Title

Autonomous Vehicles: The solution to urban transportation?

Permalink

https://escholarship.org/uc/item/544026c4

Author

Choi, Sean

Publication Date

2025-03-17

Autonomous Vehicles: The solution to urban transportation? Analyzed through Standpoint Theory & Native Feminism

Sean Choi[1]

[1]*Undergraduate Civil Engineering Student at the University of California, Los Angeles*

* sean.yu.choi@g.ucla.edu

Abstract: Autonomous Vehicles (AVs) are an exciting innovation for transportation of the future but pose issues that necessitate discussion. Under relevant frameworks of standpoint theory and native feminism, these can shed light on crucial disparities and inequities in mobility.

INTRODUCTION

Despite the concept of the autonomous car existing since the inception of the automobile in the early 20th century, it can be argued that the rapid rise of the technology is a byproduct of the work in more recent decades. Prominent companies exploring this space, such as Waymo under Google, ZooX, Cruise, and Apple[1] alongside other key stakeholders in this space are currently or formerly innovating various stages of testing and implementation of these vehicles. Under prospective collaboration and the continued involvement of 'Big Tech' organizations, the global market as a whole is projected to reach $615 billion by 2026.[2] One example among others, Waymo's overall fleet is accelerating at an unprecedented rate at various sites, where vehicles have the capability to go onto major highways in San Francisco, Los Angeles, Austin, and Phoenix. Common to each of these cities, aside from the original testing site of San Francisco, is the unifying factor of sprawl. Stemming from expansive interstates in the 1950s / 1960s that facilitated a faster mode of transportation and each of these cities prioritizing the automobile, public transit as an option was left to dwindle or left out of the picture. Most notably falling into this category was the localized Red Car system in Los Angeles, formerly among the most extensive in the United States. Dismantled through a variety of complex factors stemming from favoring freeways and buses, the preexisting decentralization of Los Angeles, and political factors prohibiting building[3], the urban development choices that shaped LA represent the contemporary American city today. Characterized by a lack of walkability, excess reliance on vehicles forming traffic, and the side impacts of pollution from exhaust, it is a smaller representation of lackluster decisions to which the root of the problems of transportation originate. While municipal governments have made decisions to usher in a larger shift towards larger-scale forms of mass transit, autonomous vehicles fall into a unique space existing between adding vehicles of the status quo onto the road while facilitating a shared form of mobility. Amidst the discussions and the rapidly emerging technology to solve the foundational problems that linger in US metropolises, each decision and expansion into new cities ultimately leads towards the foundational question analyzed primarily through the lens of Waymo in the city of Los

Angeles - are AVs the solution to our urban transportation qualms? This work is in partial fulfillment of the ENGR184 course using the blueprint curriculum in Ref.[4,5] and captured in a collection [6].

METHODS

Answering this question is not an easy feat - to this, the application of a two-step framework enables a division into a more visible and surface-level analysis in the form of standpoint theory, followed by the application of principles of Native Feminism. Standpoint theory is grounded in 3 principal claims: the social context of knowledge, making the marginalized group known and raising awareness for the non-marginalized, and originating research in the lives of the marginalized.[7] Establishing preliminary knowledge through initial analysis of the penalties and the privileges that provides a picture of those who are able to benefit from advanced forms of technology, the latter steps lead into the discovery of the marginalized and barriers faced in AV adoption that challenges the norm. Though more abstract and theoretical when applied to the context of autonomous vehicles, Native Feminism further challenges the norm with decolonization and indigenous ways of knowing, examining the ulterior motives of the large-scale companies in relation to the future of their development. All in all, the combination of these frameworks embodies the potential for differences in interpretation, leading to a unique analysis that may differ for the audience in interpretation with the broad nature of AV technology.

PRELIMINARY INTERPRETATION: PRIVILEGES AND PENALTIES

First, the essence of transportation must be discussed. In principle and an ideal scenario, the fundamental goal is to move people from point A to point B through the safe, efficient, sustainable, and equitable movement of people and goods.[8] Maintaining the context of the national vision, initial privileges in standpoint theory for AVs aligns to these goals, with acute decision-making to reduce a significant number of fatalities on the road[9], decreased traffic with less vehicles on the road[10], and greater autonomy and time saved for the rider.[11] From the author's perspective of living in one of the large urban metropolises, Los Angeles, without a car, AVs are an outlet to an alternative form of mobility for those without a personal vehicle with additional perks contrasted to the traditional vehicles. A brief observation of market pricing of the autonomous vehicles at the time of writing reveals the previously mentioned company, Waymo, to be economically feasible on a similar scale to the pricing schemes of competitors, Uber and Lyft, while maintaining the consistent standard across 24 hours of service. Additional abilities to comfortably select a vehicle without the implications of an unsafe driver and the assurance of a technology informing decisions on the road can provide mental and physical comfort, exemplified in sample personas of parents arranging rides for children or for late-night rides. The idea of an alternative modes of mobility also opens the opportunity to resolve certain issues under an urban planning standpoint, reflected in Waymo's serviced neighborhoods. With 14% of the entire county committed to parking[12], the emphasis on off-street parking requirements and lax zoning laws drain the vitality of businesses and the urban fabric of the city through increased disruptions[13], leading to AVs as a remedy to reallocate large-scale towards land usage to benefit both the business and the city as a whole. Environmental benefits are also to incorporated under less vehicles and an entirely electric fleet that contribute to a larger transition to cleaner fuels in transportation in a sector

committing 28% of the US emissions.[14] The environmental perspective serves useful here, with initiatives that are aligned with the general goals in mitigating climate change – ones of depleting less natural resources, decreasing greenhouse gas emissions (GHGs), and refined usage and consumption of energy towards more renewable sources that can serve as a commitment to reduce waste byproducts generated from traditional gas vehicles.[15] In essence, Waymo and similar AV companies offer a portfolio of privileges perhaps constrained to a sliver of society: safety in decision-making, cleaner vehicles and air, and comfortability to the growing and loyal user base who can afford and reside in regions of service.

       Through the holistic factors of pricing, consistency, and supporting sustainable and climate-conscious initiatives, the surface-level factors would suggest a general optimism with greater mass adoption in how AVs might alter the way that 'safe and efficient' transportation is carried out. However, standpoint theory also warrants the examination of the penalties under problematization, despite the suggested benefits of these vehicles. Omitted from the proposed question of "the solution to our transportation qualms" is the essential aspect of who this solution applies and who it does not to.
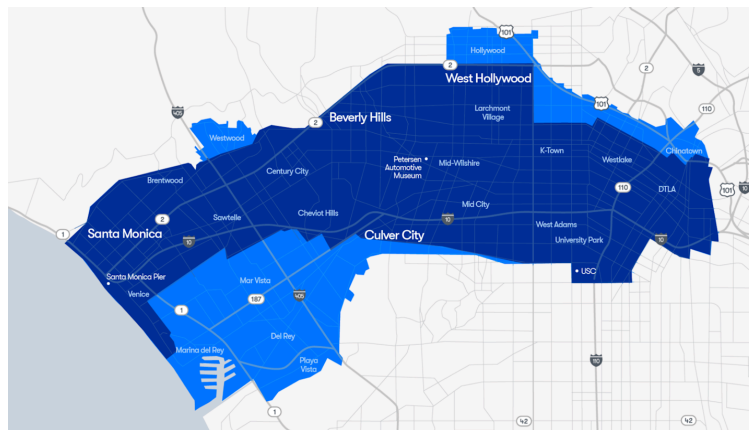

Figure 1: Waymo's current services, with dark blue depicting original operations and light blue depicting recent expansions. (Waymo)[16]

       Depicted above in Figure 1 is a current map of the service region. Waymo's current operations lie in a particular region of Los Angeles, those traditionally more wealthy and aligned with certain racial demographics that gives a better glimpse into aspects of the marginalized when placed alongside maps of racial demographics[17] and socioeconomic variables[18]. Traditionally marginalized neighborhoods in LA south of Interstate 10 in South Central Los Angeles, Inglewood, or Compton are excluded that mirror historical factors of neglect both in terms of poverty and pollution that propagates further inequities.[19] In a city where the people with disabilities, low-income older adults of all races, those in poverty, and certain groups of people of color are two times as likely to take transit rather than the average LA county resident[20], a lack of accessibility to AV transportation only distances the myriad of groups from Waymo's mission to be safer, accessible, and sustainable. While future expansions do plan on incorporating greater areas deeper into Inglewood and eventually a larger segment of Los Angeles, such progress is likely to be slow in adoption that is inhibited

by policy and company decisions to look into the implementation in modern and high-income neighborhoods first.[21]

Beyond the socioeconomic points, the ethics of decision-making and bias also play a role in the overall penalties. AVs use surrounding environmental information, motion of other vehicles, an HD map, as well as high and low-level behaviors[22], resulting in a reliance on imagery for information. Studies conducted remark the discrepancy between different ages, genders, and skin colors especially during day and night, where bias is demonstrated during the night on a degree of a some percentage points between testing groups.[23] The data that is collected and used for training indicates where marginalization can begin, alongside the training enforced in the determination of moral standards in life-and-death situations for vehicle riders under the standard trolley problem.[24] What can truly emerge as problematic is when the AV algorithms have the potential to make decisions that will prioritize the safety of some users over others, based on varying hypothetical scenarios[25] that may propagate moral inconsistencies in the vehicles that are trained from human data. Should an AV system be inconsistent with the ethical standards of another, compromising compatibility leads to issues in overall safety and social factors, once again reducing the foundational goals of transportation outlined in the beginning. In the attempt of defining a marginalized group, one can be led into numerous paths of identity politics and ethical scenarios that leads to what can seem like a never-ending task. Despite this, the fundamental practice of standpoint theory is to not quite attempt to create a persona of what the marginalized looks like in a constrained point of view, but practice identifying key characteristics of what the marginalized groups encounter on a daily basis to give the audience a picture of the concrete daily struggles and encounters of this group.

SECONDARY INTERPRETATION: A NATIVIST FEMINIST FRAMEWORK

Backed by the exercise of privileges and penalties, Native Feminism provides a deeper analysis into the applications of problematizing settler colonialism alongside its intersections, as well as a decolonized alternative. In the current absence of safety, innovation, and infrastructure, society has turned to autonomous vehicles as yet another solution that opens up the space to a variety of stakeholders, namely in the form of Waymo, to address these shortcomings. While the organization remains in the phase of innovation that permeates a general sense of excitement with each step of innovation, a general focus on commercialization of technology and a deviation to pricing over product produces risks in straying into the territory of profit. On paper, Waymo's values and vision stand to be positive and effective in enforcing the fundamentals of transportation. In reality, perhaps Waymo is more grounded in the definition of settler colonialism, one exploiting in the land to yield supreme value[26], Waymo's tactics of surge pricing mechanisms for profit generation and displacement of current Uber and Lyft drivers through increasing competition mirrors elements of historical practices displacing the native people in gentrification and displacement through a modern lens of economics and algorithms. An argument can be made for individuals working under Uber or Lyft in that they are partaking in the model applied by 'Big Tech' organizations that Waymo likewise falls under, but these workers are just as vulnerable to poor working conditions, a proportion of their wages taken away, and significant structural unemployment, especially for those primarily relying on driving-related jobs**.**[27] A greater privatization of the transportation mode devoid of education and engagement

of the communities perpetuates a more digitally inclined colonialism in a technology-influenced grab which society readily adopts as a 'technological' development. Such innovation obscures the underlying motives in which native populations utilizing transit and supporting the backbone of current ridesharing services are further neglected as the hegemonic group asserts the AVs as path towards the future.

On the other hand with more optimism, a decolonized transportation system under alliances and indigenous ways of knowing seeks to incorporate AVs could provide a glimpse at solutions that acknowledges the penalties and proprietary aspects that sustain a broken system. Rather than using AVs as the one-size-fits-all solution in a transportation network under a model of a partition between private and public organizations, AVs and public transportation should go hand-in-hand under a model where AVs adopt direct and flexible solutions pertaining to the first-mile / last-mile issues and public transportation focuses on more high-capacity solutions.[28] The facilitation of AVs more so as a service integrated with a larger network can resolve the shortcomings in transportation for sparse and underfunded services, while greater investments and extensive transportation can relieve a sole reliance on AVs for getting around. Granted, a lessened partition between the public and private sector is one not easy to achieve, and as an individual not entirely informed on the nuances and issues in policy, infrastructure, and government that inhibit such development, more thought is warranted to flesh out a true solution. Rejecting an ownership over market share or pricing structures, Native Feminist theory ultimately provides the key value of reciprocity in which privileges across different modes of transportation are shared to distance from the individualistic tendencies that exist with cars.

CONCLUSIONS

Autonomous Vehicles and the intersecting technology represents exciting ventures to advance the way we move through what are perceived to be smarter, machine-backed decisions. Many pros or privileges under the context of the frameworks are outlined in this paper showcasing the benefits of what AVs are capable of doing, but the shortcomings that implicate penalties stresses the larger implications and characteristics of the marginalized individuals within and beyond Los Angeles. Writing from the perspective of a young, prospective Civil Engineer does influence stances on the future of transportation as well as the injustices between different demographic populations, one that may not prioritize AV technology as much as the need for heightened mass transit. However, in holistically viewing the industry as one that can advance mobility as a whole, AVs can be argued to be of the same importance and priority as mass transit towards improving urban transportation - yet, regardless of the stance, engineers working to advance mobility should encode similar beliefs and perspectives under the aforementioned frameworks. Is it for our personal benefit to facilitate the privileges amongst stratified classes and groups in the status quo, or to provide a well-established solution to reduce the core problems across multiple dimensions of society?

REFERENCES

1) Othman, K. (2022). Exploring the implications of autonomous vehicles: A comprehensive review. *Innov. Infrastruct. Solut. 7*, 165. https://doi.org/10.1007/s41062-022-00763-6

2) Padmaja, B., Moorthy, C. V. K. N. S. N., Venkateswarulu, N., et al. (2023). Exploration of issues, challenges and latest developments in autonomous cars. *J Big Data 10*, 61. https://doi.org/10.1186/s40537-023-00701-y

3) Berman, J. (2023). *The Lost Subways of North America: A cartographic guide to the past, present, and what might have been*. The University of Chicago Press.

4) Lee, Ethan, et al. "Education for a Future in Crisis: Developing a Humanities-Informed STEM Curriculum." *arXiv preprint arXiv:2311.06674* (2023).

5) Y. Sergio Carbajo, Nurturing Deeper Ways of Knowing in Science, Issues in Science & Technology, 2025, v. 41, n. 2, p. 71, doi. 10.58875/jkrw4525

6) Z. Carbajo, Sergio. "Queered Science & Technology Center: Volume 3." (2025).

7) Fieser, J., & Dowden, B. (Eds.). (n.d.). *Feminist Standpoint Theory*. Internet Encyclopedia of Philosophy. https://iep.utm.edu/fem-stan/

8) U.S. Department of Transportation. (2022). U.S. Department of Transportation Strategic Plan FY 2022-2026. https://www.transportation.gov/sites/dot.gov/files/2022-04/US_DOT_FY2022-26_Strategic_Plan.pdf

9) National Highway Traffic Safety Administration (NHTSA). (2022, March 10). *Automated Vehicle Safety*. https://www.nhtsa.gov/vehicle-safety/automated-vehicles-safety

10) Othman, K. (2022). Exploring the implications of autonomous vehicles: A comprehensive review. *Innov. Infrastruct. Solut. 7*, 165. https://doi.org/10.1007/s41062-022-00763-6

11) Tennant, C., & Stilgoe, J. (2021). The attachments of 'autonomous' vehicles. Social Studies of Science, 51(6), 846–870. https://www.jstor.org/stable/48643319

12) Chester, M., Fraser, A., Matute, J., Flower, C., & Pendyala, R. (2015). Parking Infrastructure: A Constraint on or Opportunity for Urban Redevelopment? A Study of Los Angeles County Parking Supply and Growth. Journal of the American Planning Association, 81(4), 268–286. https://doi.org/10.1080/01944363.2015.1092879

13) Manville, M., & Shoup, D. (2006). Parking, People, and Cities. UC Berkeley: University of California Transportation Center. Retrieved from https://escholarship.org/uc/item/485983zw

14) U.S. Environmental Protection Agency (EPA). (2025). Sources of greenhouse gas emissions.https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions

15) Ercan, T., Banister, D., Beirão, G., Caiazzo, F., Cheng, Y.-H., Curtis, C., Ding, C., Ercan, T., Fagnant, D. J., Frank, L. D., Harper, C. D., Innocenti, A., Jones, E. C., Kim, J., Hong, Z. L., Liu, X., McIntosh, J., Milakis, D., Noori, M., ... Brailsford, S. (2022, October 8). Autonomous electric vehicles can reduce carbon emissions and air pollution in cities.*Transportation Research Part D: Transport and Environment*. https://www.sciencedirect.com/science/article/pii/S136192092200298X

16) *Autonomous Ride-hailing in Los Angeles, CA*. Waymo Service Map. (n.d.).
https://waymo.com/waymo-one-los-angeles/

17) Deming, R. (2024). *What's the demographic makeup of your community?* Maps.com.
https://www.maps.com/predominant-race-and-ethnicity-map-highlights-diversity-of-cities/

18) Neighborhood Data for Social Change: Household Income Groups. *Neighborhood Data for Social Change*. (2023). https://la.myneighborhooddata.org/2021/06/area-income-limits/

19) Bullard, R. D. (1993). The threat of environmental racism. *Natural Resources & Environment, 7*(3), 23–56. https://www.jstor.org/stable/40923229

20) Brozen, M., Rios, N., Cardenas, I., Yahata Ekman, A., & Bressette, B. (2021). *Intersectional Transportation Trends in LA County*. https://www.metrans.org/assets/research/psr-19-60_brozen_final-report_jw.pdf

21) Fatima, S., Lee, C. H., & Dannenberg, A. L. (2024). Equity issues associated with the widespread implementation of autonomous vehicles. *Oxford Open Infrastructure and Health, 2*, ouae002. https://doi.org/10.1093/ooih/ouae002

22) Liu, Q., Li, X., Yuan, S., & Li, Z. (2021). *Decision-making technology for Autonomous Vehicles*. Decision-Making Technology for Autonomous Vehicles: Learning-Based Methods, Applications and Future Outlook. https://arxiv.org/pdf/2107.01110

23) Chen, Y., Zhang, Y., Wang, Z., & Liu, X. (2023). *Autonomous Driving with Large Language Models: Survey, Challenges and Open Problems*. arXiv preprint arXiv:2308.02935. https://arxiv.org/pdf/2308.02935

24) Alex John London and David Danks (2018). Regulating Autonomous Vehicles: A Policy Proposal. In Proceedings of the 2018 AAAI/ACM Conference on AI, Ethics, and Society (AIES '18). Association for Computing Machinery, New York, NY, USA, 216–221. https://doi.org/10.1145/3278721.3278763

25) Jean-François Bonnefon et al., The social dilemma of autonomous vehicles. Science 352,1573-1576 (2016). DOI:10.1126/science.aaf2654

26) Arvin, M., Tuck, E., & Morrill, A. (2013). Decolonizing feminism: Challenging connections between settler colonialism and heteropatriarchy. *Feminist Formations, 25*(1), 8–34. http://www.jstor.org/stable/43860665

27) Wang, J., & Singh, S. (2017). Risk-Sensitive Decision Making in Autonomous Driving. In *Proceedings of the Twenty-Sixth International Joint Conference on Artificial Intelligence (IJCAI-17)* (pp. 4716-4722). https://www.ijcai.org/proceedings/2017/0654.pdf

28) Mezghani, M., Zhao, J. (2024). How will autonomous vehicles shape future urban mobility? World Economic Forum.
https://www.weforum.org/stories/2024/10/how-will-autonomous-vehicles-shape-urban-mobility/