Thesis Portfolio

ChoreoNova Ticketing System
(Technical Report)

Improving the Psychiatric Diagnostic Procedure With Machine Learning
(STS Research Paper)

An Undergraduate Thesis

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

Jared Taylor
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Department of Computer Science

Table of Contents

Sociotechnical Synthesis

In completion of my Senior Thesis, I have completed both a technical thesis and an STS research paper. For my technical portion, I developed a ticketing website for a local dance non-profit. For the STS portion, this thesis explores the various machine learning approaches to decreasing misdiagnoses in the mental health field. Both projects were developed during my Fourth Year at the University of Virginia, and even though they were not chosen for the thesis with any particular connection, they have proven to have very similar socio-technical concepts between them.

ChoreoNova came to the University of Virginia looking for students to help them develop a new ticketing service for their dance performances. They had issues getting people to come to their shows due to their inefficient system they had at the time. They had a newsletter that would link them to a third party ticketing website to allow a customer to buy a ticket. They wanted a website built and owned by their non-profit, as it would streamline the customer experience and give them more insight into customer demographics. The goal of this project was not to slightly enhance their current process, but rather create a new system that solved all of the issues on their end and the customers end. Choreonova believed that for customers to adopt the ticketing system, it would have to minimize clicks and redirects, to create a simpler process. Creating a website owned by ChoreoNova will lead to an increase in hosting fees and also will require more overhead from ChoreoNova, as they will need a web admin to create events on the website and deal with any issues that arise on the platform. However, the enhanced experience

and information gained from the new system will hopefully lead to an increase in ticket sales for them.

In the STS portion of this project, various machine learning approaches were explored. The current diagnosis process in the mental health field leads to a large number of misdiagnoses due to the reliance on the DSM-5 criteria. Diagnoses often rely on a psychiatrist's judgement and not on empirical evidence. Some approaches use machine learning to simply make better guesses using the DSM-5 criteria, while others attempt to reinvent the process by adding empirical evidence for the diagnosis. The approaches that seek to reinvent the process using more quantitative evidence have fewer misdiagnoses than those that attempt to make the current process more efficient. The machine learning approach that aims to eliminate the old diagnostic system will be hard to implement due to its required research, increased cost, and adoption. For some mental health disorders, it is not known what underlying empirical evidence is correlated with the disorder. Research will have to illuminate these relationships to allow this approach to be further developed. This approach will also require hospital or laboratory visits that will be a financial barrier to some. The traditional approach could potentially be completed with a simple survey, so this approach would cost more in comparison. Finally, it might be difficult to have health institutions and medical professionals to adopt a system when they have been relying on the old methods for their entire existence or career. However, research into this topic has shown that the system relying on empirical evidence will have better results for patients, and therefore should be pursued despite its barriers.

The two sections of this thesis are alike in that they both seek to solve a problem by reinventing a process, not extending the current and accepted one. The obvious implementation

of technology in any circumstance is to allow it to simply make things remain the same, albeit a bit more efficient. However, in the case of ChoreoNova, the system's flaws were leading to low ticket sales and dissatisfied customers. In the case of mental health diagnostics, the current system is leading to individuals not receiving critical medical care. Making either system more efficient, would simply lead to more dissatisfied customers and more misdiagnoses. Although it may require more work and be harder to have others adopt at first, implementing a new system where the current system is clearly failing will lead to a better system.