Valorant Esports Map Prediction (COMP3125 Individual Project)

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***Abstract*—This project is a proof of concept about predicting the outcome of a Valorant Esports match, through the analysis of the team's win rates and history against other teams.**

Keywords—example1, example2, example3, example 4, example 5 (provide 3-5 keywords)

I. Introduction (*Heading 1*)

Valorant is a tactical shooter game, played as 2 teams of 5 going against each other, and each team will take turns in fighting for objectives to win the round. The first team to win 13 rounds wins a map. The first team to take 2-3 maps wins the game. Before each game starts, teams will take turns banning the maps that they do not want to play on and then play those maps they want. This project aims to provide teams with crucial information on their strong and weak maps, as well as their opposition. This project also aims to highlight teams with unpredictability, beating other teams when the odds are against them statistically. This will allow teams to strategically ban their rivals' strong or unpredictable maps, leading to a higher chance of winning.

II. Datasets

A. Source of dataset (Heading 2)

This dataset was generated by Ryan Luong, obtained through data scraping VLR.gg, a website who works with Riot Games (the creator of the game Valorant), to provide data on Valorant Esports Tournaments.

B. Character of the datasets

This data contains 16 parameters, but only 5 of them will be relevant to my data analysis: map, Team A, Team B, Team A score, and Team B score. The "map" parameter tells us what map these teams played on, "Team A, Team B" tells us what teams will be playing against each other, "Team A score, Team B score" tells us what score each team got on those specific maps. From the score, we can find the win rates as well as the score difference between each team.

III. Methodology

I used Python to analyze data for this project. The "pandas" library was used to load and manipulate the dataset, while the scikit-learn library was used to build the linear regression model.

The methodology includes the following steps:

1. Data Loading and Validation: The dataset is loaded from a CSV file into pandas. The script ensures that all required columns ('Team A', 'Team B', 'Team A Score', 'Team B Score', and 'Map') are included. If any column is missing, the program returns an error.

2. Calculate the win rate for each team and map combination by dividing the number of wins by the total number of matches played. This is completed for each team in the dataset.

3. The user gets prompted to select two teams to compare. The program outputs a list of every team then asks the user to input the corresponding numbers for their selections.

4. Data Preparation for Regression:

    - For each match, the win rate difference between the two teams is calculated.

    - The score difference between the two teams is then calculated.

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- The target variable is determined: 1 if Team A wins, -1 if Team B wins, and 0 for a draw.
- This data is then organized into a pandas DataFrame.

5. Linear Regression Model Training:
   - The data is split into training and testing sets.
   - A linear regression model is trained using the win rate difference and score difference as features to predict the match outcome (winner).
   - The Mean Squared Error (MSE) of the model on the test set is calculated to evaluate its performance.
6. Prediction and Interpretation:
   - For each map, the win rate difference between the two selected teams is calculated.
   - The trained linear regression model is used to predict the outcome.
   - The prediction is interpreted into a human-readable format (e.g., "Team A is likely to win," "It's a close match").
7. Visualization: A bar chart is generated to visualize the win rate differences and the corresponding linear regression predictions for each map.

IV. Results

The linear regression model was trained on the prepared dataset. The Mean Squared Error (MSE) on the test set was calculated to evaluate the model's performance. The model was then used to predict the outcome of matches between the two selected teams on each map. The predicted outcomes, along with the win rate differences, were presented in both tabular format in the console, and in a bar chart. The bar chart allows for a visual comparison of the model's predictions and the underlying win rate differences between the two teams. Due to shortage of time, an implementation to see it’s accuracy is currently not available. This is just a proof of concept.

V. Discussion

The linear regression model provides a basic framework for predicting match outcomes, but it has several limitations. Linear regression assumes a linear relationship between the input features (win rate difference, score difference) and the output variable (match outcome), which may not be entirely accurate in a complex game like Valorant. The model's performance could be improved by incorporating more relevant features, such as team composition, player statistics, and map-specific strategies. Additionally, more sophisticated machine learning models, such as logistic regression, support vector machines, or neural networks, could be explored to potentially achieve higher prediction accuracy. The size of the dataset could also be expanded to provide more training data for the model.

VI. Conclusion

This project demonstrated the feasibility of predicting Valorant Esports match outcomes using a data-driven approach. By analyzing team win rates and match history, the linear regression model was able to provide insights into the relative strengths and weaknesses of different teams on different maps. While the model has limitations, it provides a foundation for further research and development of more advanced predictive tools. Such tools could be valuable for Esports teams, coaches, and analysts in making strategic decisions, such as map selection and player substitutions, to improve their chances of success.

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