Thesis Project Portfolio

DFit: Cloud-Based Service and Business Case

(Technical Report)

Examining How Rhetoric Affects the Development of AI Technologies

(STS Research Paper)

An Undergraduate Thesis

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

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

Esther Yi

Spring, 2024

Department of Systems Engineering

Table of Contents

Sociotechnical Synthesis

Technical Project

The goal of my technical project is to create a business case for a distribution fitting software called Distribution Fitter (DFit). DFit is a software that fits a variety of continuous parametric distributions to random samples, censored samples, or expert-assessed quantiles, and then ranks them by goodness-of-fit to find the best model. It is a joint venture between three parties: CapTech, a consultancy in Richmond, Virginia, represented by Wray Mills, whose team hosts, operates, and services DFit; Roman Krzysztofowicz, who authored the theory behind DFit and the book Probabilistic Forecasts and Optimal Decisions [1]; and Wiley & Sons, Ltd., who is to publish the book in 2024. This project provides a business case for CapTech, who needs to decide whether DFit is worth supporting. The three goals for this business case: (i) to improve the scalability and performance of DFit, (ii) to evaluate its performance relative to competing software in the market, and (iii) to forecast the demand for DFit and the book.

DFit needed to be moved to a cloud-based infrastructure, Amazon Web Services, for scalability and to be able to handle the expected increased foot traffic with the publication of the textbook. This was particularly hard because the previous software was outdated and needed significant handling to be compatible with AWS. Evaluating the performance of DFit to its other competitors is important to justify CapTech as to why DFit is a valuable asset to support. Ultimately we did find that DFit provides the best goodness-of-fit measurement MAD among competitors. Finally, the forecasting of DFit and the book is important to demonstrate the market value of both products and prediction for sales and users for DFit, which was estimated under the metric of unique accounts. This is an important measurement for CapTech so it can determine

whether the sales and foot traffic expectations fit with their expectations.

In conclusion, this report presents a compelling business case for CapTech that not only does DFit enhance the academic and practical applications of probabilistic forecasting and optimal decision making, but also positions DFit as a unique and strong tool in the market for modeling probability distribution programs.

STS Project

While working through the business case of DFit, I began to wonder how technologies became popular. I wanted to figure out what things we could do to bring traction to DFit because being a good software is not enough to make people use it. So then I decided to look at a popular case study: Artificial Intelligence. From there, I decided to look specifically at language and rhetoric to determine how those factors contribute to AI's development.

The goal of this project was to answer this question by evaluating the history of AI and what that means for us today, the language behind AI in media and news, and the social power in AI development. The history of AI is important because it tells the story of why people think certain ways about it. How perception of AI changes and some of the factors that lead to that are important. Because news and media are some of the biggest influences on what society believes to be true, the language they use to describe AI is important to study to better understand what people in society think. However, the part that will determine how and why AI is developing is the people who are in power. The motivations and objectives of such processes for those holding the power may or may not match public dissent.

What I found was that the drive and passion for AI demonstrated by the constant

investment and creation of those technologies by large tech firms are not shared by the general public. The discrepancy is observed in the language found in media and news to describe AI with more fearful and critical word choice being used. A few contributing factors to this are that in the news, fear sells much better than optimism and that unethical issues of AI practices have increased poor public perception and derogatory coverage. When the people who are being targeted by AI are not the same voices who are developing that technology, a gap develops. The people who it is being used and the people and actors who are building do not share the same values. It seems that the public perception as determined by the language behind AI is not necessarily a determinant of AI, because the smaller group of people developing the technology are not affected by the discriminatory applications of AI, nor are they as likely to fall into the clickbait of exaggerated and untrue stories.

This study relies heavily on two frameworks: critical discourse analysis which looks at the power of language and actor-network theory which is an observation of the connectedness of different human and nonhuman elements. Critical discourse analysis was used to help better understand how language molds society and public perception while actor-network theory was used to explain how different actors affect AI development. To connect the two concepts, how language is used to give power to different actors was observed.