Thesis Project Portfolio

Radiance

(Technical Report)

Security and Privacy Concerns of Facial Recognition Technology

(STS Research Paper)

An Undergraduate Thesis

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Bachelor of Science, School of Engineering

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Sociotechnical Synthesis

For my technical project, I worked on a team of computer and electrical engineers to create a security system that was able to detect living creatures, shine a light on them, and track them within a given area. In order to accomplish this, our main components were a motor system, Raspberry Pi, MSP 432 microcontroller, a flashlight, and a thermal camera. We used the thermal camera to capture thermal images in order to detect heat signatures and fed those images into our Raspberry Pi in order to perform image processing using a Python program. The output of our processed images was a box around the thermal signature. Our motors were responsible for guiding our flashlight to be centered on the thermal signatures which were controlled by the MSP 432 microcontroller. To pair with our physical system, we also created a website that was able to show the live feed from the camera, perform manual actions on the system such as enabling and disabling the motors, moving the motors, and more, and save recordings of the feed.

My main role on the project was the embedded software, specifically, the functionality of the motors which plays an integral role in the success of the system. My role included setting up and testing the motors in the early stages which lead to the ability for us to send simple commands to our motors. I worked collaboratively with a teammate to come up with the algorithm for communication between the Raspberry Pi and the MSP 432 using a UART signal. I also played a significant role in the integration of the motor system and the image processing system. This included testing and debugging of issues as well as making it more efficient to allow for a smoother tracking experience.

I was also responsible for the creation of the live streaming web application. I set up all the back end that deals with the display of the processed images frames. I worked collaboratively with a teammate to develop a clean and functional UI for our website. I also developed the back

end functionality of most of the manual control buttons featured on the site. This includes the toggle communication between the MSP 432 and Raspberry Pi button and all the manual adjustment buttons that allow the user to move the camera when in manual mode using the up, down, left, and right buttons. I was also responsible for the creation and maintenance of the Gantt chart we used throughout the semester.

For my STS paper, I discuss the security and privacy concerns of facial recognition technology. I thought of this topic because of the surveillance nature of my technical project. I was doing my research on how artificial intelligence affects surveillance technology and was able to come up with this topic. The main method used in this paper is the reading and synthesization of previous literature related to the research questions. These literatures include various types of articles and books. The pieces of literature were carefully selected to allow for a deep understanding within the specific topics discussed in this paper. I use both explanatory synthesis and argumentative synthesis. I synthesize different articles to answer questions such as: How do the negatives of facial recognition technology affect its use in criminal justice, a field in which this technology is prevalent? To what extent does racial bias play a role in this technology? I also use these resources to form an argument that answers the question: Is it too early to fully utilize this technology due to issues of privacy and consent?

As for frameworks, I have conducted a race studies analysis because it makes sense in the context of facial recognition technology in criminal justice. In this paper, racial analysis is used to examine how race plays a factor in the unfairness of facial recognition technology in criminal justice. It dives deeper into how race plays a role in the foundations of these AI and also how race plays a role in the practice of using facial recognition technology in criminal justice.