



Faculty of Computer Science and Information Technology

**WEIGHTING THE POSITION & SKILLSET OF PLAYERS IN LEAGUE OF  
LEGENDS USING ANALYTIC HIERARCHY PROCESS (AHP)**

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Bachelor of Computer Science with Honours

(Software Engineering)

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**JEREMIAH ANYI WAN JR**

This project is submitted in partial fulfillment of the requirements for the degree of  
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## **Declaration**

I hereby declare that this report is my own original work. All my works are based on references stated within this report unless explicitly stated. All the text written in this report is done by me and not by any other person.

.....

(Jeremiah Anyi Wan Jr)

15 July 2020

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## **Abstract**

*In this day and age, esports such as League of Legends (LoL) is a popular form of competition using video game, each team consisting of five players. Many researchers have conducted studies in the esports field, however, those that apply quantitative techniques are still scarce. In this project, Analytic Hierarchy Process (AHP) is proposed for weighting position and skillsets of players in LoL. It is hypothesized by the AHP developer that pairwise comparison can be used to derive priority scale through the judgment of experts. A questionnaire is designed to obtain pairwise comparison from players which was then used to develop the priority scale. The empirical results obtained show the weightage of position and skillset of each player which highlights the important criteria based on their judgment. The results can be used to determine the best players for each position and the skillset required by each player. It is proven that human judgment can be quantified to show important information that can be analyzed. As a lack of experts inhibits this research from obtaining high quality data, it is hoped that future research are able to procure experts for more valuable data.*

## **Abstrak**

*Pada zaman ini, sukan elektronik seperti League of Legends (LoL) merupakan pertandingan yang popular menggunakan permainan video, dimana setiap pasukan terdiri daripada lima pemain. Banyak penyelidik telah melakukan kajian dalam bidang esports, namun penerapan teknik kuantitatif masih kurang. Analytic Hierarchy Process (AHP) dicadangkan untuk menimbang kedudukan dan kemahiran pemain dalam LoL. Adalah dihipotesiskan oleh pengembang AHP bahawa perbandingan berpasangan dapat digunakan untuk mendapatkan skala prioriti melalui penilaian pakar. Soal selidik telah dirancang untuk memperoleh perbandingan berpasangan dari pemain dan digunakan untuk menghasilkan skala prioriti. Hasil empirikal yang diperoleh menunjukkan berat kedudukan dan kemahiran setiap pemain yang menyoroti kriteria penting berdasarkan penilaian mereka sendiri. Hasil kajian dapat digunakan untuk menentukan pemain terbaik untuk setiap kedudukan dan kemahiran untuk setiap pemain.*

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## **1.0 INTRODUCTION**

### **1.1 Project Background**

League of Legends is a competitive multiplayer online battle arena (MOBA) game where a team of 5 fights against another team of 5 in order to destroy opponent's base called the Nexus as the winning condition in a map called Summoner's Rift. Cooperation among teammates is important in achieving success. Deciding who plays in a team can determine whether the team wins or loses, therefore this study will use Analytic Hierarchy Process in weighting player roles and skillset which can determine the best players to create a team.

### **1.2 Problem Statement**

In this day and age, esports have a lot of games to compete for worldwide. For each game, tournaments can be held locally or internationally. Some of these esports games are team-based games with differing amount of players in a team for different games. When it comes to League of Legends, the formation of a team of 5 is one of the problems faced by any esports organisation that wants to enter the competitive scene. A case where there is a change of players happens frequently that can demoralise and may possibly even add new complications for the team as a whole.

Using AHP which is a strong multi-criteria element for decision making behaviour, we can find the weightage of player position and the preferred skillset for each position. This is to acquire a better understanding of what is needed to form a good team for a League of Legends game.

### **1.3 Objectives**

1. To propose the mathematical concept of Analytic Hierarchy Process in determining the weight of position and skillset of players when playing League of Legends.
2. To determine quantifiable qualifications for each position and skillsets to increase the chances of winning a game.
3. To identify the weight of position and skillsets needed when playing League of Legends. The problems are decomposed into a hierarchy of small problems which can be analysed independently.

### **1.4 Methodology**

This study will focus on conducting an extensive literature review on Analytic Hierarchy Process (AHP), a powerful tool developed in 1980 by Thomas L. Saaty that manages qualitative and quantitative multi-criteria elements for decision-making process. AHP is often used in many fields such as resource planning and allocation, purchasing and supplying management, warehouse and data collecting system, as well as team formation in a team-based sport. The literature review will also include understanding the game mechanics in League of Legends such as character roles, player positions, skillsets, winning condition, map awareness, map control and many more.

Next, the hierarchical problem involving player position and skillsets needed for position is established. Questionnaires will be designed and distributed to respondents that include experienced players, team managers, coaches, game casters and streamers to obtain their judgement. The data is then sorted into a pairwise matrix for a pairwise matrix comparison.

In the final phase, the consistency ratio is calculated to validate the results obtained from the questionnaire. Using the consistency data, a geometric mean is obtained and normalized which will produce the weights of position and skillset for each position. Some of the 8 skillset that may be studied during the project includes: Aggression, Consistency, Farming, Fighting, Objective Control, Survivability, Versatility and Vision. These skillsets may be changed depending on which skillset can be measured accordingly and whether it meets the requirements of being a suitable skillset to include.

## **1.5 Project Scope**

This project involves using Analytic Hierarchy Process (AHP) to obtain the weight of position and skillset of players when playing League of Legends. The weight can be determined by finding skillsets that can be measured to determine whether a player is good or not in a certain skillset. This allow the user of the obtained data to determine which player with a certain skillset is the most suitable to fill into which role. The data of these skillsets will be obtained by using survey in the form of a questionnaire. It is best to avoid including too many skillset to avoid having a large table that may become unreadable by an average person, and to allow higher consistency of the weightage. AHP is not used to obtain a correct decision; instead it is used as an indicator on what is the best choice depending on the situation and goal.

## **1.6 Significance of Project**

Team formation plays a vital role for a team-based sport especially when different positions are weighted, and each position require certain skillsets for the player in the role to perform well for the team. Assessments are done by the team management in order to pick suitable players in each role to work together as a team and produce the best results to achieve victory and win tournaments. The weightage of positions and skillsets provided through this study will be useful by team managers to decide the best players in each game.

## **1.7 Project schedule**

FYP 1 was done from 9 September 2019 until 12 December 2019. This covers from the brief project description of the Final Year Project until the final submission for FYP1. FYP 2 was done from 11 Feb 2020 until 15 August 2020. FYP 2 was expected to end on 29 May 2020, but the Movement Control Order (MCO) was occurring throughout Malaysia during this time. Therefore, Chapter 4 until Final Report Submission is delayed to 9 Jun 2020 until 15 August 2020. FYP 2 covers from proposal of FYP 2 until final report submission which includes paper.

Description	Start	End	Duration(Days)
Brief Project Description	9-Sep	29-Sep	21
Full Proposal	29-Sep	19-Oct	21
Chapter 1 : Introduction	19-Oct	26-Oct	8
Chapter 2 : Literature Review	26-Oct	16-Nov	22
Chapter 3 : Methodology	16-Nov	5-Dec	20
Report Submission	12-Dec	12-Dec	1

Table 1.1: Project Schedule for FYP 1

Description	Start	End	Duration(Days)
Proposal Submission	11-Feb	17-Feb	7
Chapter 4: Data Collection	17-Feb	21-Mar	34
Movement Control Order	18-Mar	9-Jun	84
Chapter 5: Result and Analysis	9-Jun	26-Jun	18
Chapter 6 : Conclusion and Future Work	26-Jun	5-July	10
Draft Submission	5-July	15-July	11
Symposium	21-July	24-July	4
Final Report Submission	24-July	15-Aug	23

Table 1.2: Project Schedule for FYP 2

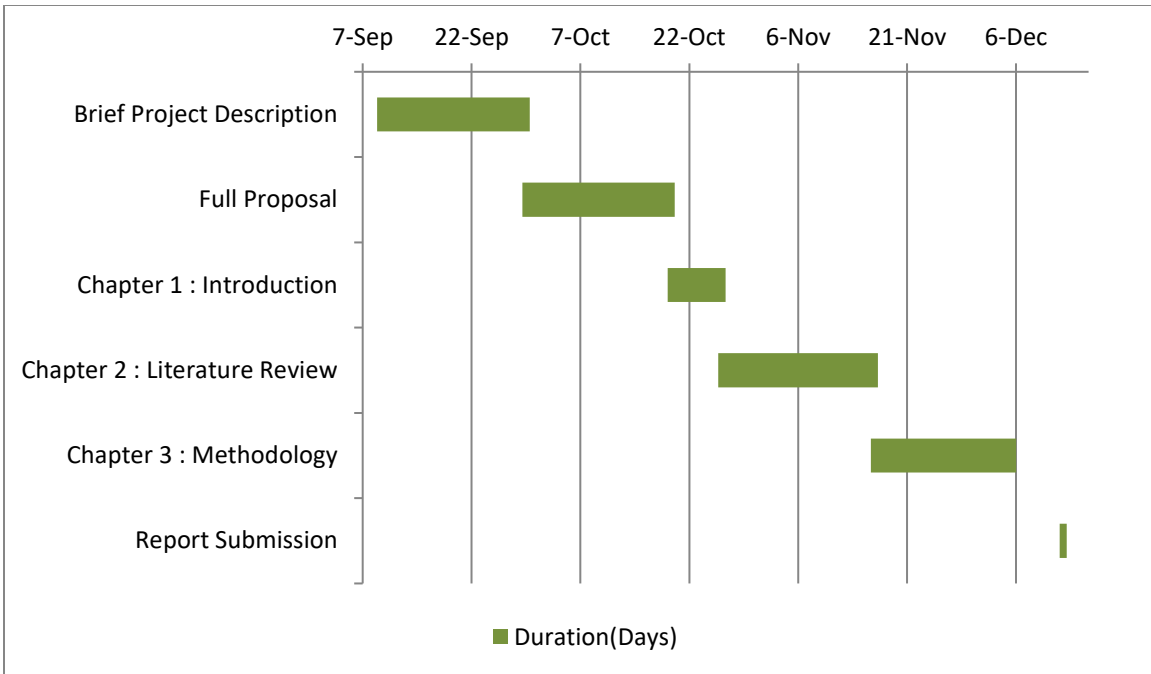


Figure 1.1: Gantt chart of Project Schedule during FYP 1

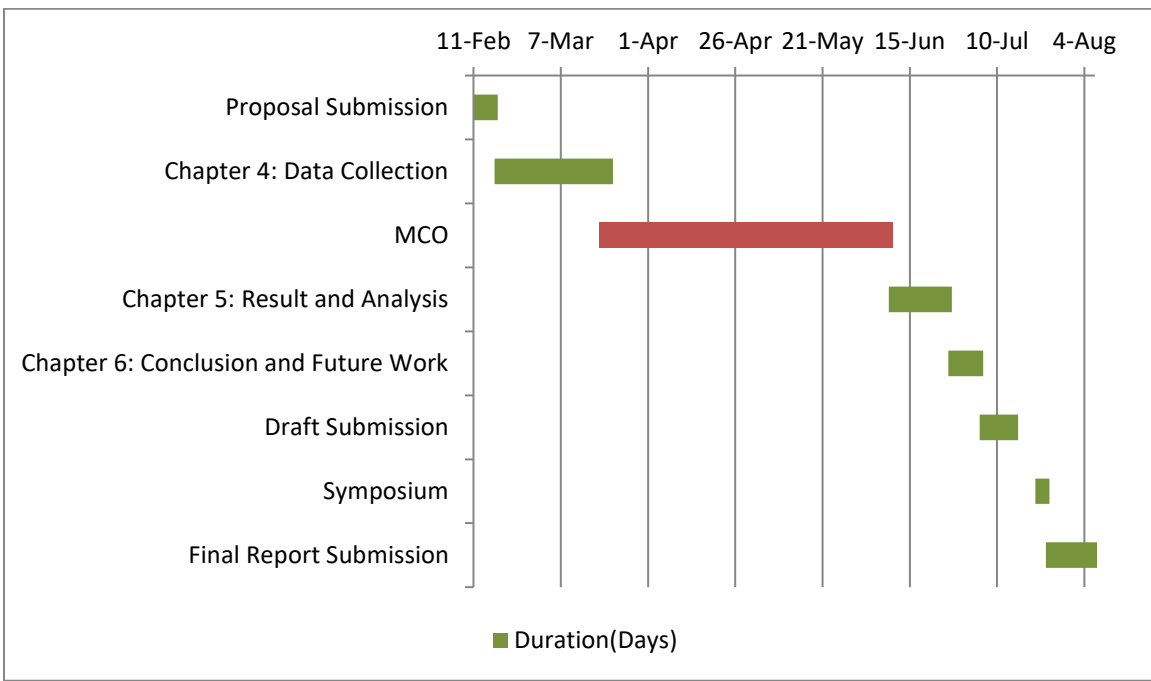


Figure 1.2: Gantt chart of Project Schedule during FYP 2

## **1.8 Expected outcome**

This project will produce a computed and tabulated datasets of weights for different positions in a team. This will show the importance level of all position, and weights for skillsets needed for each position and in the team to show the importance levels of skillsets. The weights obtained can be used by team coaches, players, and anyone else to determine which player will bring out the best results in a team and who to prioritize in a team.

## **1.9 Project outline**

Chapter 1 focuses on introducing the project by giving a background, problem statement, objectives, methodology, project scope, significance of project, project schedule and the expected outcome of the proposed project. Chapter 2 focuses on literature review about Analytic Hierarchy Process (AHP) developed by Thomas L. Saaty. Chapter 3 focuses on discussing the methodology in detail. The steps to achieve the goal of obtaining the weight of position and skillset of player are mentioned here.

## **2.0 LITERATURE REVIEW**

### **2.1 Introduction**

In this chapter, we will introduce the concept of Multi-Criteria Decision Making (MCDM) method in achieving our research objective. The purpose is to find the advantage and disadvantage of one method over another and explain why Analytic Hierarchy Process (AHP) is being used for our paper. After that, we will review other papers that make use of AHP in their research paper and find out what is the advantage and disadvantages of AHP in this research while finding out how using AHP can allow us to achieve our Research Objective.

### **2.2 Multi-Criteria Decision Making**

#### **2.2.1 Introduction**

Velasquez and Hester (2013, p. 56) said that Multi-Criteria Decision Making (MCDM) methods have been used for various applications. Here, we will review of some of the common MCDM methods and then analyze the advantages and disadvantages of each method.

#### **2.2.2 Analytic Hierarchy Process (AHP)**

According to Saaty (2008) Analytic Hierarchy Process is “a theory of measurement through pairwise comparisons and relies on the judgments of experts to derive priority scales” (p. 83). Loken (2007) said that one of the major characteristics of Analytic Hierarchy Process is the use of

pairwise comparison where the preferences between two choices or alternative are compared to each other in order to estimate the weightage of criteria (p. 1587).

AHP has seen several uses such as Lee *et al.* (2012) that evaluated the factors and alternatives of Technology Transfer Adoption to increase revenue using AHP to weight seven factors and rank three alternatives. Bentes *et al.* (2012) examined a telecommunication company to assess its organizational performance using AHP to prioritize performance perspectives and indicators. The method was used in combination with the Balanced Scorecard (BSC), a framework for performance assessment, in order to rank the alternatives properly. This framework helps show the associated necessary criteria and alternatives while the AHP is responsible for comparisons, weighting, and rankings. With four criteria and three alternatives, AHP was able to handle the multiple measures and perspectives.

Velasquez and Hester (2013, p. 58) written that one of the advantages of AHP is that it is easy for decision makers to use. It is also scalable and can change depending on the number of criteria and alternatives. Also it is mentioned that AHP “has experienced problems of interdependence between criteria and alternatives” (p. 58). Since AHP use the approach of pairwise comparisons, it can be susceptible to inconsistencies in the judgment and ranking criteria (p. 58).

### **2.2.3 Fuzzy Theory**

Balmat *et al.* (2011) provided a different approach to risk assessment in response to an increase in marine accidents according to the International Maritime Organization. There are three common risk factors identified through a new marine risk assessment system which sought to address decision making by using fuzzy method. This is done because of an increase in the