

From Classroom to Boardroom: An Internship Experience in FinTech

Ethical and Policy Challenges in Autonomous Vehicle Decision-Making

A Thesis Prospectus

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By

Janco Megerssa

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

ADVISORS

MC Forelle, Department of Engineering and Society

Rosanne Vrugtman, Department of Computer Science

Introduction

As we continue to improve the way transportation is developed and used, autonomous cars are becoming an ever-growing luxury and a technology that holds a lot of transformative potential. The continuing evolution of AVs promises a future where road safety, efficiency, mobility, and simplicity are enhanced significantly. The appeal of AVs not only comes from their sophistication but also in their potential to address some of the current challenges in modern transportation systems. Integrating AVs into everyday life is going to be a complex and difficult task. Creating reliable and efficient AVs involves overcoming substantial challenges in sensor technology, data processing, and decision-making algorithms. These challenges are not solely technical but also encompass ethical, legal, and social dimensions such as discussions on safety and prevention of harm, moral algorithms, data and privacy, joy of driving, and inclusion. (Ryan, 2020).

AVs could have complex ethical dilemmas when it comes to decision-making in emergency scenarios. There is the question of when an AV is at a crossroad, what will it decide when faced with having to choose between the lesser of two evils during an imminent accident. These dilemmas boil down to how these systems are programmed with decision-making protocols and algorithms. It is important to assess who decides what is right or wrong in these programs, how moral integrity is ensured, and how the ethics of AV decision-making meshes with public policy and legal frameworks.

For my STS topic, this research project aims to study what the ethical implications of programming autonomous vehicles for decision-making in emergency scenarios are, and how these implications shape public policy and legal frameworks. It will particularly concentrate on the ethical programming of AVs in emergency situations and how these decisions impact public

policy, legal frameworks, and public trust. For consumers to switch from traditional human-driven cars to autonomous vehicles, and for the wider public to accept the proliferation of artificial intelligence-driven vehicles on their roads, both groups will need to understand the origins of the ethical principles that are programmed into these vehicles (Awad et al., 2018). This section aims to explore the intricate relationship between AV technology, ethics, policy, and public perception, informed by relevant studies and theoretical frameworks. As AV technology evolves, understanding and addressing these societal concerns become crucial.

For my technical topic, I will be discussing a project I worked on during my summer internship. It focused on the development of a solution for a new software feature within the company's web and mobile application. Through this project I learned the various ways new technology can affect people's lives and society through its promised benefits.

Technical Topic

During the summer before my final year, I had the opportunity to participate in an enriching internship at a company that was a global leader in investment banking. My role focused on enhancing the backend systems of their digital banking platform, particularly their investment and banking app. This project was instrumental in improving the platform's efficiency and user experience, especially in handling complex financial operations like Roth IRA conversions. When working on this project and researching, our team wanted to answer the question of: How could the process of Roth IRA conversions within the digital banking platform be automated to enhance operational efficiency and user experience, while ensuring compliance with financial regulations and security standards?

The platform's team faced some challenges in its current means of IRA conversion processes. The existing manual system was inefficient, time-consuming, and prone to errors,

leading to customer dissatisfaction and operational inefficiencies. My task was to develop an automated solution to streamline this process, thereby enhancing the app's functionality and user experience. The primary goal of my internship project was to design and implement an automated system for Roth IRA conversions within the company's investment and banking web-app. This system needed to be secure and capable of handling various user requests, while also simplifying the process of initiating and completing a conversion. The challenge was to seamlessly integrate this new feature into the existing digital banking infrastructure without disrupting ongoing services as the team worked with a large codebase that consisted of numerous microservices.

Before designing and developing this solution, I worked closely with the team to understand the codebase, frameworks, and get a better understanding of how Roth Conversions worked and what the surrounding Federal and State Compliance policies and Laws were. We conducted a comprehensive analysis of the current manual IRA conversion process, the different types of conversions, and more. The team had already gathered some requirements prior to my arrival but we obtained more requirements for the automated system, ensuring it aligns with user needs and regulatory standards.

A week into my internship is when I began to design the backend architecture for the automated Roth IRA conversion feature, focusing on scalability and integration with the existing codebase. I utilized various modern programming frameworks and tools, such as RxJava for asynchronous programming and Spring Boot for application development. These efforts were not simply by myself as they were coupled with collaboration with various teams, including front-end developers, to ensure seamless integration of the new feature with the existing app interface. The company had strict rules around what could be deployed for safety reasons,

customer satisfaction, and etc. With every implementation came rigorous testing protocols, including unit, integration, and end-to-end testing, to ensure the reliability and security of the new feature.

The project at the company was a significant step in my professional development and contributed to the advancement of digital banking services. By automating the Roth IRA conversion process, the project not only streamlined a critical banking operation but also enhanced the user experience, setting a new standard for efficiency and customer satisfaction in digital banking platforms. While my project focused on digital banking, it relates with the ethical and regulatory challenges in programming AVs. Both require a careful balance between technological innovation, ethical considerations, public trust, and regulatory compliance. The experience gained in automating financial processes provides valuable insights into the broader implications of technology in society, particularly in areas like autonomous vehicles, where ethical decision-making and public policy are critically intertwined.

STS Topic

Diving into the world of autonomous vehicles (AVs) is like opening up a can of ethical, policy, and legal worms. The issue at hand isn't just about how smart these machines are at navigating roads, but how they navigate through tricky situations, especially emergencies. It's in these critical moments that an AV's programming transcends from mere code to something resembling human decision-making, loaded with moral and legal implications. This journey into the surrounding ethical implications isn't just a philosophical attempt, but a practical one too, as it has the potential to shape how laws and policies evolve around AVs. In line with how the technological determinism belief affirms the ideas that technological development exerts a great influence on society, as described by Smith and Marx (1994). Hancock, Nourbakhsh, and

Stewart (2019) also discuss this in their examination of the future of transportation in the era of automated and autonomous vehicles. They seek to answer questions focused around how such technologies will impact evolving transportation systems, the social world, and the individuals who live within it and whether or not these systems need to be fully automated or under some form of human control.

The ethical dimensions of AVs, particularly in life-and-death scenarios, are pivotal. Bonnefon, Shariff, and Rahwan (2016) explore the social dilemma inherent in programming AVs for such critical decisions, highlighting the ethical predicaments involved in determining whose lives are prioritized in unavoidable accidents. Complementing this, Lin (2016) argues for the centrality of ethics in AV development, emphasizing the need for these machines to make morally sound decisions. This ethical problem is not just theoretical but has practical implications in how AVs are programmed to respond in emergencies. Further exploring the ethical landscape, Awad et al. (2018) in their "Moral Machine" experiment delve into the complex moral decisions faced by AVs, providing a broader understanding of public ethical preferences in these scenario

The policy framework governing AVs is equally complex. Mordue, Yeung, and Wu (2020) highlight the looming challenges of regulating high-level autonomous vehicles, indicating the intricate balance between technological advancement and regulatory frameworks. This is complemented by the U.S. Department of Transportation's (2021) Automated Vehicles Comprehensive Plan, which outlines the strategic direction for integrating AVs into the national transportation system. These policies must navigate the delicate balance between innovation and public safety, ensuring that the deployment of AVs aligns with societal goals and regulatory standards. This is underscored by the necessity for comprehensive and anticipatory

policy-making to manage the societal implications of AVs, resonating with the "Technological Determinism" perspective of ensuring technology serves democratic and human-centric goals.

Public perception plays a crucial role in shaping policy and legal frameworks for AVs. Understanding public trust and concerns is vital for developing policies and legal structures that are socially acceptable and effective. In the Moral Machine Experiment, the platform gathers human perspective on moral decisions made by machine intelligence such as self-driving cars. Through this, there is a gauge of what society expects of these vehicles and what need to be put together in order to gain the trust of the public.

In the legal domain, Geistfeld (2017) examines the implications of AVs for state tort liability and insurance, providing a framework for how legal systems might adapt to this new technology. Additionally, Peterson (2012) discusses the intersection of new technology and California's insurance framework, highlighting the legal complexities introduced by AVs.

The impact of AVs extends beyond roads to urban and workplace settings. Duarte and Ratti (2018) investigate how AVs will transform urban life and infrastructure, suggesting significant changes in city planning and mobility. Pettigrew, Fritschi, and Norman (2018) extend this analysis to the workplace, examining how AVs might reshape the professional environment and surrounding areas. These changes necessitate a rethinking of urban design, transportation policy, and workplace dynamics, ensuring that the integration of AVs contributes positively to urban development and the quality of work life.

Research question and methods

Building upon the foundational understanding of ethical, policy, and legal dilemmas surrounding autonomous vehicles (AVs) as discussed in the STS topic section, this study is guided by the following research question: "How does programming autonomous vehicles for

decision-making in emergency scenarios raise ethical concerns, and what is the resulting influence on public policy and legal frameworks?"

To answer this question, the research will be conducted through a methodical approach comprising two interconnected strategies: Ethical Analysis and Policy and Legal Framework Examination. The first strategy involves an in-depth literature review that will be conducted focusing on the ethical theories and principles that apply to AV decision-making in emergency scenarios. The latter, drawing from the insights gained in the ethical analysis, this study will examine existing and proposed public policies and legal frameworks. This will involve analyzing legal statutes, regulatory guidelines, and policy documents. The study will also include understanding how ethical considerations are currently being integrated into AV regulations and what future developments are anticipated.

The research intends to produce a comprehensive view of how ethical imperatives are translated into practical programming decisions for AVs and the subsequent ramifications for public policy and legal structures. By addressing this complex interaction, the study aims to contribute to the development of responsible and ethically-grounded policies that govern the deployment of AVs in society.

Conclusion

The technical work I completed at my internship was successful in that I was able to innovate and add to the backend system for the app's team, specifically in automating the Roth Conversion process. My STS research is all about digging deeper into what it really means for AVs to make decisions, especially when things are stressful and high-stakes. This venture is about assessing how individuals feel about sharing roads with these smart cars, and going through current laws to determine how it is trying to keep up with these fast-evolving machines.

It's about unearthing the ethical, policy, and legal landscapes that these smart cars will drive through. Just like with the company's investment and banking app, the goal here is to make the path smoother, but this time, it's about making it smoother for AVs, the law, and us folks who will share the road with them. The journey at the investment banking company was a precursor to understanding how technology, when intertwined with regulatory compliance and user-centric design, can improve operational challenges while enhancing user satisfaction. Similarly, delving into the ethical programming of AVs offers a lens to view how technology can be designed to interact harmoniously with societal norms and legal frameworks, thereby contributing to safer and more responsible AV integration on our roads.

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