

UCLA STATS101A

Final Project: Analyzing the Amount of Gold of a Team in a League of Legends Match

1. Overview

Description

League of Legends is one of the most popular multiplayer online battle arena (MOBA) games to date. In this game, a blue and a red team fight each other. Each team has five players, each of which controls a fighter or champion. There are five possible roles for a champion in a team. More specifically, there are three lanes (top, middle and bottom), a jungle, and a support. Each role involves specific activities such as gaining the enemy's territory, helping other champions in the game, or collecting gold and experience for the team. A team also has minions which automatically fight any enemy unit or structure they encounter. The objective of the game is to destroy the enemy base, known as the nexus. The map of the battle field is shown below.



In the game, there are also secondary objectives that give advantage to a team during battle. For example, several dragons appear on the field during the game. If a team kills a dragon, its champions get a specific bonus such as more experience and power. The higher the champion's experience, the easier it is to defeat other champions. Another secondary objective is to collect gold during the game by killing, for example, rival champions, dragons and other monsters in the battlefield. Gold is used to buy better weapons for a champion, thereby making the champion stronger.

League of Legends is available on any operating system for free. To download the game, visit <https://www.leagueoflegends.com/en-us/>.

League of Legends has one of the most watched world championships with a grand prize that exceeds the 2 million USD. In 2018, the final match of the championship had 99.6 million viewers. As of 2021, there are 12 professional leagues for League of Legends around the world. Some teams have dedicated data science teams that turn data from the team's performance into information, which can then be used to develop strategies for the team. In this project, you will use a data set of actual League of Legends matches to find the most important variables that affect the gold collection of the blue team.

Game events and objectives

In order to understand all the attributes in the data set, it is important to know about the following most important events and objectives in the game:

- **Gold and experience:** To make your champion stronger, you need to buy objects and obtain experience to level up. To do so, for example, you have to kill minions, destroy towers and kill rival champions.
- **Nexus:** This is the most important structure in the game since destroying it means winning the game.
- **Inhibitors:** This is another important structure in the game. If the blue team destroys an inhibitor of the red team, the blue team's minions get a lot stronger. Therefore, the blue team's minions have more chances to keep pushing lanes and winning map presence. Inhibitors will regenerate themselves in five minutes.
- **Towers:** Towers are the ones that defend a team's base (part of the map). A team gains the enemy's territory by taking towers down. There are four types of towers: outer, inner, base (defending inhibitors), and nexus (defending nexus). Taking down the first turret gives a team extra gold.
- **Wards:** To increase the chances of winning the game, it is important to place wards on the map. Wards help a team to obtain map vision of the opposite team. Moreover, they allow a team to identify the rival champions in the map.
- **KDA:** KDA (Kills, deaths, assist) is one of the most important things about a game. Having a good KDA ratio means you have obtained a lot of gold and taken a lot of time from the enemy. This is because killing a rival champion puts the champion on hold for some seconds. That is, the death champion must wait before he or she enters the field again.
- **Dragons, Herald and Baron:** These three types of monsters have a very strong impact in the game. If a team kills them, it obtains a certain bonus that will give the team advantage in the game. For example, by killing the Herald, the team can invoke him so as to help destroy the enemy's towers. Killing dragons give a team specific bonus which depend upon the dragon, such as more damage and health regeneration. Killing the Baron will give the team a four-minute boost that makes all minions a lot stronger.

The picture below shows the five dragons in the game: earth, fire, elder, water and air.



More information about the game can be found on https://leagueoflegends.fandom.com/wiki/League_of_Legends_Wiki. YouTube has several tutorials to get started with League of Legends. The best way to familiarize yourself with the game is by playing it several times.

The goal of this project

In this project, you will analyze the performance of the blue team using data from actual matches. More specifically, the goal is to find a model that explains the difference between the acquired gold by the blue and red team. To build your model, you will use several match features such as the number of champions killed by the blue team, the number of champions killed by the red team, the total experience acquired by the champions during the game, among other features.

2. Data

The data for the project are in the file *lol_games.csv*. In the dataset, each row corresponds to a League of Legends match and each column to a feature of the match. The dataset includes 24912 matches and 47 features. The first feature is a unique identifier of the match, the second one is the match duration (in milliseconds), and the third one is the response: **blue team gold difference**. The rest of the features are the predictors. A detailed description of all variables in the data set can be found in the file *Variables_description.xlsx*.

3. Instructions

To carry out the project, you will work in teams of up to **3** students. Your team will submit a pre-recorded presentation. The maximum allowed time for the presentation is **4 minutes** and all team members must participate in it. More specifically, they should present at least one section of the presentation. The presentation should be aimed at a general audience. This means that your

presentation should keep the technical jargon to a minimum but demonstrate a good use of statistical concepts and methods, and a good interpretation of the results. **The presentation accounts for 100% of your final project's grade.**

The presentation should be as professional as possible, meaning that you should use a dedicated presentation software such as Microsoft PowerPoint, Apple Keynote, OpenOffice Impress, or Prezi. You should also have slides with an appealing format. You can use any recording software for your presentation. I personally recommend Zoom since we are familiar with this software. It would be good if you also appear in the video, but this is not a requirement. The most important aspect is that you clearly convey your ideas.

To watch the presentations, we will use YouTube. This implies that you must upload your presentation to that platform. Please make sure that your YouTube video is accessible from the USA. You must include the YouTube link in the corresponding row in the google spreadsheet used to register your team.

Below, I provide guidelines on the components your presentation should *at least* have.

- **Introduction.** Engaging introduction. Something that sparks interest in the problem.
- **Methodology and Results.** Explain your modelling process. At minimum, you should provide a descriptive analysis, assessment of multicollinearity, initial model and evaluation, and final model and evaluation. The key here is to demonstrate how you reached the final model and the added value of it. The challenge is to convey all this technical information in an easy-to-understand manner.
- **Conclusions.** Provide recommendations and highlight the strengths of your model.

Once again, the components mentioned above are the least a presentation must have. Your presentation should convince us that your model provides significant insights into the data and the problem.

After watching your presentation, the TAs, the readers and I will have **2 minutes** to ask one question. To this end, we will select one team member at random. So, all team members must be fully aware of the entire modelling and analysis process. Example of questions are:

- Why do you think the model works well? Why does it fail?
- What are the most important predictors? How is the most important predictor driving the predictions?
- How confident are you that the model is working well? How would you explain this specific component to your boss or little brother?

The presentation will be graded on a scale of 0 to 1. Below, I provide a *rough* guide of the scoring of the presentation.

1.0 If the presentation is excellent: engaging, entirely clear, sticks to the time limits and rules. Additionally, your team satisfactorily answers the question.

0.75 If the presentation is excellent: engaging, entirely clear, sticks to the time limits and rules. However, your team does not satisfactorily answer the question.

0.5 If your presentation lacks one of the following aspects: engaging, entirely clear, sticks to the time limits and rules, your team satisfactorily answers the question.

0.25 If your presentation lacks two of the following aspects: engaging, entirely clear, sticks to the time limits and rules, your team satisfactorily answers the question.

0.0 If the presentation is not submitted.

We will watch the presentations and ask questions during the scheduled time for the final exam. More information about the final project is on the syllabus on Bruin Learn.

Remark: Although experience with League of Legends is useful, it is not required. The final project will be evaluated based on how well you use the concepts and methods seen in class.

The due date of the final project is March 15, 2022, at 11 am PT.

No late presentation submissions will be accepted under any circumstances.

4. Material

You must use the methods in Chapters 2, 3, 5, 6 and 7 of the textbook. Therefore, you can use any method in these chapters even if we did not discuss it in class.

5. Rules

Programming Language

The programming language for this project is R.

No private sharing outside teams

Privately sharing code or data outside of teams is not permitted.

Team limits

- The maximum number of members in a team is three.
- The team members must be from the same lecture.
- After the final project is released, students must not change teams.

6. Project Updates

All clarifications and updates to the final project will be posted on **Campuswire**.