

Thesis Project Portfolio

Integrating Automation Scripts in Production Environments:

Increase Innovation and Streamline Ideas

(Technical Report)

Reframing Algorithmic Bias with Cultural Clothes in Public Facial Recognition Technology: Improving Public Goods through a Private Sector Lens

(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

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Fall, 2023

Department of Computer Science

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The Analysis of Software Development in the Private Sector for the Public Good

“If you are content with the best you have done, you will never do the best you can do.”
-- Martin Vanbee

In any task of life, we are taught from a young age to do it to the best of our ability. If every member of society did not have passion or genuine interest in their profession, society would have never technologically progressed as far as we have in the past two centuries since the Industrial Revolution. I have a passion for software development and my experiences as a student, explorer, and intern have given me the opportunity to contribute to software development in the internet and medical fields. In my most recent experience of being a system architecture intern at ST Engineer iDirect, I explored the internet and networking industry by creating innovative solutions to network scalability. As a student, my STS research project was influenced by my fascination with facial recognition technology and how its algorithmic bias classifies myself as other people from my country. Reflecting on my experiences with facial recognition and algorithmic bias in a previous machine learning course, I wanted to understand why facial recognition has poor performance despite years of research and multiple companies advertising their high performance metrics. In my research, I uncover a deeper understanding of facial recognition as a public good by analyzing it as a sociotechnical system and reveal a new perspective on the work I've done as a ST Engineering iDirect intern.

The technical portion of my thesis documents my experience as a system architecture intern at ST Engineering iDirect, a telecommunications company based in Virginia, where I

automated a portion of my project in order to decrease the time for initial deployment, decrease human error, and increase the time I had to innovate new solutions. My internship project was a proof of concept to determine if the company could integrate their next generation software into a microservice and how to utilize Single-Root Input/Output Virtualization technology to improve performance. After a few weeks of the internship, I noticed that I spent a lot of time creating the initial resources for each proof of concept iteration. Furthermore, each iteration either worked or broke the hardware in the server room which meant I would need even more time to reset the test servers. This realization reminded me that I could use automation scripts that I learned from school to decrease resources needed for each iteration. By creating the first resource automation script, I was able to decrease the resources needed to test each iteration. Additionally, the automation allowed me to devote more attention to improving the quality of my software and producing high performance results. Alongside the technical aspect of my internship, I spent more time learning about the values of the company through employees and learned about maintaining software quality and integrity without sacrificing efficiency. I acquired a lot of technical and industry knowledge during my internship, but I would soon learn that the work environment I experienced isn't universal.

My initial STS research was broadly on the analysis on facial recognition and the algorithmic bias it has towards minority populations. After reading a short excerpt from *Technological Change: Its Impact on Man and Society* by Emmanuel Mesthene, I refocused my research towards facial recognition as a public good where it had a larger discrepancy in accuracy across minority groups compared to their private sector counterparts. In my research, I analyzed the development of facial recognition technology in the private and public sector and understood the technical, organizational, and cultural differences that lead to this gap in accuracy

performance. My research concluded that the main differences are a clear system of financial rewards and a unified vision of software quality throughout the development cycle which is evident in private firms and not public agencies. Private firms have a direct financial incentive to produce higher quality facial recognition technology and emphasize a culture of technological innovation and excellence. Comparatively, the public sector doesn't have a metric to define the public benefit of improved facial recognition quality and the fragmentation of public leadership leads to limitations on technological development. In my analysis, a new ideology and visible system of rewards when developing facial recognition for the public that mimics that of the private sector can lead to improved software quality and can be applied to any future technology developed for society.

In analyzing the technical limitations, company organizational structure, and company values that go into the development of facial recognition technology in my STS research, I have gained a deeper insight into the work I've done as an intern and will do as a future software developer. In my internship, I had little access to updated servers and software licenses that limited my ability to produce a quality project. However, the organizational leadership of ST Engineering iDirect promoted high software standards, and the cultural atmosphere of the work environment pushed me to go beyond the requirements of my project. Comparing my experiences in the industry to my STS research, I realize my mindset was trained to produce quality work because there was a visible system of rewards and organizational values that promoted quality software. Regardless of where I work or who I work for in the future, it is important to bring this mindset with me even if there isn't a clear system of rewards. As a software engineer reflecting on my previous experiences, I will utilize the lessons I discovered in

my STS research to produce quality software and foster a culture that emphasizes software quality to benefit all members of society regardless of the obstacles along the way.