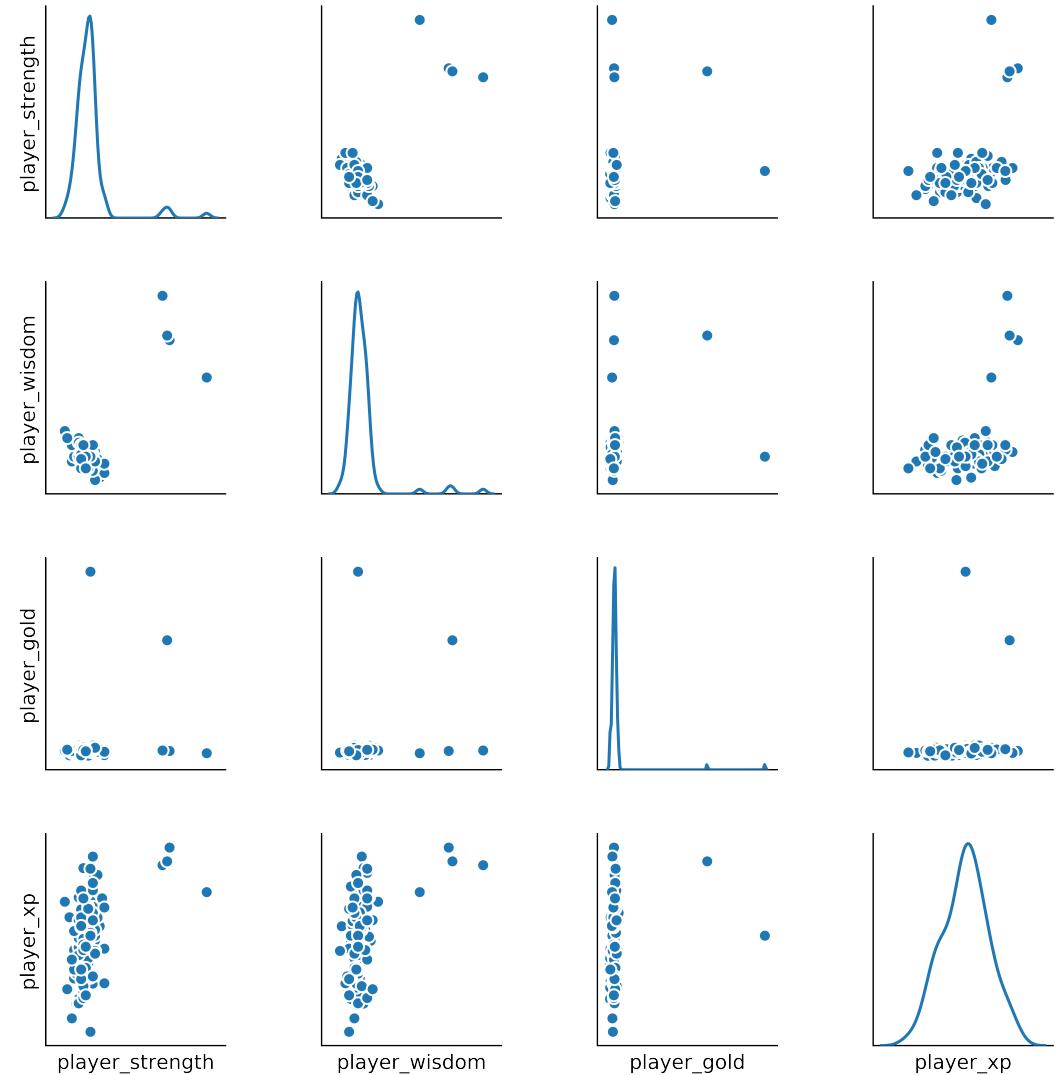
Level No outliers - All players reached level 30

Strength 4 outliers - Same outliers as wisdom

Wisdom 4 outliers - Same outliers as strength

Conclusion

There is a limited number of players who vastly outperform all others. Studying the behavior of these players could yield additional insights regarding cheating activities.



Identifying Cheating

Outlier Behavior : Initial Hypothesis

Outlier player ids

E3CA5E8B-848A-4964-B7D478FC67AD7761
06B69463-5C48-4596-9503DEDECCBD21E9
D8FBF2DA-4CA4-400A-80B1EF22F3244628
0DBAB841-C633-4B41-91DF4AE74DF138E4
EAA7972B-B05D-426E-B70733E391DFBB67

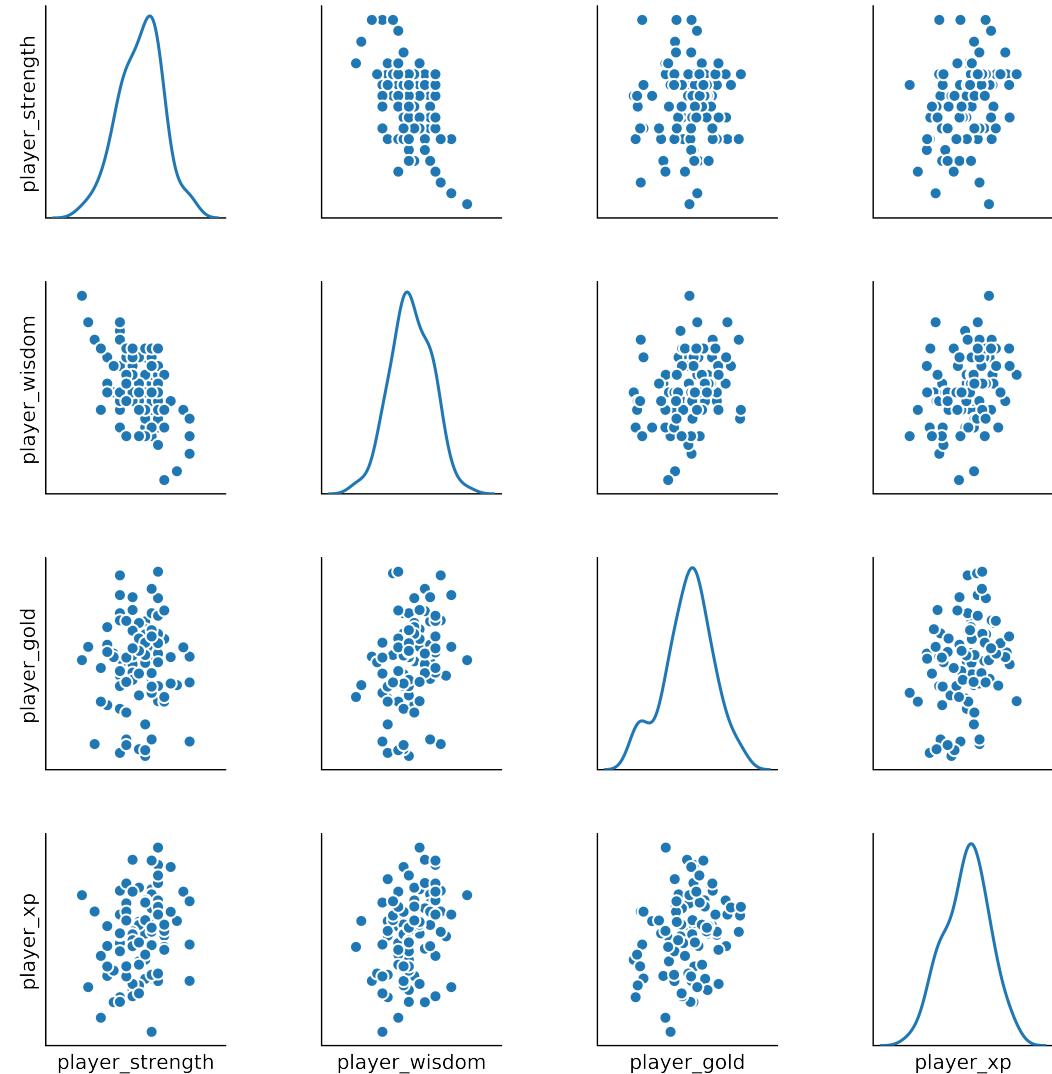
Correlation

Some positive correlation between gold and xp.

Some negative correlation between wisdom and strength.

Conclusion

Removing the outliers yields a scatter matrix with a normal distribution for all player statistics. This reinforces the initial hypothesis that outlier behavior could expose cheating activity.



Identifying Cheating

Outlier Behavior : Initial Hypothesis

Regular Players

Regular player behavior focuses on fights.

Gold Outliers

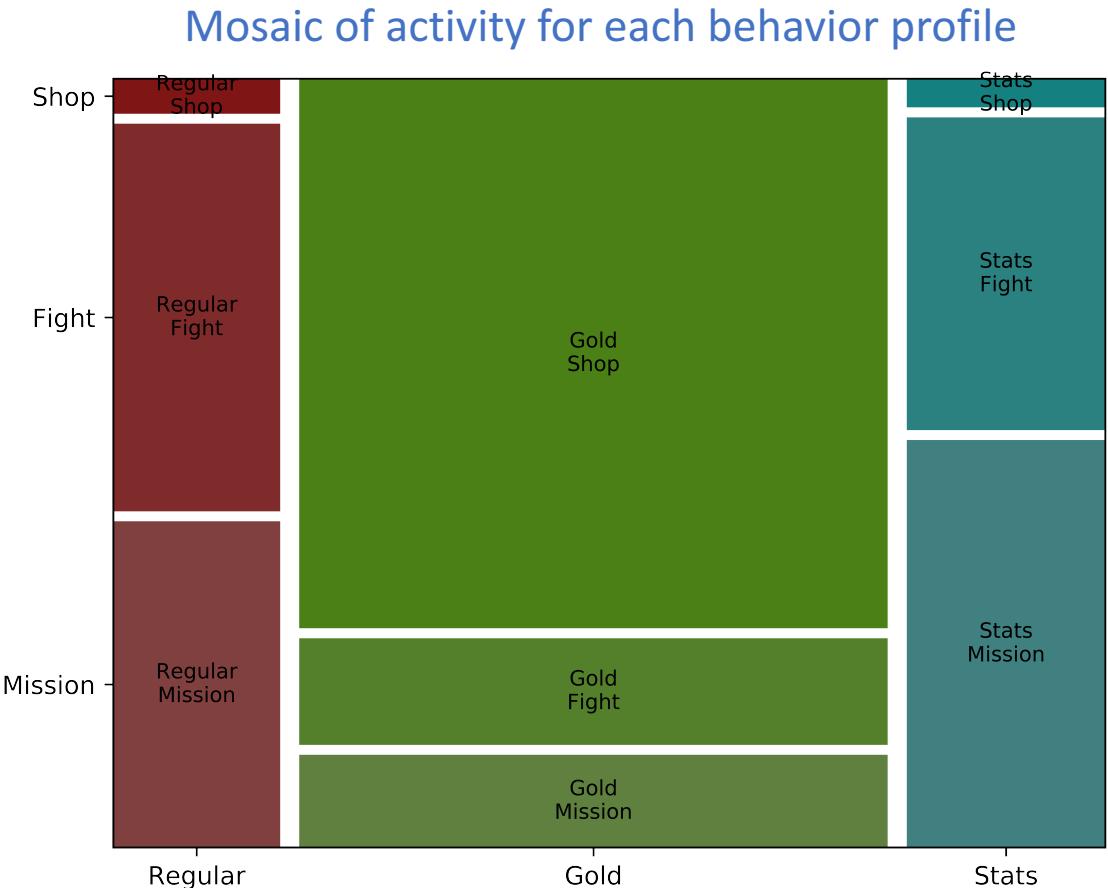
Top gold outlier behavior focuses on shop transactions. We can also see from the width of the column that these are the most active players.

Stats Outliers

Since top strength outliers are the same as top wisdom outliers, they are grouped. These players focus on missions.

Conclusion

As expected, the behaviors of the top players vary from the behavior of regular players. Further investigation of the game mechanics is required to determine if this is intended behavior.



Fight Mechanics

Outlier Behaviors : Question 1

Why do regular players focus on the mechanic of fighting monsters?

Fight Mechanics

Outlier Behaviors : Question 1

Monster loot

All monster loots follow a uniform distribution from 0-9.
Players receive loot regardless of fight outcome.

Monster xp

We did not observe any outliers on xp, therefore we can assume there are no exploits of the monster xp mechanic.

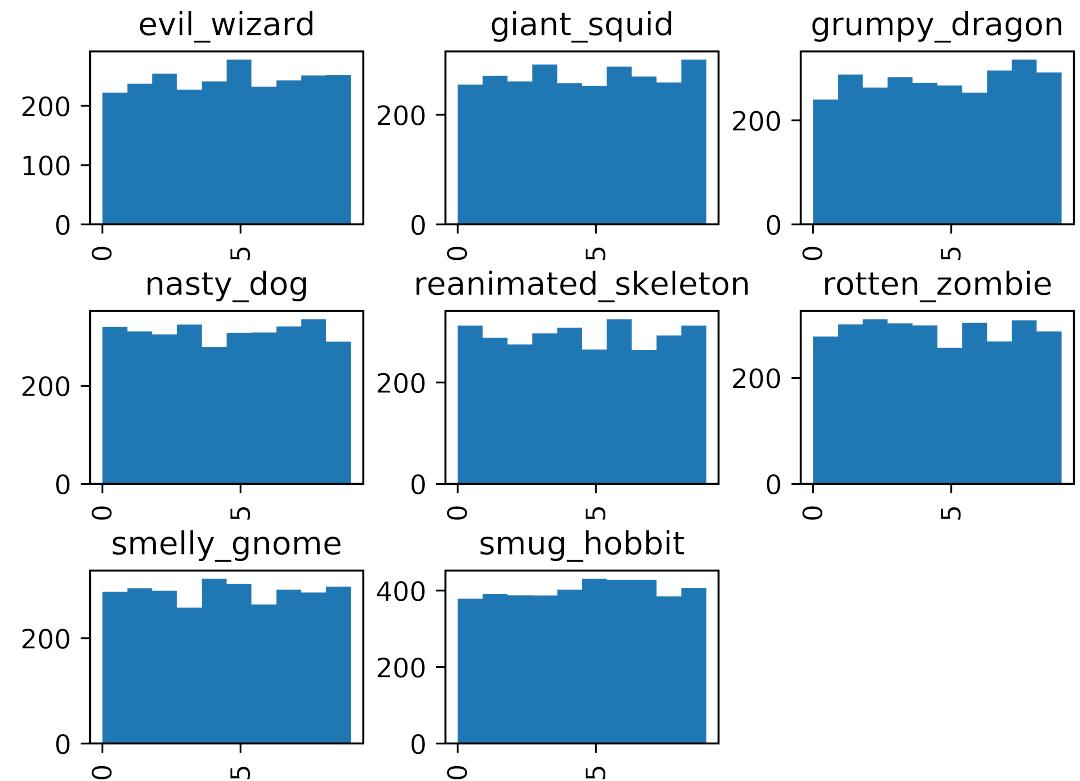
smug_hobbit power balance

smug_hobbit stats are overpowered as it is impossible to be beat.

Conclusion

There are no signs of exploits of the fighting mechanics. However, there are a couple abnormalities worth noting with regards to the power of smug_hobbit and loot rewards regardless of fight outcome.

Loot distribution for each monster type



Shop Mechanics

Outlier Behaviors : Question 2

Why do gold outliers focus on the mechanic of the shop?

Shop Mechanics

Outlier Behaviors : Question 2

Regular use of shop

Regular player use the shop to purchase better items with the gold they won though monster fighting. Theses items help them fight more difficult monsters in the future.

Shop transaction arbitrage

Gold outliers perform arbitrage by using the pricing mechanics of the shop to their advantage as they are able to buy an item and immediately sell it back at a profit. In the sample on the right, the player was able to make an instant profit of 10.

Conclusion

Gold outliers exploit a shop mechanic that allows them to arbitrage between the buying and selling price of items an obtain immediate profits.

Sample transactions of gold outliers

timestamp	event	player_gold	item_buyPrice	item_id
491	fight	33	null	null
507	shop_buy	5	28	196A0B7F...
507	shop_sell	43	28	196A0B7F...
507	shop_buy	14	29	AA598695...

Mission Mechanics

Outlier Behaviors : Question 3

Why do stats outliers focus on the mechanic of missions?

Mission Mechanics

Outlier Behaviors : Question 3

General mechanics

Missions can be completed in any order and any number of times.

Mission types

Wise_old_man : increase wisdom

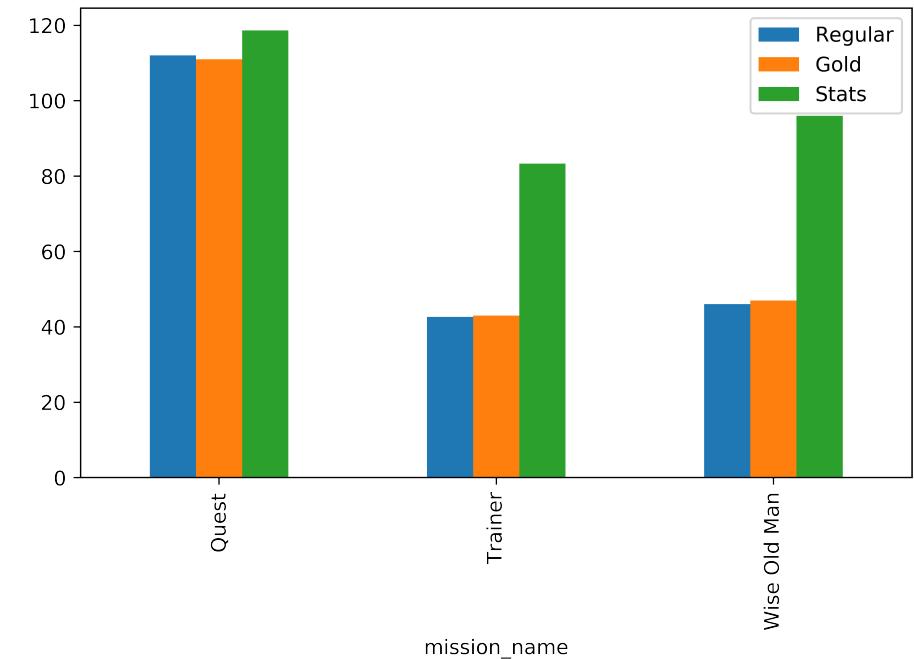
Trainer : increase strength

Quest : fight monsters to increase xp

Conclusion

Stats outliers were able to reach such a high level through repeatedly completing trainer and wise_old_man missions. It is not clear if this is a behavior which should be prevented.

Average mission type for each behavioral group



Recommendations

Fight Mechanics

smug_hobbit stats may need to be rebalanced.

Evaluate if loot payouts should only occur when player wins a fight.

Shop Mechanics

Adjusting the resale value of the items would prevent pricing arbitrage.

Mission Mechanics

May need to place a cap on number of times a mission can be completed to prevent farming player stats.

Code Reference

Tools Used

All analysis was performed using Python 3 libraries in Jupyter Notebooks.

Code on Github

<https://github.com/thegostep/Ubisoft-log-analysis>