Thesis Project Portfolio

Mitigating Bias in AI-Driven Hiring Systems for Manufacturing

(Technical Report)

Shaping the Future of Work: Competing Interests in Automation in the U.S. Labor Force

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

Introduction

It is becoming increasingly important to understand the broader social impact of AI technologies as they become more integrated into the workplace. My technical capstone project explores ways to reduce bias in AI-powered hiring systems used in manufacturing, while my STS research looks at the competing interests surrounding automation and its effects on the U.S. labor force. Although these projects analyze different aspects of AI adoption, they are both related to the central topic of implementing advanced technologies that promote fairness, inclusivity, and support for workers. This reflects the idea that true responsible innovation involves both technological solutions to specific problems and more abstract explorations of how technologies reshape social and economic structures. Through these two research projects, I gained a deeper understanding of the technical challenges of developing equitable AI systems and the complex power dynamics that influence how technological change happens in the workplace.

Technical Project Summary

My capstone project addresses the critical issue of bias in AI-driven hiring systems within the manufacturing sector. As these systems have transformed recruitment processes over the past decade, they have also exhibited troubling biases against groups including displaced workers, older employees, and minorities. I propose a targeted framework that combines fairness metrics to evaluate algorithmic bias, implements mitigation strategies such as reweighting and adversarial debiasing to address disparities, and incorporates explainability tools to enhance transparency in decision-making. Testing on simulated manufacturing recruitment datasets demonstrates that

these tailored mitigation techniques can significantly improve fairness metrics without compromising model performance. The results show promising pathways to enhance workforce diversity and connect displaced workers with reskilling opportunities. The project contributes to the growing field of responsible AI by offering specific technical interventions that manufacturing employers can implement to ensure their hiring algorithms promote equity rather than reinforce historical patterns of discrimination.

STS Research Paper Summary

My STS research paper examines the shifting dynamics between automation and labor in the U.S., specifically in the manufacturing and logistics sectors. Comparative case studies of General Motors (GM) and Amazon reveal that automation's impact on workers is not predetermined but rather shaped by corporate strategies, regulatory environments, and power relations between employers and employees. Using STS theory and the Political Economy of Labor frameworks, I analyze how automation decisions reflect labor structures rather than inevitable technological progress. The comparative case studies demonstrate how different industries approach automation, with GM directly displacing workers through robotic production while Amazon creates precarious employment alongside its automated systems. The case studies highlight that weak labor protections in the U.S. enable companies to prioritize efficiency and profit maximization which shifts the social costs of technological transition onto workers and communities. By contrasting American approaches with alternative models, which feature stronger worker protections and retraining requirements, the research demonstrates that other options exist for managing automation in ways that distribute its benefits more equitably.

Reflection

Working simultaneously on these projects enriched my understanding of AI's role in the workplace. The technical work on bias mitigation forced me to grapple with the concrete mechanisms through which algorithmic systems can perpetuate inequality, providing specific insight into how technological design choices are associated with certain social values. This technical understanding, in turn, deepened my STS analysis by helping me recognize the specific ways automation technologies embed corporate priorities of efficiency and control. Conversely, my STS research on power dynamics in automation decisions heightened my awareness of the broader context in which bias mitigation tools operate, revealing that technical solutions alone are insufficient without addressing the underlying economic incentives and regulatory frameworks. This perspective prompted me to consider implementation challenges for my technical project and helped me recognize the importance of designing explainability tools that genuinely empower workers and hiring managers rather than merely satisfying superficial transparency requirements.

Further, the parallel development of these projects helped me analyze AI systems across multiple scales, from the technical details of fairness metrics to the macro-level political economy of technological change. This multidimensional perspective demonstrates the value of approaching technological development through both technical expertise and sociotechnical analysis. By understanding both how to build better systems and how to place them within the right institutions, this research contributes to discourse around responsible innovation that views technology not as an autonomous force but as a human creation that should be consciously shaped to reflect collective values and priorities.