Players Versus Bots: The Perception of Artificial Intelligence in League of Legends

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Abstract. With the continued development of Artificial Intelligence, It has begun taking over many roles in society. One of the most prominent fields in which this is happening is virtual and video entertainment, where AI can serve as opponents, story characters, and more. Due to the unique circumstances of the video game League of Legends, it remains one of the few games in which artificial intelligence and even cheats have yet to outperform the best human players. Through an online survey, a small proportion of the community was asked about their perception of AI and hackers. The results clearly showed that a significant portion of the community withholds confidence in their ability as well as their fellow players' ability to outperform cheaters and AI. Furthermore, the AI already implemented within the game serve as little more than introductory guides for new players. As such, there is a large amount of potential for development and experimentation for AI within this game due to the level of calculations, decision-making, and overall computational power needed to create a worthy adversary.

Keywords: Artificial Intelligence, League of Legends, AI-Bots, Perception of Bots.

1. Introduction

Humanity has never failed to dream big. Tales of people wielding superhuman powers and god-like abilities have long been intertwined in our species' culture and history. While there have been efforts to materialize these fantastical dreams into something people can interact with in the form of books, poems, and games, they often left much to be desired. But when video games first began being introduced in the 20th century with the continued development of computers, artists and writers were suddenly presented with a novel way of captivating their audience. Not only could the audience interact with an adaptive screen and control various aspects of the game, but the improving graphics also meant that the games themselves became increasingly believable. According to APS news, the first video game was created by William Higinbotham in 1958, with a two-player tennis game that vaguely resembles the game Pong. This two-player game rapidly became very popular, with people queuing in long lines to get a chance to play [1, 2]. However, as video games continued to be developed, it soon became evident that there was no need to limit development to player-versus-player games (PvP). With the introduction of AI, simple games like Chess, Pac-man, Nim, or Solitaire became highly accessible and easy to play at any time. But from the start, AI needed distinct advantages to going toe-to-toe with their human opponents. Pac man, for example, had to face four ghosts. As these single-player games developed in complexity, so did the capabilities of the AI that were designed to act as our opponents.

The game League of Legends, also known simply as 'League' or 'LoL' was released in 2009 as a multiplayer online battle arena (MOBA). It pitted 10 players against each other split evenly into two different teams, and each player could choose a different character or 'champion' as their avatar. While initially the game didn't attract much attention and had mediocre reviews, over a decade of constant development and improvement of the game it has become one of the most successful video games. The website Twinfinite cited League as the second most played computer game in 2022, with over 8 million players worldwide [2]. But the reason this study examines this game, in particular, is not primarily due to the franchise's popularity. Rather, the game represents a strange middle ground between reaction-dependent and strategy-focused games. On one end, there are the hardcore strategy games such as Chess. Famously, the Chess grandmaster Garry Kasparov was defeated by the supercomputer Deep Blue in 1997 [3]. Deep Blue had inhuman calculation abilities, armed with

computer chips that allowed it to calculate hundreds of millions of possible moves and outcomes every second [3, 4]. Even if keeping in mind the number of suboptimal, illegal, or moves that are detrimental to one's game, the millions of possibilities that Deep Blue can calculate suddenly seem insignificant in comparison. On the other end of the spectrum, we have "reaction-based games", thus nicknamed due to the game's heavy reliance on a player's ability to execute quick and precise inputs. In a study by Thompson et al. in 1997, the average human reaction time to visual stimulus is 180-200 ms(milliseconds) [5]. Professional esports players range from having 100-250ms of reaction time to a visual stimulus [6]. But how does that compare to the reaction speed of a computer? With modern PCs often having processors with frequencies above 3.5-4 GHz(gigahertz), a computer can respond to a simple stimulus in less than half a billionth of a second. Of course, this is much faster than any human can react, and players will often be killed by an opposing AI before they even register to see them.

In League of Legends, instantaneous abilities and attacks are rare, and even those can be dodged and reacted to appropriately by a normal human player. Furthermore, the game has over 140 unique "champions" or characters to choose from, each with their distinct complex abilities. Combining that with a total of ten players sprawled across a large map with plenty of moving, non-player character-like monsters means that it is impractical for a current computer to try and analyze every possible movement to determine the best course of action as Deep Blue does. The word "bot" has become synonymous within the community with players who are performing sub-optimally and making poor decisions. This is primarily due to the infamously poor performance of AI both in official Co-op vs AI game modes and as "farming bots", which are third-party, illegal AI that plays matches to earn in-game currencies and rewards [7]. However, there are third-party AIs in the form of cheats and hacks. By tapping into the game's code, the software can enhance aiming and dodging capabilities within the game through calculations and AI input. When used in harmony with a proficient human player, it can significantly boost one's performance. This cyborg combination of human decision-making and strategizing as well as calculations and pixel-perfect aim of artificial intelligence creates a fearsome opponent. However, even those with assistance from illegal software are ultimately still able to be outsmarted and overcome by highly skilled players, who benefit from superior strategies, coordination, and judgment. This paper looks at three main types of AI within the game: official tutorial AI or bots, cheats/scripts/hacks, and farming bots. They all interact differently with the players and distinctly affect their gameplay. Understanding the way players perceive these forms of AI produces a qualitative measurement of the level of impact as well as the performance abilities of the different types of AI. In turn, the weaknesses, strengths, and thus areas of improvement for AI within this complicated game can be developed. As the gaming industry continues to develop and the population becomes more and more reliant on virtual technology, creating complex problem-solving AI that can tackle games such as League of Legends will likely prove to be invaluable.

2. Proposed methods and results

To gather data for this study, a google form was created with nine different questions asking about the individual's personal experience with AI in League of Legends as well as their opinion on whether they can defeat an opponent who is hacking or win despite a poorly programmed farming bot on their team. The form was made so that all participants were to remain anonymous, and no personal data besides the player's skill level in the game was collected. The form was then posted on the social media platform Reddit under the League of Legends community, and received a total of 52 responses.

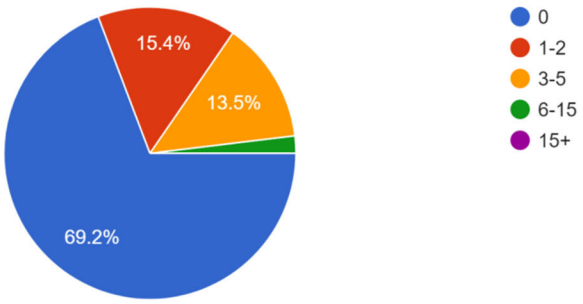

Fig. 1 The reported ranks of players that participated in the survey

As shown in Fig. 1, the majority of the players are distributed across the mid-to-low level ranks, with over 75% of participants being ranked from Iron to Platinum. Players of higher ranking are far less common, with the higher ranks making up around 15% of the participants. It is worthy to be noticed that, there were very few new players, with only 4 players out of 52 being ones that have not yet become familiar with the game. The reason is likely due to the lack of knowledge about existing communities such as the Subreddit used to post this survey among the newer players, as well as a relatively low level of interest in participating in these group surveys.

In Fig. 2, the majority of players do not interact in the game mode at all, instead purely playing the game against other players. Furthermore, only one player out of 52 reported playing more than 5 matches in the last month. Of the 16 players who did participate in a Co-op vs AI match, 12 of them cited that helping a new player was one of the primary reasons they did so, and only one participant played the game mode because they find it entertaining. This is also helpful for understanding gamers' experiences with the illustration provided in Fig. 3.

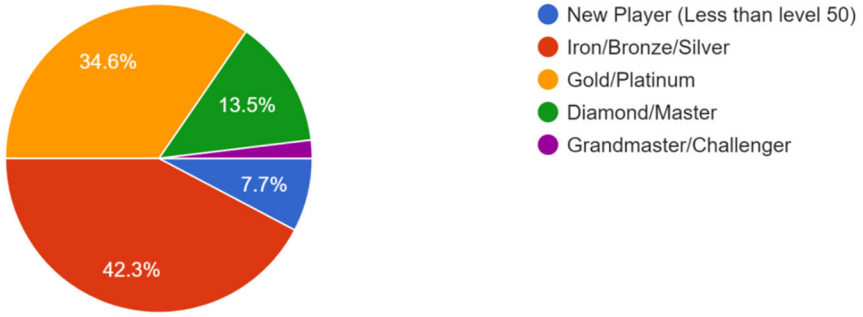

Fig. 2 The number of Co-op vs. AI matches players have participated in within the last month

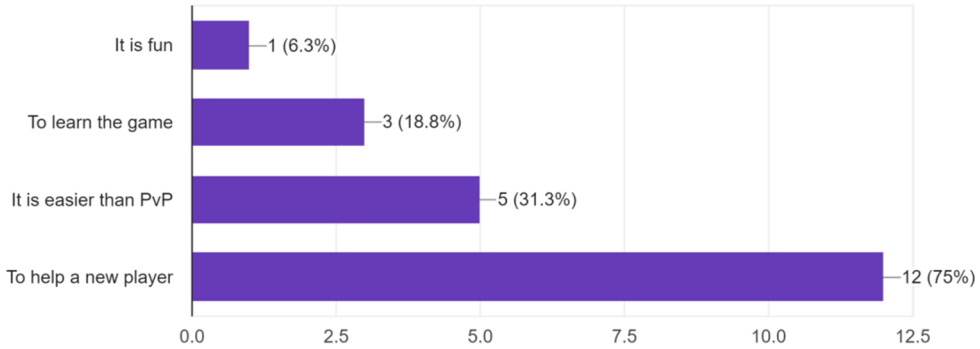

Fig. 3 The Players' reasons for participating in Co-op vs. AI Matches

When looking at Fig. 4, it's easy to see that a majority of players do not think they can outperform a scripter, with only about a quarter of the participants believing that they can succeed with relative certainty. Yet in Fig. 5, significantly more players responded with uncertainty or claimed that they

cannot win with a farming bot on their team, with only 11.5% of participants responding that they believe they can win regardless of their disadvantage.

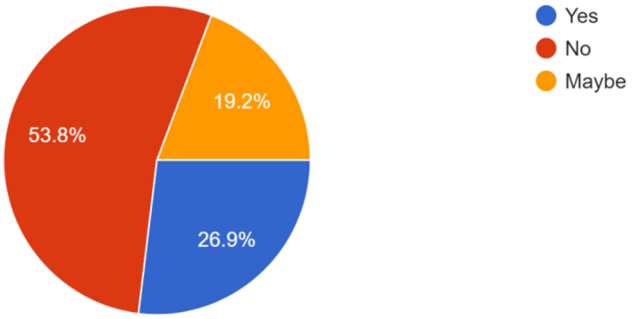

Fig. 4 Responses to "Do you think you can beat a regular enemy team with 1 scripter/cheater on their side?"

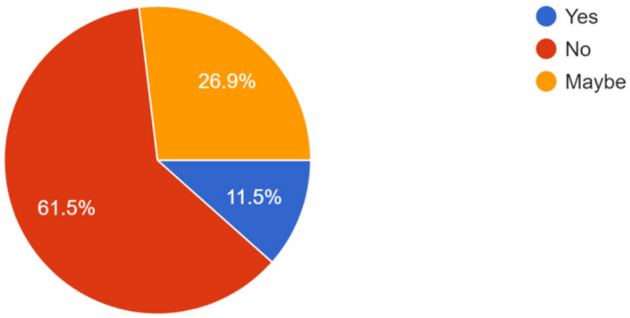

Fig. 5 Responses to "Do you think you can beat a regular enemy team with 1 level/xp farming bot on your side?"

3. Discussions

The data from this research paper shows that players of League of Legends hold the existing AI within the game to very low standards. Initially, when looking at the graphs, it's easy to think that scripters hold a significant advantage over players, but it is important to note two things. First, hacks and scripts are not limited to AI calculations that assist gameplay. Some of the scripts modify and tamper with the game's function, modifying their character's abilities in a way that is impossible for a normal competitor to do. Furthermore, nearly 50% of the participants in this survey are either new players or ranked in the bottom ranks of iron, bronze, and silver. These three ranks comprise mainly more casual players and those with still developing skills. This level of confidence against scripters is nearly unheard of in other games and is a significant indication of the shortcomings of AI and the computer-augmented advantages within this game.

This is only furthered by the lack of players who interact with the official Co-op vs AI game mode. Only one individual that participated in the survey found the game mode entertaining to play, with seventy percent of players have not played it at all within the last month. Although it is evident that some people play it because it is easier than playing against other human opponents, there are certain attributes and patterns where programmed AI in the game mode functions very differently from even novice players. For example, a blog on the website Mobafire from the user Satella describes how "towers make you unkillable in bot games" [8]. Towers are defensive structures that will do damage to any enemy players that come within range, and most players quickly learn to use them to their advantage to make themselves harder to kill, as any enemy looking to damage you will face more from the tower [9]. The mistake new players make is often being overly aggressive and misjudging the tower's capabilities, resulting in them getting killed while attempting to attack the enemy under their turret. The AI in Co-op vs AI, however, avoid the towers no matter what, even if they can likely kill the enemy and survive without receiving critical levels of damage. This behavior suggests a value system in AI, where their survival is valued higher than getting a kill. While this may seem to initially

benefit the AI to play on the side of caution, the lack of aggressiveness and the ability to punish a player's mistakes and miscalculations mean that the AI soon quickly falls behind the players.

The human players' willingness to take risks yields rewards that allow their in-game character to become more powerful as the game progresses. Furthermore, especially seen in the pinnacle of esports at the highest levels of human performance, players are regularly seen taking immense, game-changing risks. This is because professional teams are so similarly skilled and matched that many are faced with a slow, drawn-out stalemate until a player or a team decides to do something drastic, such as sacrificing the life of one of their players to get a chance at killing the entire enemy team. Perhaps the shortcomings in human judgment can create an advantage here, as these high-risk, dangerous maneuvers are often out of the opponent's expectations. This element of surprise creates a window of opportunity and makes what may initially seem like a suicidal charge become a victorious battle. Now, picture an AI versus AI match, where both teams run on similarly capable systems of judgment and risk-reward calculations. Not only will nothing ever happen in the game, but it would also be extremely unentertaining to watch.

The third-party AI in the form of farming bots on the other hand has been observed to be significantly more aggressive to the point of being detrimental to the team. Likely programmed to mimic newer players, they often are unable to judge their ability to perform, and would carelessly attack despite having a major disadvantage [10]. This is likely the main reason that poorly performing players are called "bots" due to their suboptimal ability to appropriately judge the risks and benefits of a certain action. However, to create an AI that can make this decision, the value system that has created so much controversy in the field of ethics is likely unavoidable. The classic question addressing an automated driver faced with killing a baby versus an old person can similarly be applied to the game: when in a situation where either the AI or an AI teammate has to die, who would make a choice? If the value system prioritizes either their own life or each other's lives, their conflict of judgment could likely cause a lot of problems and perhaps result in both of them dying in their attempt of either self-preservation or selfless sacrifice. It is also important to note that it is in the best interest of the third-party companies to create as human-like and as advanced AI as possible, as it will reduce the chances for their bots to be discovered and banned.

The last aspect of this game that perhaps causes the players' poor perception of AI is the necessity of improvisation. Unlike a chessboard, over half of the map at any given time can be completely obscured by what is known as the "fog of war", where players or AI cannot determine in any way what is going on over there due to a lack of information. Sometimes, players would use this to their advantage by taking non-traditional routes to surprise the enemy. An AI would only have the ability to predict a certain probability of what is going on in the fog of war and would either have to play extremely defensively or ignore the fog of war's potential danger because when something unexpected happens a player often has to scrap their entire strategy and improvise in real-time on the optimal strategy based on their previous knowledge. While the decision-making speed of AI is constantly improving, the number of possibilities resulting in a sudden change is still highly demanding. The appearance of a previously invisible enemy for example can still take a long time to process and thus the AI may not be able to come up with an efficient counter-plan.

4. Conclusion

The many moral, strategic, and creative aspects necessary to play a game of League of Legends makes it not only one of the most difficult games to learn as a human but also for AI. As a result, no AI to my knowledge has even attempted to challenge the best human players, and they continue to exist in the lowly form of farming bots, cheats, and tutorial bots. The players' perception of AI has proved that even cheaters and scripters who illegally augment the game are not seen as a threat by the higher-level players and that a farming bot or tutorial bot is nowhere near the level of performance of a human player, even a novice one. This study hopes to flag this game as a potential incubation chamber and testing ground for future advanced AI systems hoping to reach human levels of

intelligence. Not only are there set rules and a more controlled environment than if a bot were created around real life, but it can also herald the age of multiplayer games where AI can go head-to-head with even the best players despite the increasing levels of complexity. Not only will it liven up many multiplayer games, but it also opens a whole new world of possibilities for advanced single-player games that do not need pre-scripted, monotonous non-player characters, and instead interact with realistic and lively AI. As a preliminary study, there is so much potential work to be done as the gaming industry continues to develop, and League of Legends is only one candidate for such a testing ground of likely hundreds of different games.

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