**Using Logistic Lasso Regression and Ego Networks to Model Synergy in League of Legends**

**II. Introduction**

Electronic Sports (esports) is a sports category that includes video game competitions. With its popularity increasing over the last few years, following the outbreak of the pandemic, esports have been attracting more and more players, among different age groups, for a variety of games. The most popular genres associated with esports are multiplayer online arena (MOBA), first-person shooter (FPS), and real-time strategy (RTS). One of the most famous MOBA games is League of Legends. Developed by Riot Games, it was first released in 2009, it has been dominating the world of MOBA games with currently, on average, more than 150 million monthly players.

A typical game in League of Legends includes two teams of five players each selecting unique champions with diverse abilities to engage in strategic and competitive matches on the Summoner's Rift map. The game progresses through phases, including early, mid, and late game, where teams aim to destroy the enemy Nexus by overcoming turrets, inhibitors, and powerful neutral objectives. Players earn gold and experience by defeating minions, monsters, and enemy champions, using these resources to enhance their champions through item purchases.

Extensive research has been conducted over the years in the field of esports analytics. This paper is an extension of the prior work of Lee, Ramler, and Schuckers regarding the symbiotic relationships between champions in the game. Over the years, players have formulated a strategy, commonly referred to as metagaming (Carter, Gibbs, and Harrop 2012). In LoL, metagaming strategy (also known as meta) is a product of the wisdom of the crowd, and it has stabilized into a team of five unique roles:

(Solo) Top, Jungle, (Solo) Mid, Attack damage carry (aka “ADC”), and Support. All these different roles are required to distribute themselves among three lanes in the Summoner’s Rift map, as it can be seen in Figure 1

Figure 1 Summoner's Rift map with meta role distribution

AD Carry and Support are the only two meta roles that share the same lane. Therefore, their cooperation is vital for the success of the team. However, this cooperation is heavily reliant on the performance of the two champions selected for these roles.

Inspired by this study and a similar project on a different game called Clash Royale, this research aims to investigate the synergistic relationships between champions in those two roles, employing Logistic Lasso Regression and Ego Networks to model and analyze the impact on game performance metrics. This project not only serves as a valuable exposure to esports analytics but also lays the groundwork for future academic opportunities, allowing me to explore the intersection of my passion for esports and analytical skills within the field of sports analytics.

This experience will also be a determinant for pursuing further education in graduate school and strengthen my applications for more competitive graduate programs.

**II. Project Approach/Design/Methodology**

The research will build upon the groundwork laid by previous studies, utilizing datasets from Ramler and Lee, as well as drawing insights from various peer-reviewed publications such as "Observing the Impact of Game Features and Content on Champion Usage in League of Legends" (2015), "Identifying and evaluating successful non-meta strategies in League of Legends" (2017), and a more recent examination of gender-based differences in match performances among League of Legend Champions in 2021.

To achieve the objectives of this research project, we will focus on refining the existing dataset to suit the specific requirements of our analysis. Once the dataset is appropriately prepared, the next step involves the application of advanced statistical techniques, such as Lasso Regression, to extract meaningful insights. Lasso Regression is particularly suitable for our purposes due to the complexity of the models with numerous interconnected terms.

The goal is to zero out coefficients associated with insignificant terms. This process aids in model simplification by effectively removing irrelevant features and highlighting the most impactful ones. Additionally, the introduction of Ridge Regression will be considered to incorporate a slight bias in the coefficients, contributing to the stability of the model.

During our investigation for the right model, we might come up with several insignificant models that might not work well, once overwhelmed. We can always come back to the initial model and restart the process with other parameters of our choice. However, this process of fine-tuning the model enough to understand the mechanisms in the game, meaning that we will be able to get statistically significant results, might take more than the available time we have for the research.

For this project, we will utilize the high-performance cluster supercomputer on campus. We will also need to use a free, open-source statistical software and programming language, called R, integrated with RStudio, which is already used in many classes within the curriculum. Nothing needs to be purchased; Dr. Ramler will only have to give me access to use some more complicated tools, like the supercomputer.

**III. Appendices:**

**- Appendix A Literature or Resources Cited: Complete references to any scholarship cited in your proposal should appear here.**

Ramler, I., Lee., C.S., +Strong, S. (2021) “Investigating Match Performance Differences between Genders of League of Legends Champions.”

<https://doi.org/10.1145/3472538.3472549>

Lee., C.S. and Ramler, I. (2017) “Identifying and evaluating successful non-meta strategies in league of legends.”

<https://doi.org/10.1145/3102071.3102081>

Lee., C.S. and Ramler, I. (2015) “Rise of the bots: Bot prevalence and its impact on match outcomes in League of Legends.”

<http://doi.org/10.1109/NetGames.2015.7382992>

Ramler, I, Lee, C.S., and Schuckers, M. (2019) “Identifying Symbiotic Relationships between Champions in League of Legends.”

**- Appendix B Project Timeline: Using a narrative or tabular format, briefly outline your weekly goals for progress on your project. Describe what a typical work day on this project will be for you. Will you be working primarily in a studio, the library, a lab? What types of specific things will you be doing? It is expected that you will work 40 hours per week on your project, and your timeline should reflect this. Please explain whether and why you plan to deviate from this requirement.**

**-Appendix C Level of Preparation for the research proposed. List: Skills/technique/knowledge needed to complete the project. Describe any relevant classes and grades received; other experience (laboratory work, internship, etc.)**

Stat 113, 213, 289, 234, 334, CS 256, Machine Learning, R, SQL