Thesis Project Portfolio

Outfit Cataloguer: A Digital Wardrobe Assistant

(Technical Report)

Addressing Algorithmic Bias in Artificial Intelligence

(STS Research Paper)

An Undergraduate Thesis

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Executive Summary

When Outfit Cataloguer was conceptualized, the feature that was believed would be of the greatest impact was automatic outfit generation. If a machine learning (ML) model was trained on a user's fashion choices and wardrobe, it would have the capability to compile new and interesting outfits for the user and reduce the amount of manual input for the app while still reaping the benefits. While ML has not yet been implemented in Outfit Cataloguer, it was still pertinent to explore the dangers of AI for this project. For engineers, it is important to be aware of potential harm that could be created by their work. As a preventative measure, the inherent and created biases of machine learning were investigated in the STS Research Paper, as well as how to reduce them.

Clothing production and the fast fashion industry are large sources of water waste, pollution, and carbon emissions. The industry is supported by consumers who buy new clothes frequently. Outfit Cataloguer is a web application designed to help end users utilize their full closet. This is accomplished in the app by allowing users to upload images of their clothing and apply attributes to them, such as color, formality, and type. The uploaded items can then be filtered by attributes and combined into outfits. The goal of this project is for users to construct and wear outfits that make use of a wider range of their closet, reducing their need to buy new clothing. This aim could be supported further by implementing a machine learning algorithm to automatically build outfits based on their previously built outfits.

Algorithmic discrimination occurs when AI systems make decisions based upon protected attributes, such as race, age, or sex. This kind of bias is often present in ML models. Technologies ranging from facial recognition to recidivism calculation have been found to possess algorithmic discrimination, and ML usage is growing very quickly in practically every industry as well, so the need for methods to mitigate this discrimination is high and rising. This

paper seeks to answer this question: how can algorithmic bias be reduced in artificial intelligence? The Social Construction of Technology (SCOT) framework will be used to examine this question, specifically in how biased algorithms are produced. The research for this paper will compile different strategies and resources for reducing bias during the designing, building, testing, and production phases of ML models. There will be both non-technical strategies, such as those relating to the demographics of the engineering team, as well as technical ones, often involving algorithms to speed the debiasing process.

Rather than simultaneously, the work for Outfit Cataloguer in its current state was completed about a year before researching for and writing the STS Research Paper. Outfit Cataloguer was started as a class project and more polishing was done after the class concluded. This project is still unfinished and will be until automatic outfit creation is implemented. It was advantageous that the ML discrimination investigation occurred before starting this feature because bias can consciously be planned for and avoided. If Outfit Cataloguer was created in its entirety before the STS Research Paper, it is likely that there would be unintentional biases contained within the model that would need to be removed, which could require retraining. It is less time-consuming, cheaper, and potentially less harmful to proactively prevent bias in the creation stages of a model than to have to modify it after the release stage.