Thesis Project Portfolio

Golf and GameForge: Innovative Analytics for Recommender Systems

(Technical Report)

Development and Distribution of Rekognition, an Amazon Facial Recognition Software Tool, in Relation to Virtue Ethics

(STS Research Paper)

An Undergraduate Thesis

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

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

Rose Dennis

Spring, 2022

Department of Engineering Systems and Environment

Table of Contents

Sociotechnical Synthesis

The technical and STS research project outlined in my thesis explore the research question of how to mitigate the socio-technical problem of biases and disadvantages that arise when Artificial Intelligence(AI) based predictive modeling methods are used to create selection tools. The two projects work to create a deliverable and an understanding to better create data-driven tools that are equitable and efficient. In this synthesis I will outline the two projects I worked on to explore the overarching research question present and discuss the insights I gained while working on them.

The technical project component of my overarching research question, consists of building a data-driven AI tool using predictive modeling to help streamline the collegiate golf recruitment process. The tool will pair golf players to teams based on optimizing both parties' statistics and future growth. The goal of this deliverable is to help alleviate the current fragmented recruitment process and to create a platform that is accessible to all golf players and coaches. The new system will build upon the existing Gameforge features using predictive modeling, artificial intelligence, machine learning, publicly available data, and proprietary metrics from Gameforge. The enhancement will consist of three components: a two way recommender system for players and coaches, a player archetype creation to identify strengths and skill gaps, a new holistic ranking system that goes beyond player scores. In conjunction with the technical project, I worked on a STS research project that analyzed the inherent flaws and bias present in a data-driven, artificial intelligence based facial recognition tool (FRT). In order to carry out this analysis I explored Rekognition, a FRT available in the public market, developed by Amazon that was created to identify individuals by examining and mapping facial features. The tool learns to identify individuals by looking for patterns in large data sets that serve as the baseline training data set for facial matches made. Due to public concern and outrage

over Rekognition being used in law enforcement settings and leading to wrongful arrests, two MIT researchers decided to explore the accuracy of the facial matches made by the tool. They found that the error rates for gender classification were higher for females than they were for males, and higher for darker skin toned individuals than for lighter skin toned individuals.

Analyzing these two complementary projects, pertaining to my overarching research question, allowed me to gain insight that I would have not gained from them individually. The technical project work on developing a recruitment selection platform for collegiate athletes, added to my understanding of utilizing data in order to make informed decisions that have been verified and analyzed to contribute to overarching goals. The STS research project helped me see that AI tools designed to streamline tedious processes may overlook qualitative components. Both projects led me to recognize that AI based predictive modeling tools can create a socio-technical world where selection processes become closed off to new experiences or metrics that could be indicators of a successful selection and can exacerbate biases present in training datasets. These projects have shown me that engineering is not just about creating efficient and well designed artifacts but rather about building a holistic socio-technical world while innovating.