The Reliability of Predictive Models in Esports

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Introduction and Objectives

This project is centered around a decade-old video game called League of Legends, which is one of the most popular video games in esports. Due to its nature of being a complex team-based strategy game, intuitive human predictions of the game's outcome are relatively unreliable. Many approaches have been adopted to assist intuitive human predictions in traditional team-based sports, such as the Least Squares Method and various supervised machine learning algorithms. These methods have been significantly outperforming human predictions. The objective of this research is, hence, to test whether the predictive models generated using these methods can achieve a similar level of reliability in a more complex game like League of Legends.

Methods

Least square method:

- This method is used to generate multiple linear regression models using the least square solutions to the matrix equations that represent the linear correlations between all the variables.

Linear/Logistic regression models (machine learning):

- This method uses supervised machine learning algorithms such as gradient descent to generate linear/logistic regression models. These models are used to predict the outcome of a game.

Bootstrap Resampling:

- This method utilizes resamples of a relatively small sample space to generate a more reliable ensemble model from individual models of each resample.

Results

Here is an example of the models I built using the least square method:

$W = 0.0582g + 0.0488d + 0.5838$

W: win probability, g: gold lead at 20 min,
d: net # of drakes at 20 min

Coefficient of Determination R^2: 0.3984

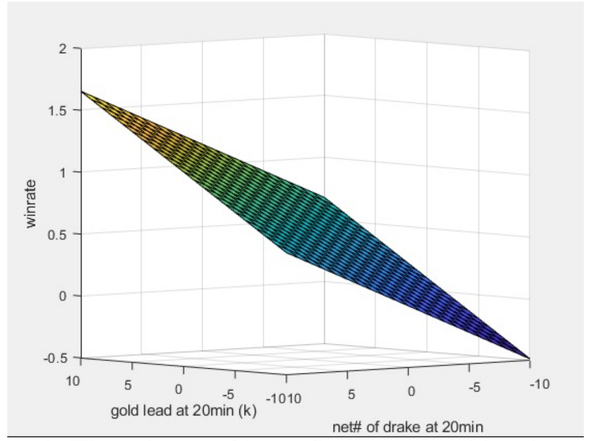


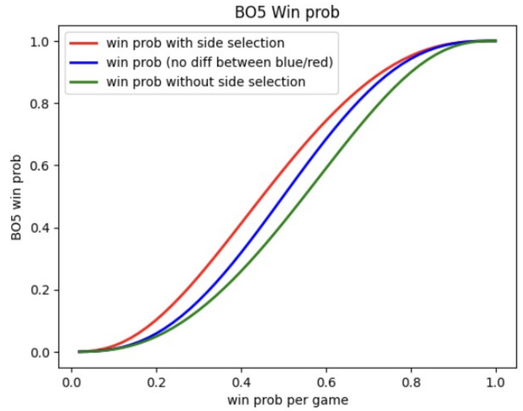
Figure 1: The plane of best fit generated by the model.

The models generated through machine learning algorithms cannot be visually presented due to their large number of variables. Here is a table showcasing the reliability of some example models using various metrics:

Model	Accuracy	Precision	Recall	R2
Logistic Regression Model	72.6%	72.7%	98.8%	N/A
Linear Regression Model	N/A	N/A	N/A	-0.081
Bootstrap Logistic Regression Model	76.1%	77.2%	97.7%	N/A
Bootstrap Linear Regression Model	N/A	N/A	N/A	-0.118

Results

Here is the graph showing the transformation from a single game win probability to a best of 5 series win probability using the negative binomial distribution:



Conclusions

Multiple linear regression models created using both methods showcase moderate/weak correlation based on their coefficient of determination (R^2), with the least square method resulting in higher R^2 score potentially due to the issue of overfitting in gradient descent. Logistic regression models (through machine learning), on the other hand, have decent accuracy/precision scores and very high recall scores. Finally, there is no significant difference between the bootstrap models and non-bootstrap models.

Literature Cited & Acknowledgements

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