Predicting Counter Strike: Global Offensive Round Winner

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Abstract

The Objective of this project is to predict whether Counter-Terrorists or Terrorists win a round based on multiple factors in the game. More details about the video game will be mentioned later in the report. I have used the dataset from openML which has multiple features and one Target value which mentions if the T won the round or if CTs won the round. I have used Random Forest Classifier to model the dataset. The model will predict whether Ts won the round or CTs won the round with reasonable accuracy.

1. Introduction

Counter Strike: Global Offensive(CS:GO) is a tactical first person shooter video game developed by Valve and Hidden Path Entertainment. The game pits two teams, Terrorists(T) and Counter-Terrorists(CT) against each other in different objective-based game modes. The most common and the one we are going to be focusing on is the game mode which involves the Terriorists planting a bomb while Counter-Terrorists attempt to stop them. This mode is called Competitive matches. Ts and CTs each consisting of five players go head to head in a thirty-round match. The team to win sixteen rounds wins the game. After fifteen rounds(half-time), each team switches sides where Ts will become CTs and vice versa. Each round is one minute and forty-five seconds long. There are many maps you can play on and each map contains two bomb-sites. The objective of the T side is to plant the bomb before the round ends OR eliminate all the CT players. If the bomb is planted, the timer will reset to forty seconds. The objective of the CTs is to either eliminate all the Ts or if the bomb is planted, defuse the bomb. If the bomb is not planted and any one of player from each team is remaining; if the timer goes to zero, the CTs will automatically win the round. There are various weapons both teams can buy at the start of each round. At the start of the game, both team will have the same cash and each player will have their own cash. You can earn more cash by doing various things such as eliminating the opponents, planting the bomb, defusing the bomb. Players will also earn a fixed amount of cash at the end of each round. If the team wins a particular round, they get more cash than the losing team. So, the main objective is to win sixteen rounds. There are some unique weapons to each team such as; AK-47, which is an assault rifle only Ts can buy. This weapon is extremely powerful and can kill the opponents with a single headshot. On the other hand, CTs have M4-A4 or M4-A1s which is equally powerful. There are also various grenades such as a HE grenade, Flashbang, Molotov or Incendiary grenade and smoke grenades. Each grenade is very valuable and can be the difference in the winning the round. Players can also buy a Kevlar vest and helmet which is expensive but will add a hundred more health points. Each player will have hundred health points at the start of each round. Coordination and Communication between team-members is critical in winning each round.

2. Project

This project will determine who wins a single round based on multiple factors taken from the dataset.

2.1 Dataset

The dataset used in this project is taken from OpenML which is called CSGO-Round-Winner-Classification. It consists of seven-hundred demos from high-level tournament played in 2019 and 2020. Snapshots of each round has been recorded every twenty seconds until the round is decided. The total number of snapshots is 122411. There are ninety-seven features and one target value. Some of the features which could be important to the classifications are,

- time_left: Time left in the current round.
- ct_score: the current score of the Counter-Terrorist team.
- t_score: the current score of the Terrorist team.
- bomb_planted: if the bomb has been planted or not. True or False
- ct_health: the total health of all CT players. In range 0-100
- t_health: the total health of all T players. In range 0-100
- ct_armor: the total armor of all CT players.
- t_armor: the total armor of all T players.
- ct_money: the total bankroll of all CT players. Amount in USD.
- t_money: the total bankroll of all T players. Amount in USD.
- t_players_alive: Number of alive players in T side.
- ct_players_alive: number of alive players in CT side.
- t_weapon_X: weapon X count on T team. Eg: AK-47
- ct_weapon_X: weapon X count on CT team. Eg: M4a4
- ct_helmets: number of helmets on CT team.
- t_helmets: number of helmets on T team.
- ct_defuse_kits: number of defuse kits in CT side
- round_winner: CT =S counter-terrorist, T = Terrorist.

2.2 Data Preprocessing

The dataset was .txt file which has a lot of comments starting with %. It also has @RELATION and @ATTRIBUTE sections which explain each attribute and their type. It then has @DATA section which follows all the raw data which we are most interested in. The first process is to load the dataset from OpenML which can be done using the requests package. The requests will allow you to get the file using the url of the file. Once we have the file, we are interested in the raw data which means we have to get rid of all the comments and the sections where they explain each attribute. We can achieve this by opening the dataset, splitting the file by each line and skipping the parts where the line starts with % or @. All the other lines other than this has the raw data, so we will get all the data in an empty list called data. We also need the column names which can be done by using the @ATTRIBUTE and getting all the names after this line. Fortunately, the dataset does not contain any NULL fields and the only thing we need to add to this dataset is a new target field which converts the CT, T of round_winner to binary. So, we add a new column called final which will map T to 1 and CT to 0. This means, if the Ts win a round, the target is 1 and if CTs win a round, the target is 0. This is the only data preprocessing required for this dataset.

2.3 Data Analysis

After the preprocessing, we need to figure out which attributes strongly determine the target value. This can be done by plotting a correlations graph. (absolute values)

Final	1.000000
ct_armor	0.336382
ct_helmets	0.308255
t_helmets	0.297458
ct_defuse_kits	0.291557
t_armor	0.290753
ct_grenade_flashbang	0.253868
ct_players_alive	0.216798
ct_grenade_smokegrenade	0.209975
ct_weapon_awp	0.198626

t_weapon_ak47	0.194147
ct_health	0.190662
bomb_planted	0.187101
ct_weapon_m4a4	0.178008
ct_grenade_hegrenade	0.168781
ct_grenade_incendiarygrenad	0.168517
ct_weapon_ak47	0.166855
t_grenade_flashbang	0.166839
ct_weapon_sg553	0.163963
t_weapon_sg553	0.163709
ct_weapon_usps	0.152893
t_weapon_awp	0.149878
t_players_alive	0.142518
t_grenade_smokegrenade	0.140348
t_weapon_usps	0.136694
t_grenade_hegrenade	0.116336

Since these are all the attributes which determine the target value the best, we will work with these attributes. We will have a new dataset called df_selected which will only have these attributes.

2.4 Model

We will be using the train_test_split to split the dataset to train data and test data. We will be using eighty percent as training data and twenty percent as testing data. We will also be using StandScaler from sklearn to transform the training and testing data so that we don't have skewed data. For the model, we will be using two models; KNeighborsClassifier and RandomForestClassifier. We will be using the scaled Training data to fit to the model and score to determine the accuracy of each model.
Random Forest will be useful in this project because the nature of the problem allows us to use Decision trees.

3. Results

After fitting the scaled trained data to **KNeighborsClassifier**, the score of the result is **0.77** or **77%.**

After fitting the scaled trained data to **RandomForestClassifier**, the score of the result is **0.83** or **83%.**

4. Conclusion

We achieved an accuracy of 83% which is decent and can be used to determine who wins a round of CS:GO. This can be used by various people who play CS:GO on a regular basis to check what is important to win a round in CS:GO.

References

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