The Human and Nonhuman World of Chess

A Research Paper submitted to the Department of Engineering and Society

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

Patrick Zhang

Spring 2024

On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Advisor

Kent Wayland, Department of Engineering and Society

Introduction

The centuries-old game of chess has witnessed major changes within the last 15 years due to the rise of superhuman artificial intelligence (AI), AI that surpasses humans in ability. The rise of AI has touched almost every field, from language translation, transportation, education, medicine, entertainment, and more, and chess is no exception. In 1997, a computer called Deep Blue made by IBM became the first computer to defeat the world chess champion, Gary Kasparov at the time ("Deep Blue," n.d.), and computers have continued to far outpace humans in chess improvement. Today, computers known as chess engines can defeat the best chess players in the world virtually 100% of the time, which has brought complicated impacts to the chess community.

High level chess has been played since the 1800s, so it is fair to say that chess has been without AI for most of chess history. The reasons why chess has always captivated humans isn't easy to explain, like in art or music. The current highest-rated chess player Magnus Carlsen once stated in an interview: "I appreciate creating something unique… also just an idea, something I haven't seen before" (McGourty, 2015). Grandmaster Boris Gulko said "Chess may be just a game, but it is also an art, and it is in the human dimensions of that art - the haphazard trajectory of imagination, the expression of passion, and the struggle of personalities - where not only the beauty but the actual strength of grandmaster play resides" (Hamilton, 2000). These quotes show that the best chess players in the world appreciate some human elements of the game, such as uniqueness, beauty, and imagination. However, the rise of superhuman AI jeopardizes these ideals. In the pursuit of the highest level of chess attainable, players are starting to devalue these previously valued ideals in favor of the "perfect" move suggested by chess engines. Some believe the rise of chess engines has detracted their chess experience. According to journalist

Oliver Roeder, some of the best chess players in the world (most of which started playing before the rise of superhuman AIs) say that they would not have started playing chess if they knew that superhuman AIs would eventually become so powerful (Roeder, 2023).

But chess engines are here to stay, so it is up to humans to decide how their chess experience should be impacted by the engines. The rise of chess engines was fast and recent, so in many ways the chess community is still undecided how to best deal with such a monumental change. How chess should react to best incorporate superhuman AI is still to be determined. This research paper investigates how humans can coexist with superhuman AI in chess while still maintaining "human elements" such as individuality and style.

Sociotechnical Situation

The rise of chess engines has resulted in a complex sociotechnical situation involving human chess players and nonhuman chess engines that far exceed human players in chess ability. Superhuman AI has had some positive impacts on chess players, such as allowing chess players to improve faster by analyzing their games with them (Levinson, 2011, p. 181). Players who are learning the game can compare their moves with what the engines would have played in the same position, making it much easier to identify where they are going wrong. AI has also introduced new strategies and tactics that were not previously conceived, making viewing chess games played between engines very exciting.

However, there have also been negative impacts on chess players. Despite not being undefeatable (every few years, stronger AIs are created), these computers have been treated as the "perfect" or "correct" move, which has removed a lot of the human elements of these board games (Strogatz, 2018). For example, players are often judged by comparing their moves with what the superhuman AI made. Moves that differ from the superhuman AI's move are

considered suboptimal even if the human move was logical and gave the player a very good chance of winning. Players are thus being held to an almost unattainable standard (Campitelli, 2013). The obsession over playing "perfect" moves has led to human elements such as creativity and style to be devalued. Nowadays, professional chess players spend much of their time memorizing moves that the superhuman AI plays (Wilkenfeld, 2019, p. 43).

The main social group that I plan on focusing on is professional chess players because they are the ones who have invested the most into chess. Former chess world champion José Raúl Capablanca viewed chess as a "battle of ideas" (Wilkenfeld, 2019, p. 44). In the aforementioned quote, Magnus Carlsen identifies uniqueness as an important ideal. These quotes suggest values that are in direct opposition with memorizing moves of a superhuman AI.

Literature

Because the rise of chess engines and similar superhuman AI are so recent, there isn't much literature on their impacts on the player community. However, there has been a lot said about what attracts humans to chess, what I call the "human elements" of chess. Identifying these human elements are important to understand how chess engines are impacting the human experience in chess.

There is a deep notion of "beauty" in chess which computers may go against. Beauty is subjective, but Aharoni (2021, p. 249) identifies two components of a beautiful move - unexpectedness and "superiority of mind over matter". These components only make sense in the context of a human, as only humans "expect" moves and have minds. Myers (2012) identifies criteria for the beauty of chess puzzles such as "successfully violate heuristics", "use all of the piece's power", and "neither strangeness or difficulty produces beauty".

These notions of "beauty" in chess point to an element of the human experience in chess that is potentially jeopardized by the advent of superhuman AI. There is a "human experience" in chess that comes from cognitive mechanics evoked by the chess problem (Myers, 2012). In one of Kasparov's games against Deep Blue, he gambled and tried a novel approach but was quickly defeated by the machine (Hamilton, 2000). What would often have been touted as bold and instinctive play was exposed as objectively nonoptimal. Nowadays, the opening stage of chess games (the first roughly 15 moves) are often moves that players have memorized from the superhuman AI (Wilkenfeld, 2019, p. 40), leaving little room for the aforementioned "superiority of mind over matter" (Aharoni, 2021, p. 249), "the haphazard trajectory of imagination, the expression of passion, and struggle of personalities"(Hamilton, 2000), or "battle of ideas"(Wilkenfeld, 2019, p. 44).

Theoretical Framework

This sociotechnical situation can be viewed in a mutual shaping context because it is an example of a new technology (chess engines that can defeat humans) on humans. There have been both positive and negative impacts, all of which could not be foreseen before the technology was invented and has taken off within the last 15-20 years. Since chess has been around for much longer than that, there is ample opportunity for stark comparison between the chess world with and without superhuman AI. The sociotechnical system can broadly be defined as the chess community (professionals, recreational players, viewers, etc. but I will focus on professionals) and the superhuman AI technology. Human's drive to get better at chess shaped the decision of AI developers to create computers that can play chess. The introduction of the superhuman AI technology has permeated through the routine of every chess player, as

evidenced by virtually every chess website containing ways to use a chess engine and every chess analysis containing input from the technology.

Methods

I will investigate my research question in the context of the mutual shaping framework through collecting evidence from interviews and podcasts from top chess professionals. The reason for this is chess professionals have invested the most into chess, thus are impacted the most by the effects of superhuman AI. Also, by narrowing the pool of individuals to research, I can get a deeper understanding of a specific demographic. Chess professionals share their opinions often (through interviews, podcasts, and other media), which makes it easier to gain a thorough view of their perspective.

I located interviews and podcasts of top chess professionals through searches on search engines such as Google and video platforms such as Youtube. The players covered include current chess players ranked in the top 10 such as Magnus Carlsen, Ding Liren, Fabiano Caruana, Hikaru Nakamura and past highly ranked players such as Vladimir Kramnik. In the case of Ding Liren, I have located interviews in his native language, Chinese, and have translated them myself for analysis, as interviews done in a players' native tongue is likely to reveal more genuine insight.

For my analysis, I focused on discussions regarding three broad categories: what players like about chess, the impact of superhuman AI on chess, and how chess should change. While the interviews generally contain a wide range of topics, these categories were discussed frequently, so there was sufficient content to analyze. For each category, I identified excerpts from my sample of interviews that addressed that category. I was able to discern consistent

themes in the opinions of the top chess players. There were also recurring suggestions for how chess can change in order to be more compatible with superhuman AI.

Results

Many of the interviewees have some notion of beauty in chess that extends beyond playing perfect moves. As previously mentioned, Carlsen is quoted as to value "uniqueness" in positions and playing something new. Gulko mentions passion, imagination and personality. Capablanca emphasizes ideas, referring to chess as "a battle of ideas". In an interview with Lex Fridman, Grandmaster Hikaru Nakamura mentions "creativity" and the "possibility of different positions" that makes it nearly impossible to learn everything there is to learn about chess. He also values the individuality of chess, talking about how he can interact with people of different backgrounds, nationalities, age, etc. on chess (Fridman, 2022).

In 2022, the question of superhuman AI's impact on the game of chess was brought to the forefront of the minds of everyone in the chess community following the unprecedented decision of reigning world chess champion Magnus Carlsen to not defend his title. This decision was particularly shocking because he was the highest rated chess player and was voluntarily deciding not to play in the game's most prestigious event (Lourim, 2022). Carlsen explained his reasoning in several interviews and podcasts that I analyzed, saying "The main reason that I am not playing the classical world championship is that I don't enjoy it" (Chess.com, 2024). This points to a previously unmentioned "human element" of chess: it must be enjoyable for the players. Carlsen goes on to explain several factors of the world chess championship format that, when combined with superhuman AI, decrease his enjoyment of the event. The first is the long time (many months) before the match for both players to prepare. During this time, both players are leveraging superhuman AI to memorize opening moves. The second is the long time control

(time given to each player to think for the entire game - several hours for the world championship, a few minutes for faster forms) for every game. Thus, when they reach a point in the game where they haven't memorized the moves, players have enough time to methodically figure out the best move. In Carlsen's own words, "in very long time controls with deep preparation, you can mask a lot of your deficiencies as a chess player". Thus, Carlsen believes that the world championship is not necessarily determining who is the best chess player. Carlsen advocates for more games with less time for each game, as "less time emphasizes pure chess" (Fridman, 2022).

Carlsen's decision was major news, so unsurprisingly many of the interviews and podcasts that I analyzed of other chess professionals discussed this topic. Most expressed a similar sentiment to Carlsen and understood his decision. Grandmaster Hikaru Nakamura repeated that there are too many draws in the world chess championship and games are not as creative or exciting because games are too long and players have so long to prepare (Fridman, 2022). Grandmaster Fabiano Caruana pointed out that world chess championship matches have the tendency to follow memorized moves and not involve much risk taking (Johnson, 2022). Grandmaster and current world chess champion Ding Liren wonders what is the point when games fizzle out in a draw after both players play prepared memorized moves from beginning to end. He points out that only a portion of the moves were thought of by the players in the moment, and much of it is memorized from their preparation. With modern day opening preparation and so long to think, it is simply too difficult to force your opponent into making a mistake and winning (Sammie, 2023). Grandmaster and former world champion Vladimir Kramnik says "The increasing strength of chess engines, the millions of computer games and the volumes of opening theory available to every player are making top-level chess less imaginative.

Decisive games in super-tournaments have declined, while the number of games with what I'd call ‘creative’ content is also on the slide” (Kramnik, 2019). There are too many draws and not a lot of decisive games - for example, all twelve games of the 2018 world chess championship between Carlsen and Caruana were draws, forcing tiebreakers to decide the champion (Kramnik, 2019).

Carlsen had many specific recommendations for how chess should be played after the rise of superhuman AI. His recommended format for the world chess championship and other top chess events involve faster time controls and more games. Faster time controls would result in more intuition and less rote memorization of computer moves. More games is made possible by the faster time controls and allows for a much larger sample size to more accurately judge who is the better chess player. In a Youtube video with grandmaster Hikaru Nakamura, fellow grandmaster Alireza Firoujza echoes this sentiment adding that the match shouldn’t last so long, saying “I think they have to make the tournaments over the world less days… for example they made the time control much more less [and] the days also” (Nakamura, 2021). Carlsen also recommends many chess variants that decrease the impact that superhuman AI has on the game. A variant called Chess960 (also known as Fischer Random chess) scrambles the opening position, eliminating the usage of chess engines on commonly occurring positions (Fridman, 2022). Carlsen recommends playing Chess960 at longer time controls and normal chess at shorter time controls. Chess960 should be played at longer time control because with limited knowledge of the starting position before the game begins, players need time to think starting with the very first move (Chess.com, 2024). Carlsen brings up several variants with minor changes to the rules but would drastically reduce the effectiveness of superhuman AI: no-castling, allowing pawns to move diagonally, and being able to capture your own piece.

Grandmaster and former world champion Vladimir Kramnik revealed extensive research in chess variants most compatible with the superhuman AI of our current age. He went as far as partnering with Deepmind, a company that made one of the strongest chess engines ever. Kramnik and several Deepmind researchers rigorously investigated the implications of several rule changes, such as removing castling, allowing pawns to move sideways/backwards/two moves forward anywhere on the board, allowing self-capture, and more. They found that several variants researched resulted in dynamic play and novel strategies (Tomašev, 2020). In an interview with international master and chess content creator Sagar Shah, Kramnik highlights a variant called no-castling chess, inspired by his aim "to find a chess variant that would not only have the potential to bring the excitement and decisive victories back to chess, but is also aesthetically pleasing" (Kramnik, 2019). "Castling" in chess is a special move where the king moves toward a corner and a rook simultaneously moves toward the center. It is largely used as a defensive move, as the king is easier to defend when it is in a corner rather than in the middle, near its starting position. Almost every professional chess game utilizes this move. By removing this from the game, the king is forced to stay in the middle for much longer, where it is vulnerable to being attacked. In addition, the rooks, one of the strongest pieces, are often stuck in the corners, resulting in extra maneuvering being required to coordinate the pieces. In this way, no-castling chess makes games more dynamic and simultaneously "concretely eliminates all theory and not just for two or three years I assure you, but for tens of years" (Mukhuty, 2019). Thus, modern day opening preparation would be much less of a factor. While Chess960 is picking up traction among chess professionals, Kramnik believes no-castling chess "is a simpler and more efficient solution" (Mukhuty, 2019).

Discussion

It is clear from both previous scholarly works and the interviews in my research that to chess players chess is more than just playing perfect moves. The rise of superhuman AI has brought the ideal of playing perfect moves to the forefront, diminishing the role of other factors of chess moves. Carlsen's views about the impact of chess engines reducing the enjoyability of chess are especially convincing because Carlsen is willingly giving up on hundreds of thousands of dollars in prize money. Furthermore, the abundance of fellow chess grandmasters that have understood his reasoning and shared similar sentiments shows his views represent a consensus, meaning his concerns should not be taken lightly. While Carlsen is currently one of the only high profile players to stop playing due to these views, his absence from top chess tournaments represents the need to adapt the way chess is played at the highest level to continue satisfying the chess community. At the end of the day, chess is a game and should be enjoyable for its players and viewers.

Carlsen, Kramnik, and other members of the chess community have proposed several ideas. Given that these players have dedicated so much of their life to chess and have extensively researched their solutions, these are strong proposals that are highly likely to significantly decrease the role of superhuman AI in chess. They are also grounded in logic. For example, scrambling the starting position eliminates the existence of commonly occurring positions, erasing the usefulness of using superhuman AI to memorize optimal moves for specific positions. In no-castling chess, keeping the kings in the middle of the board makes positions more double-edged, reducing draws. In addition to altering the format of regular chess, there are a plethora of exciting rule alterations that have the potential to allow chess to fight against the drawbacks brought by superhuman AI, while maintaining familiarity with the original rules.

Conclusion

Chess has been around for centuries, but recent advancements in AI technology have brought about major changes to the chess world. Superhuman AI which can far surpass any human chess player has influenced the way chess is played and learned. However, it often conflicts with "human elements" of chess of creativity, individuality, uniqueness, and enjoyment. At the top level of chess, superhuman AI can be used for extensive preparation, which involves memorizing moves for commonly occurring positions. Based on my research of interviews and podcasts of top chess professionals, this has resulted in less creative and exciting games. Carlsen's shocking and unprecedented decision to not defend his world championship title brought many of these issues with top level chess to the forefront, and almost all chess professionals researched shared his sentiments. Carlsen and other chess professionals have proposed many changes to the way top level chess should be played in order to maintain the aforementioned "human elements" while coexisting with superhuman AI. These involve shorter time controls for normal chess games and introducing variants such as Chess960 and no-castling chess so that the effectiveness of rote memorization is limited, the intuition and skill of the chess player can shine through, and games can be more dynamic and exciting.

Further research could investigate the interaction between humans and superhuman AI for non-professionals such as recreational players and humans. Non-professionals do not have the same experiences regarding opening preparation and near-perfect moves, but would likely still benefit from the solutions presented by Carlsen, Kramnik, and others. Further research could also investigate the impact of superhuman AI on other games such as poker and go, as the reach of superhuman AI on games extends far beyond chess.

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