Thesis Project Portfolio

Improving Computer Science Curricula to Better Prepare Students to Develop Secure Applications

(Technical Report)

Order versus Justice: The Struggle over Predictive Policing in the U.S.

(STS Research Paper)

An Undergraduate Thesis

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In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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My STS technical report entailed the option of proposing a new course for the computer science department at UVA. My proposal was a course called “Cybersecurity in the Modern Workplace” where students can learn how to use and implement cyber security techniques that closely mimic situations they are likely to encounter in real life scenarios. My STS research paper examined the difficulty associated with implementation of predictive policing in the United States. This required my examining the consequences of specific predictive policing algorithms and their implications. The connection between my topics came from looking into the question of how social groups in the United States seek to improve public security and safety. Exposing students to security measures and requirements early in the curriculum h will help them be better prepared for tackling more complex issues like including AI bias in the future.

For my technical report, I explain the main purpose of my proposed class of Cybersecurity in the Modern Workplace which is to emphasize the critical need for improved cybersecurity in the United States. While the current curriculum enables students to learn about cybersecurity, there needs to be increased emphasis on introducing students with the means to deal with real world scenarios. My idea is to develop a synthesis of courses between CS3420 (Advanced Software Development Techniques) and CS4630 (Defense Against the Dark Arts). CS3240 simulates working in a team which is similar to how the app development process functions in a work environment, but the course does not put much of an emphasis on security. CS4630 teaches students about hacking techniques and how to prevent them, but it is usually concerned with outdated smaller level issues that do not relate to conventional use. My proposed course would have students work in teams to develop applications with an emphasis on security measures. For my STS research paper, I examined the effectiveness of predictive policing in the United States. Predictive policing incorporates predicting or forecasting crimes before they

occur. This is accomplished by using machine learning to develop algorithms based on large datasets of crime history to try and predict where crimes may occur. The effectiveness of these algorithms vary based on how each algorithm is developed and how each is used. Although, many studies show that these algorithms contain biases that negatively and unfairly affect and discriminate against marginalized communities. This algorithmic bias is a result of faulty datasets that are a byproduct and reality of real-world bias in policing.

Security in the realm of technology will always be an ever-growing issue. While we may advance technology with the intention of doing good, there will always be groups that intend to use it for malicious purposes and security must come into play. However, as engineers, we must make sure that policies we implement do not unintentionally harm others. Social issues including algorithmic bias in tech is a major issue and one that I feel is important. Future tech workers need to understand these issues are real and present and by going into this industry, they will either be working against it or upholding it depending on their actions. Having a better understanding early on is helpful which is why I feel that my proposed course of Cybersecurity in the Modern Workplace and work as a base to familiarize ourselves with problems industry is hoping to solve.