

Math 3030 Module 1 Final Report

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1 Introduction

Marvel Rivals is a highly popular multiplayer video game featuring 6 versus 6 matches. At the end of each match it is possible to view the performance of each player, measured by various stats such as kills, deaths, etc. Depending on a win or loss, players have a tendency to attribute this outcome to the value of some particular stat. My intention is to perform a logistic regression, evaluating the correlation between these various stats and a player winning or losing a match. This is an area of mathematics that sits firmly in the realm of statistics and data science, utilizing data and computer software in order to make predictions about a players performance based on their end game stats.

2 Methods

The main work being done here was performed through a software package that can be downloaded and used with Google sheets, called XLMiner Analysis ToolPak. This software enables users to perform a multitude of statistical sets on recorded data, in particular, the logistic regression tool was used as we are particularly interested in the correlations of various stats to a binary value representing a win or loss.

While the initial plan was to record the necessary information using web scraping tools, the website that was ultimately selected for data gathering forbids the use of such tools. This means the data had to be recorded manually in a spreadsheet, which was done partially with the use of AI tools.

The data gathered pertains to the following statistics

1. KDA (Kill-Death-Assist Ratio): This is the ratio obtained by adding kills and assists and dividing by deaths
2. Kills: Enemy player deaths as a result of damage you contributed
3. Deaths: Self explanatory
4. Assists: Kills that were acquired by players who you were assisting in some way, typically through healing or buffs

5. Final Hits: Kills in which you directly reduced an enemies health to 0, meaning you were the last person to cause them damage
6. Damage: Self explanatory
7. Damage Blocked: Damage that was absorbed through methods that ultimately prevented teammates or the player from receiving said damage, typically obtained through shields or walls utilized by the player
8. Healing: Self explanatory
9. Accuracy: Self explanatory

3 Results

Table 1: Regression Results (100 Games)

Variable	Coefficient	Standard Error	P-value
Intercept	0.1844384524	1.746393028	-
KDA	0.9167161854	0.5068814792	0.0705226555
Kills	-0.0318750374	0.134542985	0.8127239663
Deaths	-0.1877311738	0.1878119424	0.3175186717
Assists	0.2282007551	0.1440593947	0.1131768589
Final Hits	0.4682867582	0.2354443076	0.04670681465
Damage	-0.00263653037	0.001475225897	0.07390444124
Blocked	0.0001084086170	0.000378567813	0.7745984873
Healing	-0.00338539688	0.001665284296	0.04206017361
Accuracy	-1.613471347	2.547238406	0.5264595113

Table 2: Regression Results (205 Games)

Variable	Coefficient	Standard Error	P-value
Intercept	0.9520489363	0.9826923872	-
KDA	0.4405337199	0.2268237135	0.05211465183
Kills	0.05783906867	0.07082845753	0.414152614
Deaths	-0.1903163241	0.09087293153	0.03623214403
Assists	0.05811998859	0.06384175008	0.3626243203
Final Hits	0.1496702625	0.1158446787	0.1963603203
Damage	-0.00130590078	0.000814581962	0.108900535
Blocked	-0.00003714291	0.000244546510	0.8792777357
Healing	-0.00086799003	0.000569189248	0.1272694274
Accuracy	-1.847733807	1.195844618	0.1223151428

The most important value that should be considered first is the P-values, a low P-value means the coefficient obtained for a given variable is less likely to

have occurred due to luck. In the first 100 games the variables which appeared to show an immediate predictive effect, filtering by a P-value of less than 0.1, were KDA, Final Hits, Damage, and Healing. While the coefficients for KDA and Final Hits are positive, indicating that these values do indeed make a positive impact on the odds of winning a game, the coefficients for Damage and Healing are not only miniscule but actually negative.

The second table should be given more heedance, as information on more games is acquired we can reasonably expect to get a more accurate picture of the relevance of these various stats. Here the only values that are still statistically significant (According to our previous metric) are KDA and Deaths. It is interesting to note that the coefficient for KDA has halved in significance, as it indicates that KDA may have been a significant predictor for the first 100 matches tested but in the long term is not as relevant as first testing may originally indicate.

4 Conclusion

As it stands this project can currently be considered incomplete or inconclusive. Although the P-values tend to decrease as the number of games tested increases, the pattern of decrease is currently erratic and hard to predict with just two tests run. The obvious answer to this is to test with more games in the hopes that over the long run clear patterns should form, but until a better method is found for gathering data the number of games to be tested is currently limited by manual effort which is slow at best.

5 Appendices

5.1 AI Usage

Artificial Intelligence was primarily used to assist in gathering and recording information in a microsoft excel spreadsheet. It was also used to generate the Latex code that was used to create the two tables in the results section.

5.2 References

1. Statistical Inference by George Casella
2. Goodhart's law (Wikipedia Article)
3. Tracker.gg (Marvel Rivals Game Stats Website)
4. Logistic Regression Overview with Example (Statistics by Jim Article)
5. Machine Learning Methods for Predicting League of Legends Game Outcome
6. Statistical Learning for Esports Match Prediction by Kevin Bailey

7. Logistic Regression in Machine Learning (Geeksforgeeks Article)