Winner Winner Chickie Dinner?

DSI26 Capstone: Winner Prediction for Fortnite

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About the project

Overview

Electronic sports (or esports) is a form of competition utilizing video game. Esports differs from regular video gaming in that it is competitive (human-vs-human) and, like traditional sports, usually has an interesting spectator element.

Genres of Esports

- Multiplayer Online Battle Arena (MOBA)
- First-Person Shooter (FPS)
- Battle Royale
- Real-Time Strategy (RTS)
- Fighting
- Collectible Card Games (CCG)
- Sports & Racing

1 billion

Global Revenue for
Esports in 2020

495 million

Global Audience for
Esports in 2020

125 million

Prize money awarded in
tournaments in 2020

"Our world-class events and digital infrastructure have also made Singapore an attractive location for the industry to hold gaming and e-sports events here. The government will continue to support companies as they push boundaries through experimenting with new and immersive content formats and business models, as well as level up the quality of our local talent to become leading creators of world-class content."

—Singapore Tourism Board and Enterprise Singapore

Singapore Focus


GEFestival
Global
Esports
FEDERATION
GLOBAL
ESPORTS
GAMES
2021
SINGAPORE

Top 3 Games Awarding Prize Money

According to Esports Earnings.

Problem Statement

- Predicting the winner of a match using historical player data

Genre

Battle Royale - Fortnite

Scope

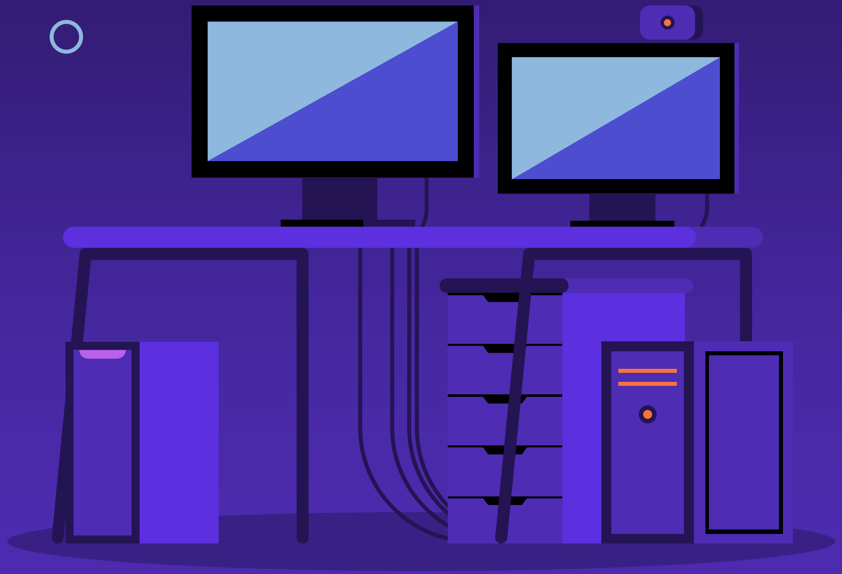
Solo Matches, where the winner competes with up to 99 other players

Model

Classification-based model to predict winner


FORTNITE

LOGJAM LUMBERYARD
SLEEPY SOUND
SHIFTY SHAFTS
THE DAILY BUGLE
COVERT CAVERN
CONEY CROSSROADS
CAMP CUDDLE
TILTED TOWERS
SANCTUARY
THE JONESES
ROCKY REELS
GREASY GROVE
CONDO CANYON
CHONKER'S SPEEDWAY



02

Data & Workflow

Workflow

Web Scraping

Data Cleaning & EDA

Classification Modelling

Evaluation & Conclusion

Web Scraping

First set of data to be gathered from Fortnite Tracker, Match Statistics, using:

- Requests library
- Selenium Webdriver

Web Scraping

Second set of data to be gathered from Fortnite Tracker, Player Statistics, using:

- Fortnite Tracker API

Data: Datasets

Match Statistics

Critical information:

- Eliminations
- Points
- Time Alive
- Placement

Misc info such as:

- Team ID
- Event ID
- Geo Identities, etc.

Player Statistics

Cumulative Statistics:

- Matches
- Kills
- Wins
- Score
- Minutes Played
- Top Rankings, etc.

Ratio Statistics

- Kills per game / per minute
- Win ratio
- Score per match / per minute
- Average Time Played
- Kills to deaths ratio

Data: Player Statistics - Match Modes

Solo

Solo Player

Trios

A Maximum of
a Team of 3

Lifetime

Cumulative Statistics
of All Modes

Duos

A Maximum of
a Team of 2

Squads

A Maximum of
a Team of 4

LTM

Limited Time Modes
with Special Rules, not
counted in Lifetime

Sample Player Statistics

LAST 7 DAYS | LAST 30 DAYS | **LIFETIME** | 56,500 Matches

BEST TRN RATING	SCORE	TOP 3/5/10	TOP 6/12/25	TIME PLAYED
4,999 LEGEND	23,250,105	40,115	45,533	454D 6H 54M

WINS	WIN %	KILLS	K/D
33,135	58.60	359,991	15.41

SOLO — 21,539 Matches

TRN RATING: 4,987 LEGEND | RANK: -

WINS 9,362	KILLS 138,680
WIN % 43.50	K/D 11.39
TOP 10 13,163	TOP 25 16,242
TIME PLAYED 97D 15H 42M	AVG. MATCH TIME 6M 31S
KILLS/MATCH 6.44	KILLS/MIN 0.99
SCORE/MATCH 225.87	SCORE/MIN 34.60
SCORE 4,864,983	

DUOS — 4,824 Matches

TRN RATING: 4,999 LEGEND | RANK: -

WINS 2,132	KILLS 26,023
WIN % 44.20	K/D 9.67
TOP 5 2,813	TOP 12 3,355
TIME PLAYED 37D 23H 50M	AVG. MATCH TIME 11M 20S
KILLS/MATCH 5.39	KILLS/MIN 0.48
SCORE/MATCH 359.96	SCORE/MIN 31.74
SCORE 1,736,445	

SQUADS — 23,281 Matches

TRN RATING: 4,983 LEGEND | RANK: -

WINS 16,248	KILLS 145,658
WIN % 69.80	K/D 20.71
TOP 3 18,342	TOP 6 19,810
TIME PLAYED 231D 15H 1M	AVG. MATCH TIME 14M 19S
KILLS/MATCH 6.26	KILLS/MIN 0.44
SCORE/MATCH 529.16	SCORE/MIN 36.94
SCORE 12,319,410	

03

Data Cleaning & EDA

Data Cleaning

Match Statistics

- Missing data: Dropping said rows as the data is faulty
- Dropping Miscellaneous Columns such as IDs, Insert Time and End Time that is non-float

Player Statistics

- Missing data: Dropping Ratings columns and dropping rows with mostly empty values
- Dropping Zero value columns

Merger of Match Statistics and Player Statistics

Feature Engineering

Player Statistics

Lifetime Statistics

- Feature columns available in the individual sections but not provided (Mostly the ratio statistics)

- Making the Top statistics more interpretable (Top 3/5/10 & Top 6/12/25)

1.44%

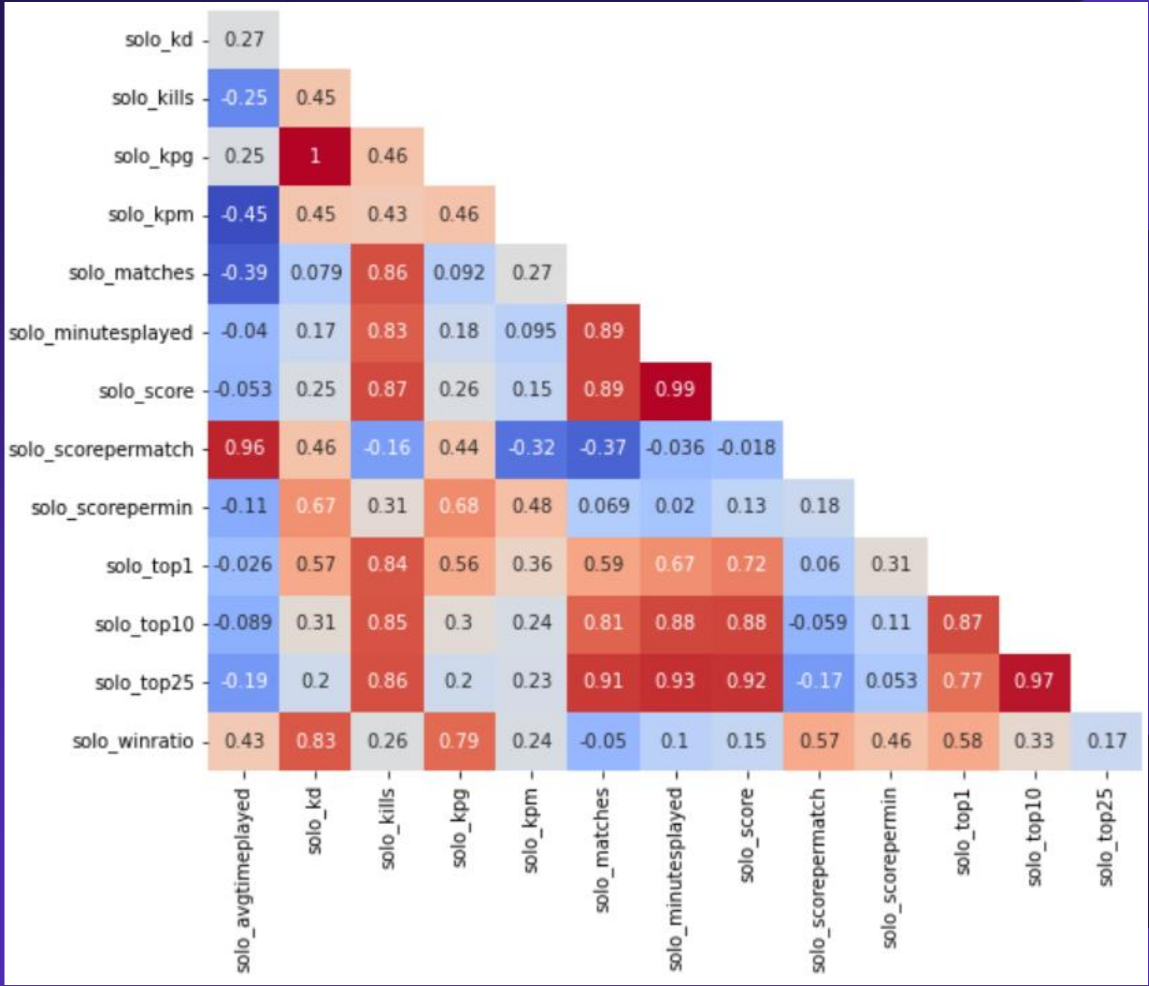
Winner Count in Data

Correlation

Solo Statistics

- Unsurprisingly, all of the columns are heavily correlated with one another

- The correlation for match modes are also similar.

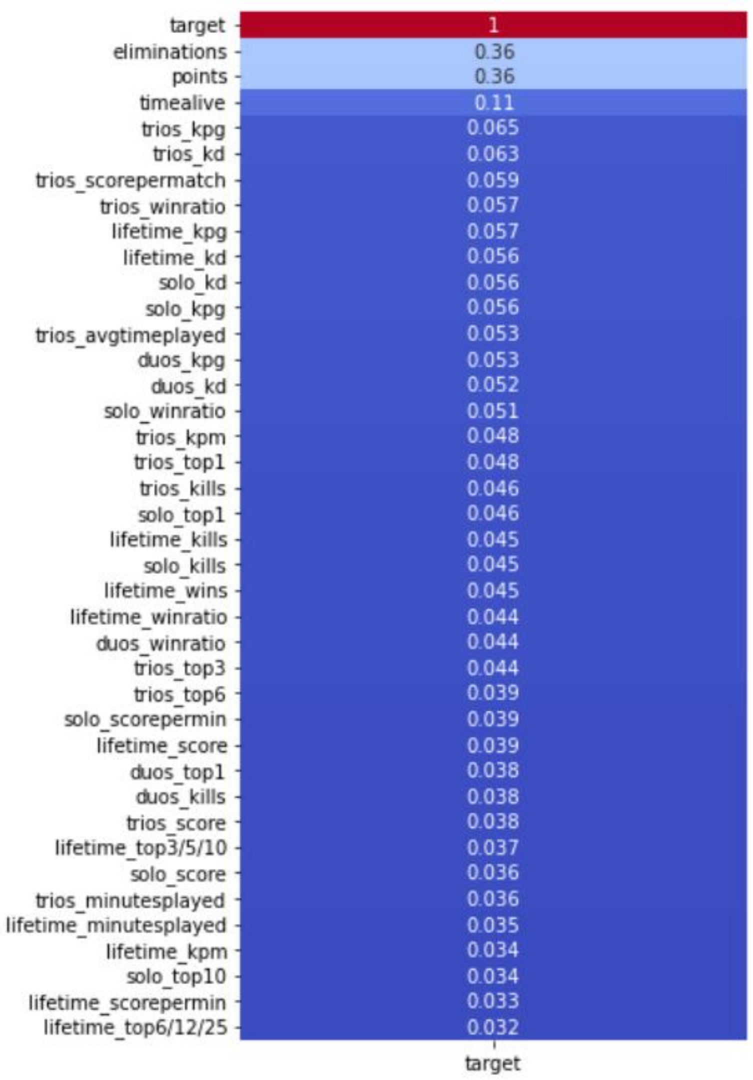


Correlation

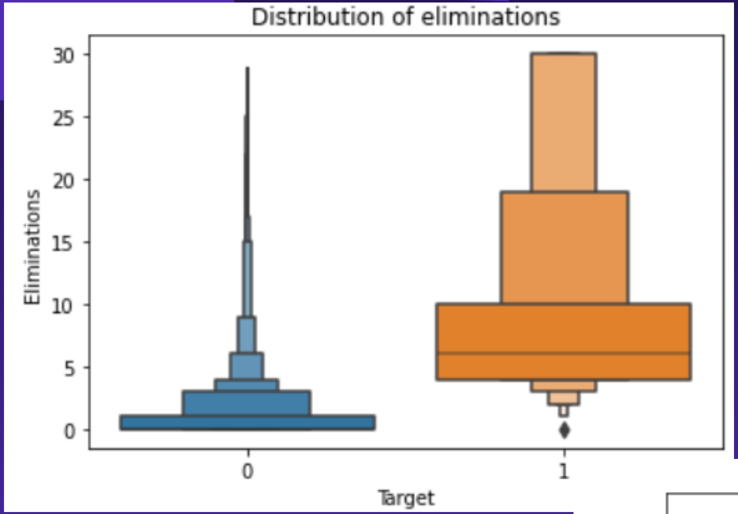
Correlation to the Winner

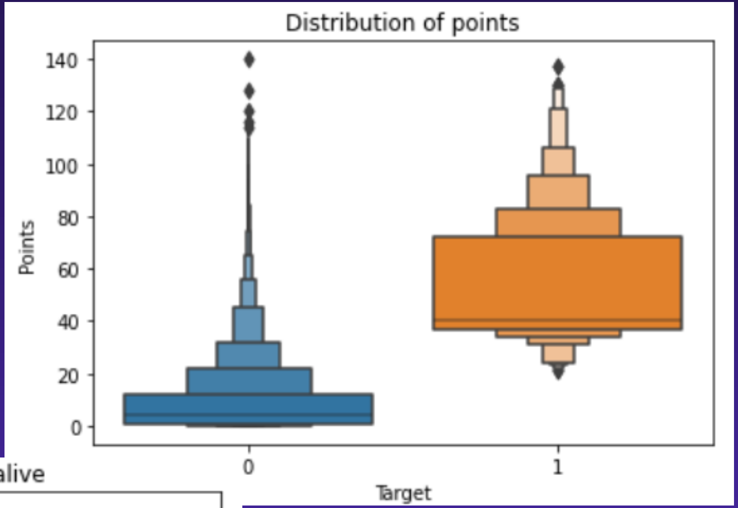
- The 3 match statistics **‘eliminations’**, **‘points’** and **‘timealive’** are more correlated compared to the player statistics.

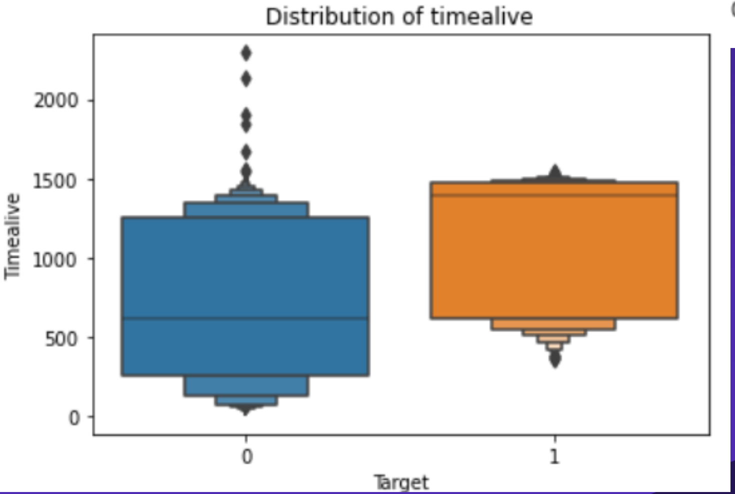
- Very low correlations for the player statistics => Model not being very effective



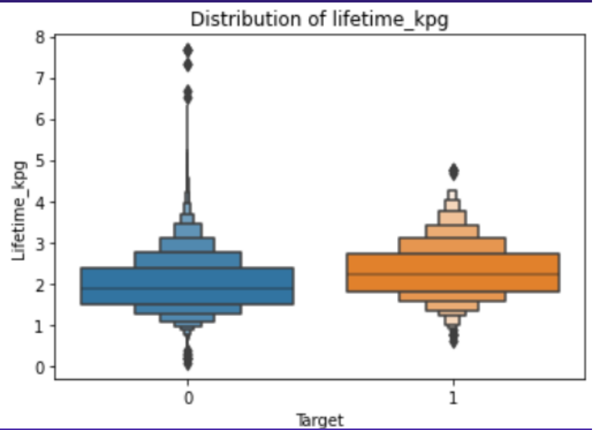
Box Plots for Match Statistics

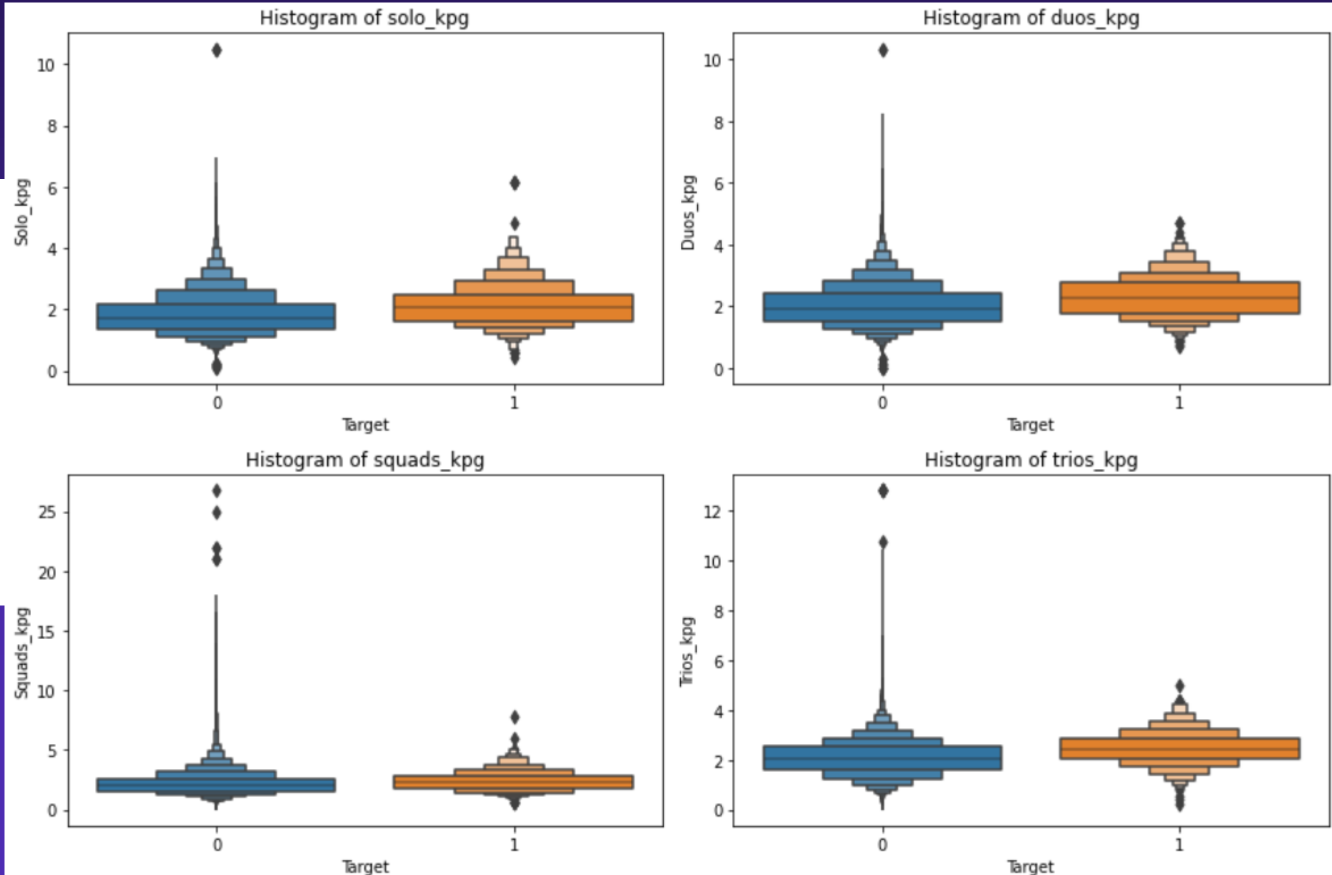




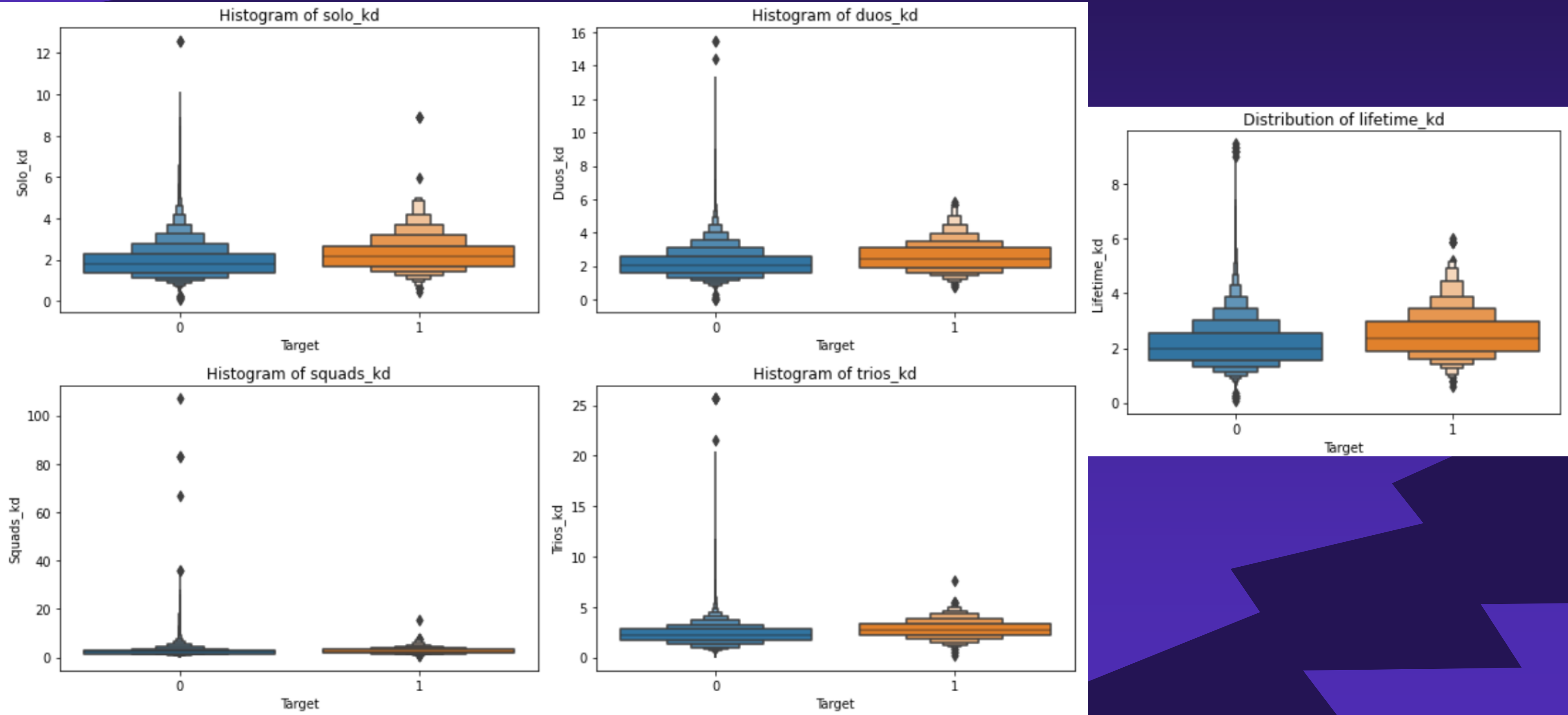


Box Plots for Player Statistics





Box Plots for Player Statistics



04 Models

Model Framework

Basic Classifiers

- Logistics Regression
- K Neighbors Classifier

Tree-based Classifier

- Random Forest Classifier

Boost Classifier

- Light GBM Classifier

Neural Network

- Keras Classifier

Modelling

- Various parameters are used to tune the above models through the use of Grid Search CV.
- The results are as follows:

model	GridSearch_score	train_score	test_score	accuracy	recall	precision	roc_auc_score	f1score	average_precision
Dummy	0.0144	0.0144	0.0144	0.9856	0.0000	0.0000	0.5000	0.0000	0.0144
LogReg	0.0327	0.0347	0.0246	0.6611	0.5839	0.0247	0.6230	0.0473	0.0204
KNN	0.1520	0.2769	0.1559	0.6201	0.6510	0.0244	0.6353	0.0471	0.0209
RandomForest	0.1945	0.3222	0.1861	0.8310	0.4899	0.0419	0.6629	0.0771	0.0279
Light GBM	0.2177	0.4424	0.2230	0.9275	0.4497	0.0913	0.6921	0.1518	0.0490
Neural Network	0.1543	0.2896	0.2005	0.7551	0.5906	0.0344	0.6741	0.0650	0.0262

Scoring Metrics

Average Precision

Primary indicator: Measure model's ability to identify the positive class while minimizing false positives

Accuracy

Basic indicator: Ratio of correct predictions to total predictions

Sensitivity

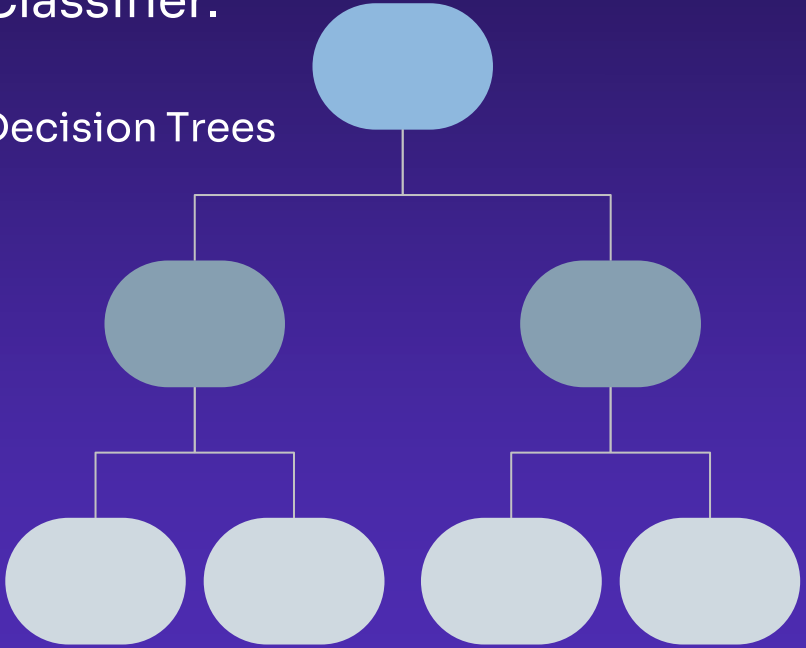
Secondary indicator: Ratio of true positives over true positives plus false negatives

F1 Score

Secondary indicator: Harmonic mean of precision and recall

Final Model

- The best model is the Light GBM Classifier.
- The parameters are as follows:
  - Boosting Type: Gradient Boosting Decision Trees
  - Scale Pos Weight: 99
  - Max Bin: 200
  - N Estimators: 200
  - Learning Rate: 0.01
  - Max Depth: 25
  - Num Leaves: 255
  - Min Child Samples: 200
  - Colsample by Tree: 0.9
  - Subsample: 0.9
  - Subsample Freq: 2



05 Evaluation

Confusion Matrix

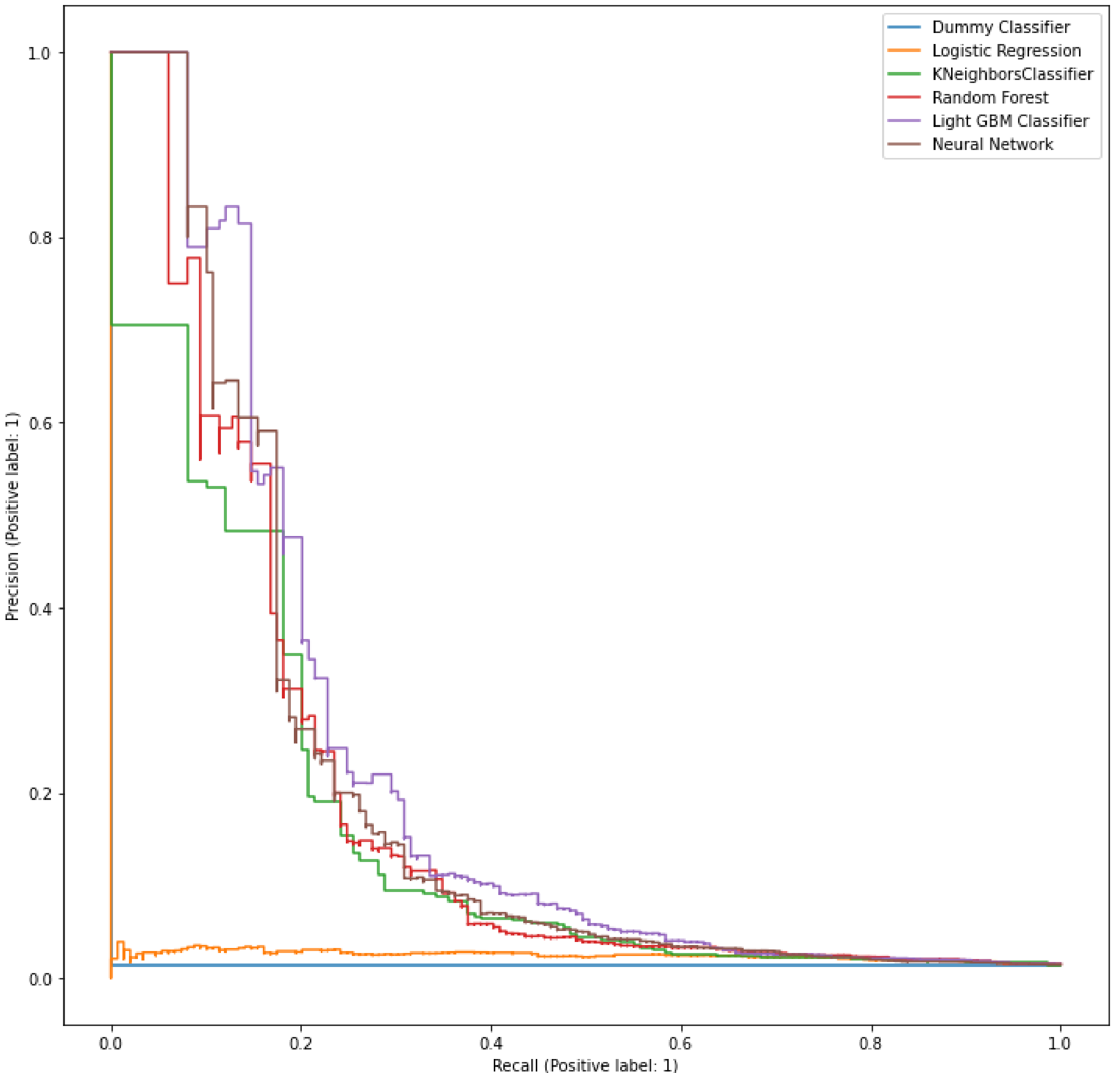
	Predicted Non-Winners	Predicted Winners
Actual Non-Winners	9,519	667
Actual Winners	82	67

Precision-Recall Curve

Average Precision:

0.0490,

Compared to Baseline of 0.0144



Other Scoring Metrics

Accuracy:

0.9275,

Compared to Baseline of 0.9856

Sensitivity:

0.4497,

Compared to Baseline of 0

F1 Score:

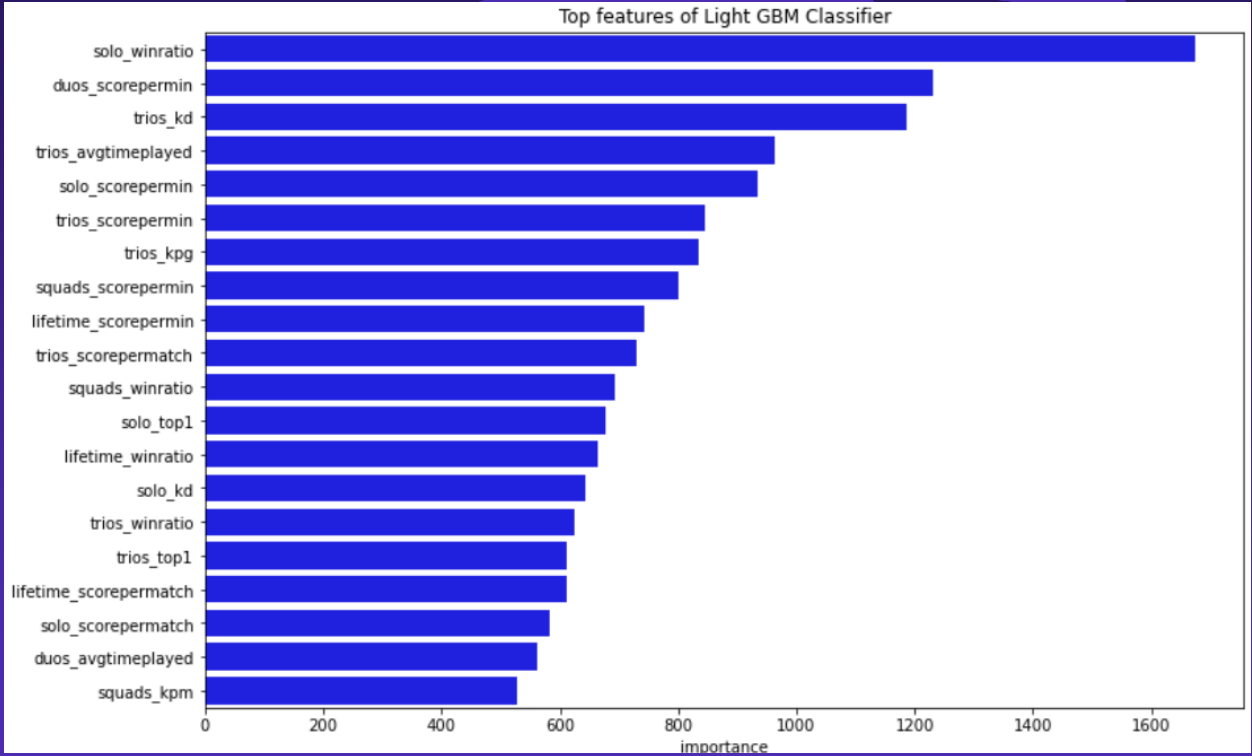
0.1518

Compared to Baseline of 0

Recommendations

Features to use to judge:

- Solo Win Ratio
- Score per min (for various match modes)
- Win Ratio (for various match modes)
- Ratio Statistics related to Trios match mode



Feature Importances of Final Production Model

06

Conclusion

Conclusion

Improvements to current model:

- More match and player statistics data => Limited scale due to limitations of web scraping
- Other forms of player statistics not directly related to game-based => Not readily available and may be irrelevant

Using match statistics to model:

- Model using match statistics like `eliminations` and `time alive` => Instead of predicting the winner, identify factors to increase chances of winning.

Future Applications to other games

Thanks!

Do you have any questions?