Creating a Multimedia, Interactive Experience for Netflix

Facial Recognition Software and the Politics of Design in Sociotechnical Systems

A Thesis Prospectus

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By

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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

Since the creators and designers of many technology platforms tend to be white, male, and from a high income background, there is unconscious bias that occurs when designing products. For example, searching up images of "unprofessional hairstyles" on Google Images will return images of naturally Black hairstyles (Korte, 2020), which displays and reinforces traditional racial stereotypes. Additionally, these inequalities exist regarding gender as well. In video conferencing platforms such as Zoom and Skype, the hardware is coded to recognize lower tones of voices over higher pitched tones. As a result, women in meetings are often silenced if a man has decided to speak at the same time as her (Feldman, 2020). Through my Capstone project, my team and I hope to create an inclusive media experience for all potential Netflix users. Specifically, my team is working with Netflix to design a new, multimedia experience that is unique compared to other entertainment platforms such as Hulu, HBO Max, Amazon Prime, and more. We will be focusing on creating an interactive cooking experience that includes aspects such as audio and visual cues, games where users can connect virtually with their friends, cooking assistance, and multimedia navigation that creates a seamless experience for the Netflix user base. This involves designing for every user, including those who may need special accommodations.

The focus of my STS research paper, facial recognition bias, is loosely based on my Capstone project in that technology and media have to be designed for good. However, my research paper will focus more on structural barriers and ideas that influence the creation and bias that exist in facial recognition software. Throughout the paper, I will be utilizing the framework of sociotechnical systems involving the politics of design for technology. This framework creates the question: What barriers, ideas, and prejudices exist when designing

technologies for the masses? This entails society working to eliminate bias when creating technology for the masses to ensure safety and innovation for all. Throughout this paper, I will specifically discuss the creation and implementation of facial recognition systems and outline the different barriers that create a technological society that is not inclusive to the masses. Finally, I will relate this topic back to my framework and then detail methods and recommendations to take down those barriers and improve upon facial recognition systems.

Technical Topic

Creating an inclusive watching experience is necessary to ensure that Netflix's user base is being properly cared for, especially in a time when social media and entertainment interest has grown extensively. Netflix recently released their first-ever inclusion report in January of 2021 (Myers, 2021). They have demonstrated diversity in their workforce, with women making up 47.1% of their workforce, minorities and people from underrepresented backgrounds making up 46.4% of the workforce, and finally, doubling the number of Black employees in the US over the last three years. They have done this by implementing more inclusive hiring practices that include a technical bootcamp opportunity with historically black universities and hosting events with different organizations such as /dev/color, techqueria, Ghetto Film School, and TalentoTotal. Netflix has stated future goals of working to recruit more Hispanic/Lantinx, Indigenous, and other underrepresented individuals, learning more about topics of inclusion and representation outside of the U.S., and working to measure their progress over time. However, even with all of these initiatives, there are few experiences on Netflix created for individuals with disabilities. While there are many shows on the streaming platform that provide representation for people with disabilities such as Special, Atypical, and The Fundamentals of Caring, there are no experiences that are designed specifically to accommodate people with

disabilities. For example, if a person is unable to use their hands or arms, there is no way to use audio to interact with Netflix.

Our Capstone project is working to create an interactive, multimedia cooking experience for all Netflix users that includes audio and motion cues, celebrity chef appearances, and a social media gaming aspect that connects users together. There has been no prior work done on this project by previous students, so our technical team is laying the groundwork for this new experience. Our three main goals of our project: creating a user storyline (Figure 1), improving the navigation of the cooking interaction by creating a nodular recipe map with interactive

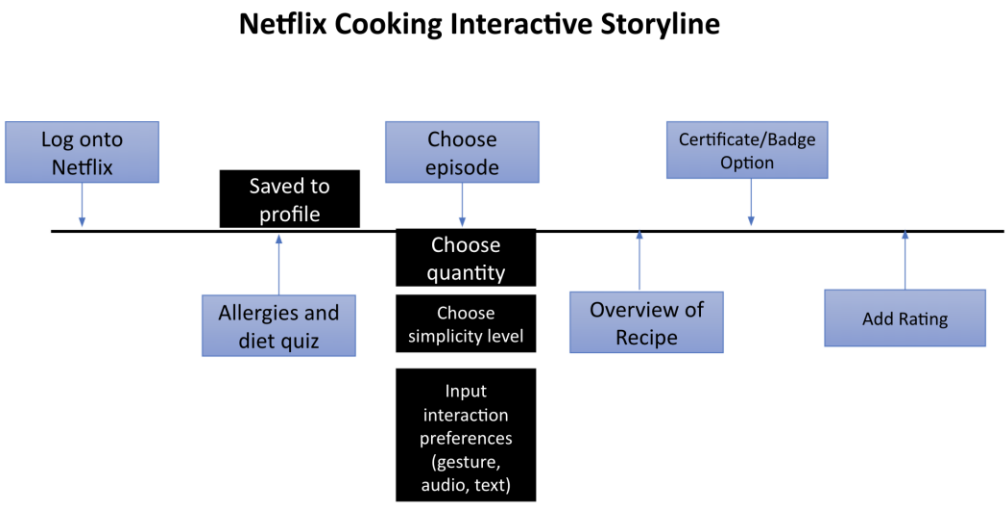

Figure 4. Gerling's Capstone team's proposed storyline for Netflix's users (author)

features (Figure 2), and creating unique gesture and voice interaction tools that promote inclusivity and ease of access to the user.

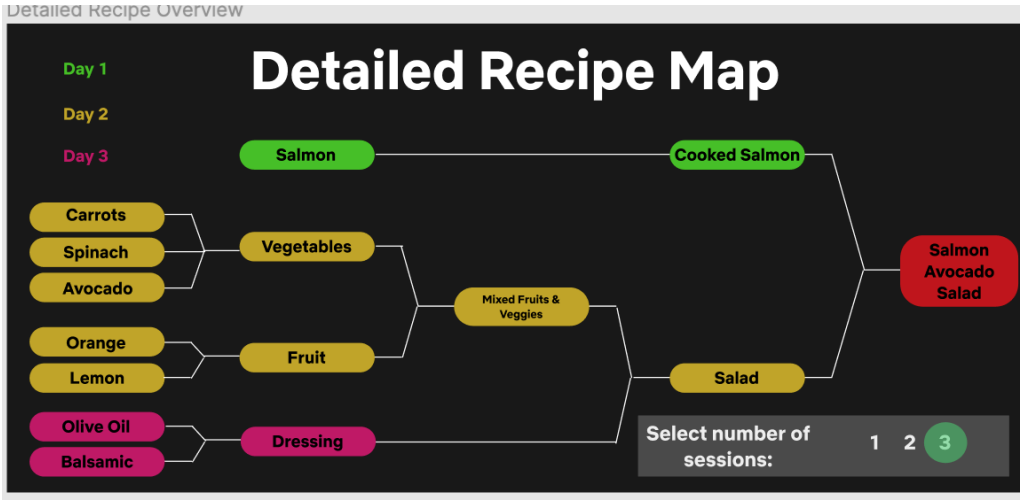

Figure 5. Example of a nodular recipe map

The gesture and voice interaction tools are not only helpful for people with disabilities, but also for a chef who doesn't have use of their hands because they're busy cooking, or for a busy parent who finds it difficult to multitask while cooking meals. Additionally, we hope to create a unique entertainment experience that is unlike any other cooking show available on current streaming platforms. Adding in ideas such as a recipe overview map with interactive steps, mini cooking skill tutorials, and trivia games, this experience will be both helpful and entertaining to the masses. We are hoping to be leaders in a new innovative experience that can set the stage for future interactive media experience. We are led by Professor Greg Gerling, an Associate Professor in Systems Engineering and Biomedical Engineering at the University of Virginia and are working with Victoria Bellotti, a Senior UX Researcher in the Core Member Experience at Netflix.

In order to achieve our goals, our team has created a step by step plan, with some steps already completed. So far, we have spoken with Victoria to gauge the resources that Netflix is willing to contribute to the project. From there, we have created a user journey map to pinpoint

possible Netflix user pain points and use cases, as well as created several prototypes to see what our most viable product (MVP) is. From here, we plan to conduct user interviews to gain more information about what features would be best to include in our final prototype design. Finally, we will create a series of final prototypes to display to Professor Gerling and Victoria using UX design skills and UX/UI research. For my specific tasks that I am owning for this project, I have created the customer journey map and will continue to create prototypes using the application Figma. When this project is successfully completed, the goal is for our created prototypes to be researched and built by the Netflix team and then integrated into their current streaming service where it can be updated and maintained throughout the years.

STS Topic

While many individuals only see facial recognition technology as a useful tool to help them easily unlock their iPhones, it can have detrimental results for others, specifically, people of color. Robert Julian-Borchak Williams was one of these individuals. Williams was working at his automotive supply company office when he got a call from the Detroit Police Department demanding that he come to the station because he had been arrested. Williams faced emotional distress when police arrested him in front of his wife and kids, telling him that he faced charges of "larceny" and that he faced a "federal warrant" (Hill, 2020). Once he reached the police station, the officers accused him of stealing watches from Shinola, an expensive, trendy boutique that Williams had only visited once in 2014 when it had opened. The officers then proceeded to show Williams a screenshot of the suspect, who was a black man with a similar build as Williams. However, it was obviously not him.

This error was not borne from a purely human mistake, instead, law enforcement was led astray by a misidentification by facial recognition software from the company DataWorks Plus. Past studies have shown how unreliable and inaccurate this system is, with the algorithm falsely identifying African-American and Asian faces 10 times to 100 times more than Caucasian faces. The software had identified Williams as a possible match, and when his picture was included in a lineup and shown to a Shinola employee, Williams was incorrectly identified. The detectives quickly realized the mistake but Williams was forced to stay in jail for 30 hours and had to be released on a $1,000 bond.

Studies done about the accuracy of facial recognition systems include one by researchers in the MIT media lab, Joy Buolamwini and Timnit Gebru. In their study, they sought to create a bias detector to evaluate the accuracy of current facial recognition systems when used on individuals of different races. Darker-skinned females had the highest error rate of around 34.7% while the maximum error rate for light-skinned males was 0.8%. This discrepancy in error most likely occurred because the datasets used to inform popular facial recognition systems were made up of lighter-skinned subjects, leaving the software unable to correctly recognize darker-skinned individuals. Another study done by the National Institute of Standards and Technology (NIST) in 2003, found that algorithms had a harder time identifying female subjects than male subjects and that the rate of identification accuracy was also lower for younger subjects. This dataset bias not only exists in facial recognition systems but in other important technology implementations in healthcare settings. For example, Ruha Benjamin also conducted a study in the Science journal discussing how the automated system used by health insurance companies to evaluate the health profiles of individuals is inherently biased. For example, “...if two people have the same risk score that indicates that they do not need to be enrolled in a “high-risk

management program", the health of the Black patient is likely much worse than that of their White counterpart" (Benjamin, 2019). This discrepancy occurs because the data set used to train these automated systems is historic, which includes factors such as "segregated hospital facilities, racist medical curricula, and unequal insurance structures" (Benjamin, 2019). Bias in data sets is not limited exclusively to facial recognition software and is instead prominent in many vital societal technologies.

Facial recognition software is seen by government and law enforcement agencies as a quick solution to identifying criminals. However, this mindset is unsuccessful in upholding the framework of sociotechnical systems that consider the politics of design. The case studies Companies who provide agencies with this technology are doing so knowing that their algorithm is biased and can possibly put innocent people in jail. Societal ideas and structural barriers for minorities affect who companies design their products for, therefore including bias in technologies that have the potential to negatively impact individuals' lives, such as facial recognition technology. Williams' case is not an isolated incident. In 2019, Amara K. Majeed, a Brown University student, was mistakenly identified as the Sri Lankan bombing suspect, Fathima Qadiya. According to Majeed, she woke up to "…35 missed calls, all frantically informing me that I had been falsely identified as one of the terrorists involved in the recent Easter attacks in my beloved motherland, Sri Lanka" (Fox, 2019). However, her life was forever changed when a group of investigators used facial recognition software that matched Majeed's picture with a picture of the suspect. Majeed began receiving death threats and was worried for the safety of her family back home. Majeed was wrongly identified through a biased facial recognition and as a result her life was unfairly risked with no consequence to the manufacturers of the facial recognition software in question.

As of right now, there are no concrete solutions to this problem. Companies, law enforcement, and government agencies continue to use bias software to identify individuals. However, there is research being done on how to reduce the bias in facial recognition software that may lead to better innovations in the future. For example, students at Durham University are conducting research on "bridging the gap between facial recognition systems that perform almost perfectly for white faces, but perform less well for faces of people belonging to other racial and ethnic groups" (Durham University, 2020). Hopefully, this is a sign that further and more intensive research on this topic will succeed in the future.

From the wrongful arrest of Robert Williams to the incorrect identification of Amara Majeed, facial recognition software has proved time and time again that it holds an inherent bias against people of color and women. However, many of the large companies that develop the algorithms for this software are unwilling to work to destroy the bias in their data. This is a hard lesson that must be learned as it can only cause further prejudice for minorities in an evolving society. As demonstrated through the multiple case studies and research studies that have been done, politics of designs in our society must be considered to create technology that lacks bias and caters towards our diverse, growing society,

Next Steps

For my technical project, our next steps would include continuing to meet with Victoria Bellotti, our assigned Netflix representative, to continue adjusting our Figma prototypes and assessing what features should be considered the Most Viable Product (MVP). For the rest of the semester and next year, our team hopes to continue our UX design process by conducting user interviews to assess what improvements that the Netflix user base desires from the company.

After conducting these interviews, we will continue to reiterate and improve our prototypes by taking into consideration these improvements from both our user designs as well as feedback from Victoria.

In regards to my STS topic, some policy regulations and changes that should occur to decrease overall bias in facial recognition systems would be creating a regulatory framework for facial recognition development to ensure consideration of data bias and to increase diversity of data provided for AI training, increasing the diversity of engineering teams working on facial recognition software to include all perspectives and opinions (i.e. minorities and women), and creating governance procedures to regulate how facial recognition software is used to impact society. By implementing governmental change on a higher level, overall structural bias can be reduced. Through all of these steps, the framework of incorporating the politics of design can be achieved.

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