Connect 4 Robot

Impact of Social Media on Disproportionate Groups and the Responsibility of the Engineer

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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.
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Introduction

Social media is a form of electronic communication where users create online communities to share information, ideas, messages, and other content which includes websites for blogging or for social networking. This has been around for much of the time of the internet and is apparent as one of many well known applications such as Facebook, Twitter, YouTube, Instagram, Snapchat, and many others. Social media is a form of technology that is persistent and will continue to thrive, especially during the COVID-19 pandemic (Anderson & Jiang, 2018). With the construction of social media and the development that goes into this technology, there is the possibility of censorship and ways that social media may disproportionately affect groups of people based on their race, age, political ideology, and socioeconomic lines of living (Cobbe, 2020). Some issues that can come from the social engineering of censorship include the unintended censorship of African American tweets disproportionately or LGBT users (Cobbe, 2020).

Another issue that comes from social media is the addiction to social technologies as well as mental effects on individuals. Especially with the youth, social media has become a widespread commodity in conjunction with smartphones globally, ever-prevalent in areas including India where social media addiction among teenage users has been documented (Ramesh Masthi, Pruthvi, & Phaneendra, 2018). This technology is designed to keep users engaged and continuously dependent upon it by, deliberately or not, fostering insecurity, providing entertainment through observing the ideal image and lives of others, and compensation for lack of social interaction which leads to further addiction (Kuss & Griffiths, 2011). The key factor is that these addictions have been designed such that social media is meant to be addictive

to keep users within the applications for the benefit of the organizations developing the technology.

Investigating the problems of addiction and the mental effects of social media along with discrimination, the technical topic will aim to create a product that takes people away from social media addiction while also separating itself from the discriminatory nature that social media holds. The STS topic will discern how exactly social media disproportionately affects targeted groups and how the engineers can and should change this part of social media.

Technical Topic

With the era of COVID-19 and lockdowns over the past year, there has been an increased isolation among people and increased depression (Tulane University, 2021). Many people utilize social media as a method to keep in touch with others online when they could not interact with others face-to-face. With this lack of social interaction comes a desire to fill that void and leads to further isolation and addiction to social media with the negative effects of social media leading to possible mental illnesses (Kuss & Griffiths, 2011). One important factor to note is that during the COVID-19 pandemic, there has been a vast spike in the growth of the consumer robotics industry most likely due to the similar role of filling the void of social interaction with a product for entertainment and recreation (Edwards, 2021).

One of the ways in which individuals engaged in recreational activities was with board games to play with friends and family. One of the classic examples of a board game that would accomplish such a task is Connect 4 in which two players have different colored chips taking turns inserting chips into a seven-column board to align four chips horizontally, vertically, or diagonally to win the game. In building technologies, engineers build societies, and so with the increasing consumer robotics market and the isolating event of the COVID-19 pandemic, a

proposed solution to the addictive and discriminatory nature of social media is the creation of a robotic Connect 4 game. Since the market shows that it is possible for a consumer robotic toy such as a new rendition of a classic board game to succeed as a product, this technical project would provide an alternative to the desires that social media attempts to satisfy (Edwards, 2021).

Since the Connect 4 robot is meant to address the problem of addiction to social media and reduce the disproportionate negative impact on certain groups of people, the Connect 4 robot is designed to be engaging by being interactive and engaging to users with non-discriminatory and inclusive approaches to all people. Figure 1 shows a flowchart displaying the interaction between the robot and the human player.

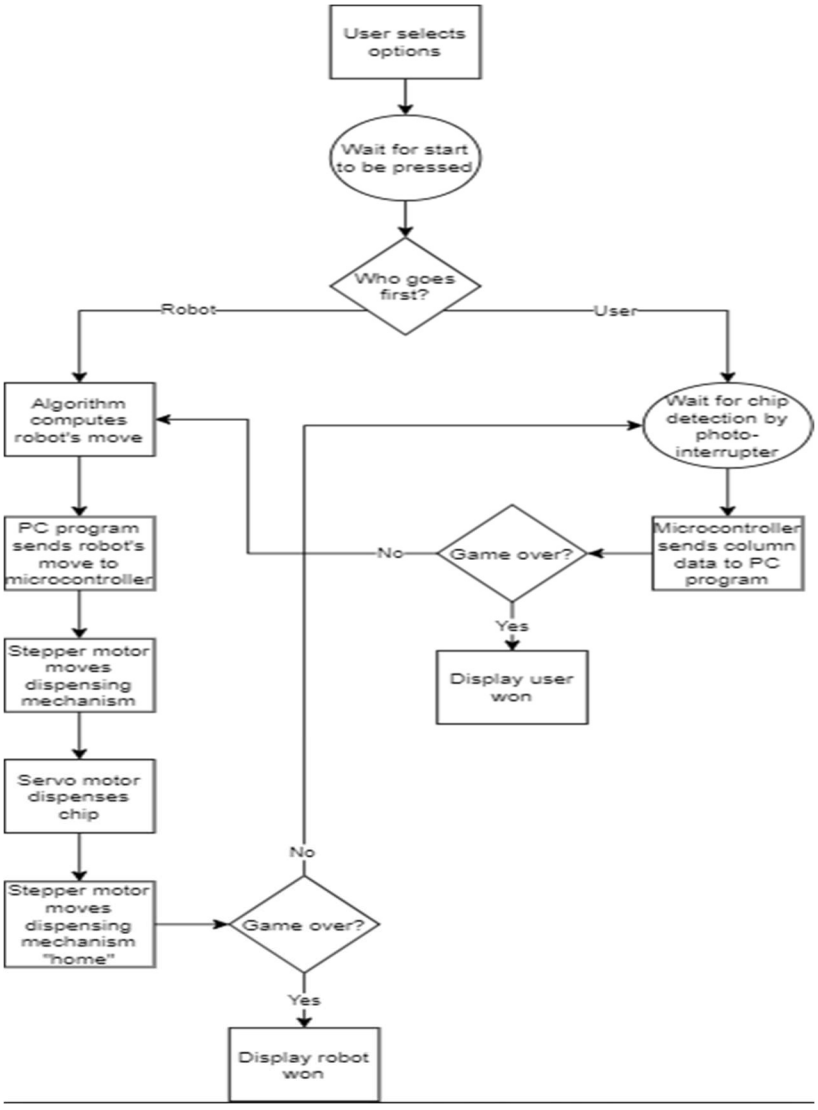

Figure 1: Connect 4 robot gameplay flowchart (Created by Capstone team). This displays a high level interpretation of how the robot will interact with the user and play through a game of connect 4.

The robot will sense moves when it is the player's turn and act accordingly to either play a piece and determine after each move if there is a winner for the game.

Another way the robot will be engaging to the individual with the difficulty settings. The robot will be able to play against a human in either "easy mode", where it will randomly place down pieces to provide a relaxing experience for the human player by exhibiting moves that would allow the user to win without much difficulty. The robot may also play at a hard difficulty level where it will provide more complex strategies against the player. The robot will be able to

determine the best moves to challenge the user and attempt to win using a minimax algorithm, which ensures the largest payoff for the computer based on a zero-sum game to minimize the potential score for the human and maximize the potential score for the computer (Yanovskaya, 2020). Figure 2 displays an example of the algorithm where the maximizer selects the max possible value and the minimizer selects the lowest possible value to simulate the computer playing to maximize their own points with the assumption that the opponent will also play optimally.

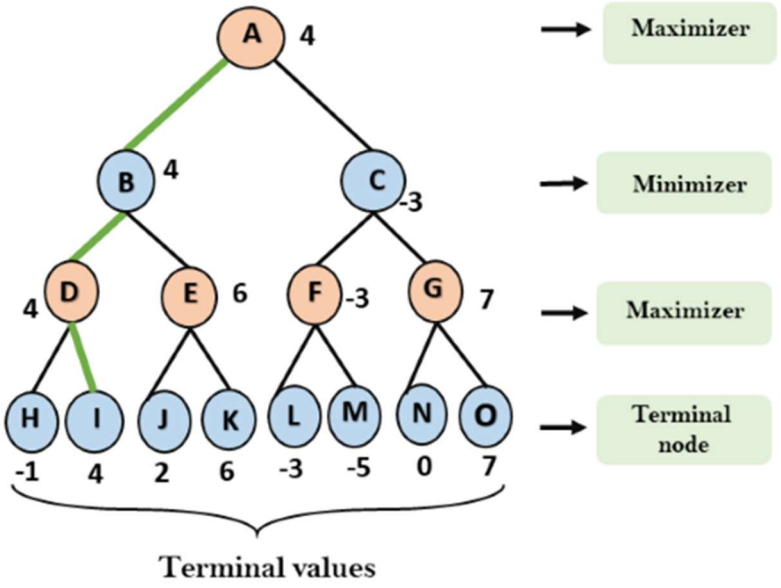

Figure 2: Minimax algorithm (JavaTpoint, 2021) recursively computing the best move assuming the computer plays optimally (maximizer) and the human plays optimally (minimizer).

The final key feature of the Connect 4 robot is that it is engineered to provide an experience that is non-discriminatory and will play in an unbiased manner according to the desires and inputs of the human player. While there would be no inherent benefit for the robot to discriminate between groups of people based on their differences, it is the responsibility of the social engineer to create algorithms that do not censor societal subgroups. Engineers must construct technology to prevent capitalizing on the addictive nature of technology, such as that of social media on the youth. A major part of this technical project is to show that it is possible for

the engineer to design a technology that minimizes the disproportionate negative consequences on individuals or groups. The engineer must be conscious of how their technology may affect others since the creator of technology has the power to greatly influence society. This project aims to highlight that a product can be successful without having to have hidden agendas or bias against certain groups of people.

STS Topic

During the spread of COVID-19, there has been a highlighting of continual discrimination between different groups of people even on social media such as the discrimination towards Asians and Asian Americans during the coronavirus era (Yang, Tsai, & Pan, 2020). Such actions as these are reasons that social media has factored in censorship which may target certain groups. The most famous example of this is in China, where political dissent or anti-government humor is censored due to being perceived as a threat to the stability of the government (Luqui, 2017). Other problems from social media may include the fact that it also disproportionately affects women in terms of body positivity due to the targeting of women on social media with the "ideal" standards for women that negatively impact these individuals (Perloff, 2014). There is also the addictive factor of social media where it draws the user to continually use the technology and come back to it for repeated use for the reasons such as social interaction, information seeking, pass time, entertainment, and convenience utility (Whiting & Williams, 2013). This insight shows why users keep coming back to social media despite the many negative effects that it has on society (Whiting & Williams, 2013).

The reason for all of these factors is due to the social engineering that occurs, because it stimulates feelings of gratification for the user while also targeting groups such that it can censor groups or target people for fulfilling agendas or profits for advertising. Figure 3 displays a

sociotechnical diagram utilizing the diamond structure to display the influence of technology, society, and organizations with social media.

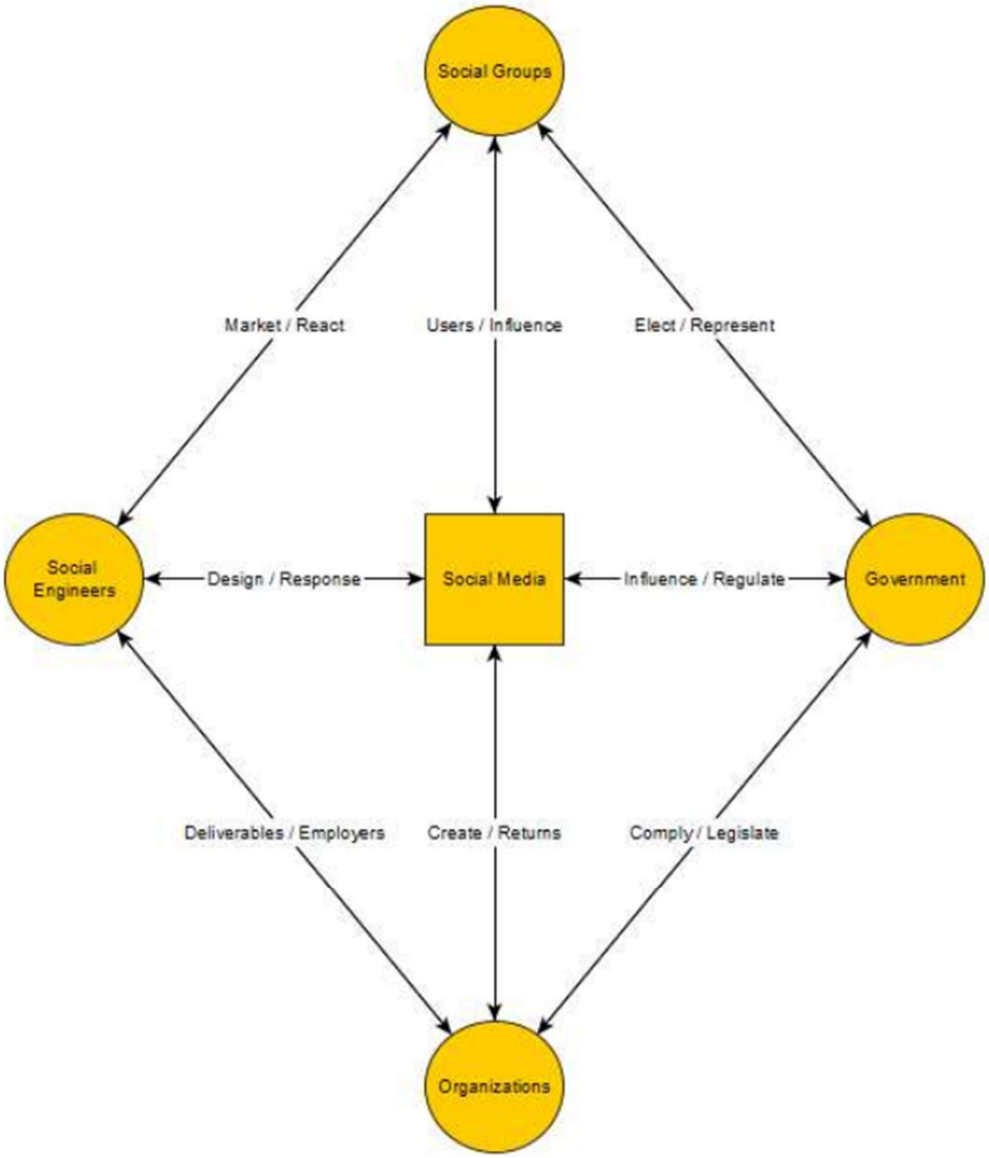

Figure 3: Sociotechnical diamond diagram (created by author) of social media affecting and being a part of society framing the problems of social media within the context of society, organizations, and the technology.

From this model, there is a relationship between social groups such as the ones disproportionately affected by social media such as minority groups or groups with certain traits. There is also the separation of social engineers as an entity that works with organizations to

create social media. The government is also a factor that affects social media such that laws can be passed affecting the technology or the organizations behind the technology. Some important factors to note is that while organizations are behind the creation and maintenance of social media, social engineers are the designers of the technology and can interact with the social groups to adjust the technology whether that is to target groups such as with displaying certain things within the social media to them or by censoring them.

With this framework in mind, the sociotechnical diagram gives context for why certain actions occur within social media and how they are influenced by social engineers. For governments such as the Chinese government, they may order social media organizations to censor certain political groups or opinions to which the organizations enlist the social engineers to implement these changes within the social media (Luqui, 2017). For women that are disproportionately affected by body image issues, organizations may be utilizing social media as a form of advertisement to social groups which social engineers then design the applications to market to groups to convince them to consume products or brands to improve their body image (Perloff, 2014). This all culminates into the greatest role of the social engineer which is to create and design social media that appeals to social groups and users to keep them engaged with the application for the benefit of the company whether it has a positive or negative effect on the user. This is done by utilizing gratification theory to design the technology which include convenience utility, expressing opinions, social interaction, and knowledge seeking so that it markets to the users, and this results in a deliverable to the organization that gains profits and revenue from the input of the social engineer (Whiting & Williams, 2013).

With all of this in mind, a large part of the social problems with social media affecting minority or disadvantaged groups within society are caused by social engineers designing the

technology to target and censor these groups. From an STS perspective, it is important for all engineers to be cognizant of their effects on society and how they can take control of their actions to make changes for the better to improve society. This gives an opportunity for the social engineers behind this technology to dismantle the systemic problems of social media such as discrimination, targeting, censorship, and the addiction of social media by changing the technology and utilizing their unique position between social groups and organizations to further create technologies that build greater societies.

Research Question and Methods

How does the technology of social media disproportionately affect different groups based on critical differences, and how do engineers contribute to this problem while also bearing responsibility for protecting these users? This question delves into two parts where the first focuses on the apparent problems within social media that display the inequalities and injustices of society affecting certain groups of people. The second part is how this problem arises, and turning attention towards designers of the technology and highlighting how the engineers behind social media applications are responsible leads to how they should be more cognizant of their approach to developing technology and work towards improving society and the marginalized groups. The methods for addressing this research question will be to analyze data that displays the disproportionate effects of social media on certain groups of people such as African Americans (Cobbe, 2020) as well as the groups of people such as teenagers addicted to the technology (Montag et al., 2019). This will also include how to address the second part of the question with the factor of the social engineers by analyzing the data that shows how groups of people are affected such as the addicted teenagers because of the factors of social media that display the addictive nature of social media which will give an insight into how social media is

designed by engineers to target and affect certain groups of people (Montag et al., 2019). When the data has been properly analyzed, this will lead to the interpretation of the data where the paper will show how the problems affecting groups of people can be alleviated by the designers since they are responsible for how the technology works and can work towards a solution for the betterment of society. This will also allow for a chance to explain why it is important for social engineers to assist for the good of society rather than be opportunistic and prey upon the weaknesses of certain groups of people.

Conclusion

Creating a robotic algorithm to simulate a real life game of Connect 4 with a player could offer an alternative to social media since one of the goals for this device is to minimize any and all possibilities of discrimination or disproportionate targeting such that social media faces. This technical project would create a way for interaction between something robotic similar to how using social media can be an isolating event that separates the users from others and negatively impacts them. The STS topic will deliver a new insight into the disproportionate ways that social media has developed to target individuals and the moral responsibility of the engineers designing these applications. With this deliverable, marginalized groups would be able to voice their opinions to the corporations and engineers through communication such as switching to other social media platforms, and social engineers would be able to reflect on these discoveries and move forward to developing social media that does not target or discriminate against certain groups consciously and unconsciously.

References

Anderson, M., & Jiang, J. (2021, May 27). Teens, Social Media & Technology 2018. Retrieved October 14, 2021, from https://www.pewresearch.org/internet/2018/05/31/teens-social-media-technology-2018/

Cobbe, J. (2020, October 07). Algorithmic censorship by social platforms: Power and resistance. Retrieved October 14, 2021, from https://link.springer.com/article/10.1007/s13347-020-00429-0

Edwards, D. (2021, February 16). Pandemic lockdowns boost consumer robotics market to $10 billion in 2020 revenues. Retrieved October 14, 2021, from https://roboticsandautomationnews.com/2021/02/16/pandemic-lockdowns-boost-consumer-robotics-market-to-10-billion-in-2020-revenues/40492/

JavaTpoint. (2021). Artificial Intelligence: Mini-max algorithm - javatpoint. Retrieved October 14, 2021, from https://www.javatpoint.com/mini-max-algorithm-in-ai

Kuss, D., & Griffiths, M. (2011, September). Online social networking and addiction--a review of the psychological literature. Retrieved October 14, 2021, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3194102/

Luqiu, L. (2017, May 3). The cost of humour: Political satire on social media and censorship in China - luwei Rose Luqiu, 2017. Retrieved October 14, 2021, from https://journals.sagepub.com/doi/full/10.1177/1742766517704471?casa_token=hBQTIcVYm-sAAAAA%3AE7mW0CkBi_vAzEimplD_9-fKYUniVnPdpnJrIcVjUv-KCEJICuwxyymbF5AZpC0Xaa5Xm9srlSLa

Montag, C., Lachmann, B., Herrlich, M., & Zweig, K. (2019, July 23). Addictive features of social media/messenger platforms and freemium games against the background of psychological and economic theories. Retrieved October 14, 2021, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6679162/

Perloff, R. (2014, May 29). Social media effects on young women's body image concerns: Theoretical Perspectives and an agenda for research. Retrieved October 14, 2021, from https://link.springer.com/article/10.1007/s11199-014-0384-6

Ramesh Masthi, N., Pruthvi, S., & Phaneendra, M. (2018). A comparative study on social media usage and health status among students studying in pre-university colleges of Urban Bengaluru. Retrieved October 14, 2021, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6166494/

Tulane University (2020, December 8). Understanding the effects of social isolation on Mental Health. Retrieved October 14, 2021, from https://publichealth.tulane.edu/blog/effects-of-social-isolation-on-mental-health/

Whiting, A., & Williams, D. (2013, August 30). Why people use social media: A uses and gratifications approach. Retrieved October 14, 2021, from https://www.emerald.com/insight/content/doi/10.1108/QMR-06-2013-0041/full/html?casa_token=iYj8iLYeReUAAAAA%3AP_EOdknUd8nIDAt2pLFuGRV1jU5i-qlh4_2xP7fhKuAl35oS2vsgXbzCY5laQUAENv8xdqz3g7fw0I5q7b1wo4BrQ-vfKG7aHyjCX6ebUf9Y5TcXzeI

Yang, C., Tsai, J., & Pan, S. (2020, December 14). Discrimination and Well-Being Among Asians/Asian Americans During COVID-19: The Role of Social Media. Retrieved October 14, 2021, from https://www.liebertpub.com/doi/abs/10.1089/cyber.2020.0394?ai=su&mi=cjwv&af=R

Yanovskaya, E. B. (2020, February 14). Minimax principle. Retrieved October 14, 2021, from https://encyclopediaofmath.org/index.php?title=Minimax_principle