

**Lowcode: Innovative Web App Development**  
(Technical Paper)

**Artificial Intelligence Art: How artificial intelligence can affect the current bias within facial recognition systems**  
(STS Paper)

A Thesis Prospectus  
In STS 4500  
Presented to  
The Faculty of the  
School of Engineering and Applied Science  
University of Virginia  
In Partial Fulfillment of the Requirements for the Degree  
Bachelor of Science in Computer Science

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October 27, 2022

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**

With a projected global market forecast for 65 billion U.S. dollars by 2027, low-code is a developing industry that shows potential for overtaking traditional coding (“Relevant Low-Code Statistics for 2022 | Quandary Consulting Group,” 2022). The popularity of low-code arises from the increases in flexibility (83%), speed (63%) and automation (67%) (“Large Enterprises Succeeding with Low-Code | Appian”, 2019). As a result, businesses are able to optimize and track their process of digital transformations with reduced cost, risk and time. In the case of this technical project, low-code platforms, specifically Mendix, can be used to develop website applications for both commercial and governmental use. The development of a website would require communication between a client and producing functionality and aesthetics that align with the client’s envisioned application. An additional aspect of the technical project is the creation of pluggable widgets specializing in funnel charts that would increase the efficiency and ease-of-use for display of customized data.

The second proposed project in this prospectus examines artificial intelligence (AI) art which serves as a unique avenue for creating digital art. Currently, there are many discussions on the effect that AI art has on modern society and whether it proves to be a positive or negative change. AI art mainly presents its usefulness in improving facial recognition systems, providing important cultural art styles, and inspiring creativity for people around the world to experience their thoughts through visual representation. More specifically, AI art displays potential in the advancement of facial recognition systems throughout the world. According to a Harvard study on facial recognition, the current system boasts a 90% accuracy rate of detecting individuals yet show discrepancies in people of color and gender (“Racial Discrimination in Face Recognition Technology | Harvard University”, 2020). As such, IBM and Microsoft have halted their

progress on facial recognition until it reduces their level of bias. AI art maintains the capacity to provide a larger database that could reinstate a vital tool in the crime departments of the world.

## **Technical**

A San Antonio, Texas-based startup that works closely with both commercial and governmental projects requires implementation of new web applications and widgets for use in software development of new projects. Mendix, a leading low-code language, tackles this web application development problem by reducing production time of traditional coding with visual aids to optimize the creation of new websites and widgets. The Mendix language allows users to provide essential websites for prominent companies along with professional skill sets in communication, technical coding, and team building. Combined with React, my role at this startup consisted of providing more general developmental tools for the company while also producing customized websites for potential clients. Further development of more widgets and websites are always possible to continue production of more client-based projects. With low-code becoming a rising software development avenue, the next look may be to introduce programs like Mendix as a new leading tool to the coding community.

When applying the Mendix library to web applications, the documentation contains vast and thorough information. Both new and old widgets or import packages are provided with guides to utilize the code and designed to integrate with ease. The Mendix “marketplace” offers frequent new features that develop with the growing software industry. Implementing these widgets and the respective blogs/documentation yielded concrete results in processing data, creating new features and optimizing the efficiency of the application as a whole (“Marketplace Overview | Mendix Docs”, 2022). Furthermore, the integration of Javascript allowed the use of

its libraries which indicated even greater potential for development. Mendix and Javascript often work in tandem therefore speed up and improve upon the web application development process.

After a three-week training process and opportunities in side projects, I was teamed with a fellow intern to develop a Minimum Viable Product (MVP) for a potential client. The project introduced new challenges as I learned to develop the application under pressures of deadlines and consistent communication with both the team and the client. The application consisted of all our learned techniques while also requiring implementation of new features.

To begin the project, Mendix requires a strong data structure that builds upon the backend data management. This management is done through a domain model that consists of entities and associations. Creating an entity is similar to initializing an object in traditional code. An entity usually represents a class of real-world objects (such as customers, invoices, CDs, etc.) and an instance of an entity is called an object (“Entities | Mendix Marketplace”, 2022). In order to make entities function throughout the project, associations connect entities to display a hierarchical breakdown between entities. For example, if there is a teacher entity, there may be multiple student entities that may be correlated with a teacher. This process was used to initialize the key entities of the project and ultimately develop a prototype application that could onboard a potential client for the company.

### **STS Topic**

Facial recognition has become a staple in security for its uses in law enforcement surveillance, airport passenger screening, and employment or housing decisions. However, given the current societal influence of facial recognition systems, many institutions must understand the technological determinism that arises from this technology (Smith, 1994). Current societal standings of facial recognition technology cannot be classified as evil or just but rather as a

developing tool directly impacts societal classifications. The potential impacts of face surveillance consists of two distinct yet related cases. The first issue represents the breach of liberties and civil rights as the technology becomes more advanced. Face surveillance specifically threatens privacy, freedom of expression, and due process as the photos within a recognition database could be procured from an individual's smart phone to the police driver's license system. Technological determinism would argue that similar privacy-invasive technology affects society and people's decisions regarding technologies such as facial recognition. The second issue emerges as the misidentification of people, specifically the youth, elderly, women, and people of color. Misidentification places innocents within the perception of crime and leads to serious consequences for the victim's public image and livelihood ("What is Facial Recognition Technology?" | Algorithmic Justice League", 2022). In the case of Amara Majeed, a Brown University student, Sri Lanken police erroneously identified Majeed as a public prime suspect of a bombing due to incorrect facial recognition systems. Afterwards, Majeed faced death threats, police scrutiny, and interruption in education (Fox, 2019). Another act of misidentification is shown through Willie Allen Lynch, an innocent African American male. The facial recognition system match for Lynch resulted in a low confidence yet was charged with intent to distribute serious drugs in 2016. Despite the arduous trial, Lynch was sentenced to eight years in prison as evidence of the match was never revealed (Mak, 2019). These cases serve as clear reminders for the underdevelopment of facial recognition systems that displace distrust in innocent people throughout the world. Although there may be many other solutions, AI art could provide aid in improving facial recognition systems and solving its detrimental problems.

For AI art to significantly contribute, it is important to establish how it works and understand its capabilities. Current programs, such as DALL-E, are able to receive a visual or

textual semantic, generate images similar to the prompt, map an image based on the prompt and display a completely “original” image. These programs have the ability to alter existing images while also being able to narrow down millions of images into one (O’Connor, 2022). Utilizing AI art programs, facial recognition databases can better analyze incoming data and optimize their algorithms to improve accuracy. AI art will be able to address both previously mentioned issues of privacy and misidentification. Firstly, the nature of facial recognition systems relies on machine learning, the programming of algorithms to “learn” from previous experiences in order to solve problems that are too complex to solve with conventional programming. (“Machine Learning and Facial Recognition | Pxl Vision”, 2022). The creation of AI art with variations of people in every race, age, or gender will provide images for facial recognition systems to practice and improve their identification process. By gaining experience in matching features of artificial images, facial recognition systems can learn to better identify a target match even if their appearances have changed. Furthermore, the use of AI art will also address the issue of privacy. Even though an existing photo of the match target must exist, artificial photos of “faces that do not exist” allow for databases to not intrude on people’s sanctions of agreement. As described, facial recognition technologies map and analyze face geometry and facial expressions to identify a similar match. The technology typically scans the distance between eyes, nose, mouth, etc. and adds to its memory of how a certain archetype of people may look like (“What is Facial Recognition | Amazon Web Services”, 2022). AI art provides the safe and vast database that facial recognition systems seem to lack.

## **Methodologies**

Research Question: Given the recent rise of artificial intelligence art, how could it affect the current bias within facial recognition systems?

To answer this research question, I will use the Wicked Problem Framing methodology. According to a case study called the Gender Shades Project, facial recognition systems by Microsoft, FACE++, Amazon and IBM yielded at least 80% accuracy among women and at least 99% among men throughout all of its trials (Gender Shades Project, 2018). However, upon closer examination, it was found that divergent error rates across all demographic rates displayed noticeably lower accuracy rates, with the lowest in subjects who are female, black and 18-30 years old. Although much of facial recognition technology is relatively new, the bias of age, race and gender in these facial systems are causing heavy controversy among today's societal standards.

This discourse called for IBM and Microsoft to take steps to reduce bias by improving their data and modifying their programs. Amazon and their facial recognition system (Rekognition), on the other hand, responded that the Gender Shades Project testing methods were the main point of concern, rather than the inherent racial bias of facial recognition databases (Wood, 2019). The Wicked Problem Framing relies on the idea that all wicked problems contain indirect and hidden connections between symptoms and root causes of an overarching issue (Seager, Selinger and Wiek, 2012). Given Amazon's defensive response to an inherent racial bias that was found across many other facial recognition systems, I find the Wicked Problem Framing a fitting framework due to the creators of this technology. Facial recognition systems seem to provide itself as an essential tool in many industrial and governmental departments across the world but contain inherent bias that need further development. This controversy calls for a new reorganization and planning process of equalizing facial recognition accuracy across all demographics.

## **Conclusion**

This paper consists of a coverage on Mendix and its emergence of low-code as well as the bias and effects created by the use of facial recognition technology. For the first topic, a small team will be leading a project on developing a low-code web application for a client and creating widgets for internal company use. The goal of the project is to provide a viable prototype to potentially introduce a new client to the company while also gaining personal experience in business and software engineering. The end results of the project are to learn skills to frontline other projects and further the library of available tools.

On another topic of leading software technology, artificial intelligence art contains the potential to provide an aid in developing better facial recognition systems. Due to the high levels of discrepancies throughout ranging demographics, facial recognition systems call for an improvement in accuracy while also providing privacy for the public. Artificial intelligence art bridges this gap by creating vast and unique images of varying individuals that aid in future matching analysis. The technology has been proven to function at incredible rates but requires much needed attention in detecting people of color. This paper covers the possible uses of utilizing distinctive human features in order to improve facial recognition systems that cause controversy throughout the world.



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