It's Your Battle

A real-time winning prediction system for LOL

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I.   Problem Definition

League of Legends (abbreviated LoL) is a multiplayer online battle arena video game developed and published by Riot Games. It was generally well received at release, and has grown in popularity, with an active and expansive fanbase.

Our project is a real-time winning prediction system based on current battle situations such as items, experiences, positions. A successful implementation can predict winning possibility, help adjust current strategies and add more favor to game experiences.

II.   Heilmeier Questions:

1. WHAT ARE YOU TRYING TO DO? ARTICULATE YOUR OBJECTIVES USING ABSOLUTELY NO JARGON.
We propose a system that evaluates the winning probability of each side in League of Legend. The evaluation is based on all the events that's recorded in the timeline through the game.The objective is to give a real-time prediction during the game.

2. HOW IS IT DONE TODAY, AND WHAT ARE THE LIMITS OF CURRENT PRACTICE?
Currently we have seen win rate predictions of MOBA based on character composition which is definite on the start of game. Such predictions don't take into consideration the subsequent game events and some numerical indicators such as kill/death/assist ratio.

3. WHAT'S NEW IN YOUR APPROACH AND WHY DO YOU THINK IT WILL BE SUCCESSFUL?
The prediction system will take into accounts various events during the game and give a time-series calculation. The system is more complex and need thorough analysis of internal mechanism in LOL since we need to judge and measure the influence of different events.The prediction will be continuous and adjust itself after influential game events.

4. WHO CARES?
"League of Legends" is one of the most popular video games in the world. It has about 100 millions monthly players in 2016[18]. The players care about how their decisions made during the game.

5. IF YOU'RE SUCCESSFUL, WHAT DIFFERENCE WILL IT MAKE?
If the project is successful, the players will have a clearer understanding of which factor weights more during the game and what kind of performance during the first 5, 10 or 20 minutes will help win the game. It can help players improve the game strategies.

6. WHAT ARE THE RISKS AND THE PAYOFFS?
League of Legends has great uncertainty and complexity. Thus, a potential risk of this project is not able to obtain a good prediction model since there is too many variables in the game. It is critical and challenging to select the most relevant and important features for model training.If handled wisely, the system will provide the players with a successful prediction model.

7. HOW MUCH WILL IT COST?
All the technologies used in this project will be open source, so it will have no cost except the time and effort of six team members. The team plans to use SQLite for data storage and D3 for data visualization. The machine learning model will be built in Java.

8. HOW LONG WILL IT TAKE?
The project will take 10 weeks to finish.

9. WHAT ARE THE MIDTERM AND FINAL "EXAMS" TO CHECK FOR SUCCESS?
At the midterm, the team plans to finish data collection and cleaning and model training with machine learning algorithms. The model will be tested from command line. At the end of semester, the team will finish a web application for displaying the result of the trained model.

III. Survey / Literature Review

Our literature review considers different sports and game prediction strategy using various techniques. The following is the summary of our survey.

Our goal is to predict the outcome during the process of the game, hence, we should use not only the full post-match data, hero selection data[10] but also zone changes and distribution of team members data[3]. To obtain the above data, we can use Riot Games API[16].

There are many approaches to predict the outcome of a game. As we known, Multiplayer Online Battle Arena (MOBA) games rely primarily on combat to determine the ultimate outcome of the game. Hence, we can model combat as a sequence of graphs and extract patterns that predict successful outcomes of the entire game[2]. For predicting, there are many machine learning algorithm we can use, such as Naive Bayes classifier, Logistic Regression and Gradient Boosted Decision Trees[15][18]. In particular, we should first divide the game character into different classes[14] for better evaluation. Other than the evaluating the objective data from the game, we should also evaluate the subjective data, such as the social structures behind players by their map interaction[6], so that we can judge and find bad players, which can help us to predict the outcome of the game[5].

In addition, we can use WEKA workbench to implement the machine learning on our data.[1] After our basic evaluation, we should still detail the augmented algorithm used to improve the prediction results of the existing model and detail the entire process involved i.e., data collection, feature extraction and feature encoding. We should then expound upon various aspects and possible improvements to the algorithm and different directions for future work[7][8].

There is so much complexity and uncertainty of League of Legends[9]. We still need to continue our survey during the process of our project.

IV. Timeline / Plan

We have 10 weeks to complete this project. The distribution of work can be as follows:

	Week 1-2	Week 3-6	Week 7-8	Week 9-10
	Data	Algorithm	UI	Deployment
Yinzhi Zhu	Retrieve counting features for training	Multidimensional scaling	UI design	Present to OP.GG and record reacts
Pei Lyu	Clean data using Google Refine	Linear PLA	UI implementation	Gather tips from survey
Yiwei Li	Collect data from OP.GG	Linear SVM	UI implementation	Design surveys ,collect opinions
Yongrui Lin	Complete cross validation(holdout)	Non linear kernel-based classifier	Survey design and response collection	Revise to ensure cohesiveness
Yidong Liu	Complete cross validation(k-fold)	Non linear regularized regressions	Survey results analysis	Bug fixing
Nan Li	Prepare SqLite queries	Dimension reduction and feature selection	Connect UI to core algorithms	Improve UI
Section responsibilities	**Yinzhi Zhu Nan Li**	**Pei Lyu Yiwei Li**	**Yongrui Lin**	**Yidong Liu**

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