IN THE SHADOW OF LLMS: TROUBLE IN THE "SMART" AUTOMOTIVE INDUSTRY

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Abstract

This paper explores the tumultuous landscape of the modern automotive industry, once heralded as the epitome of artificial intelligence (AI) and machine learning (ML) applications through the promise of connected and autonomous vehicles (CAVs). The introduction of large language models (LLMs), notably with ChatGPT's launch in November 2022, marked a turning point, casting shadows over the ambitious goals set by major tech and automotive players. Notable failures, including Ford's shutdown of Argo AI and Volkswagen's struggle with electric vehicle transitions, have led to a crisis in the viability of connected and autonomous driving.

The paper identifies four central types of limitations contributing to this crisis: technical, economic, financial, and regulatory. Technical limitations expose the inadequacies of autonomous vehicles in meeting their promised capabilities. Economic limitations highlight the unsustainable nature of platformizing automotive operations, linked to innovations like vehicle subscription models. Financial limitations point to the speculative investment decisions that underpin technological projects. Regulatory limitations showcase the industry's renegotiation of conditions in response to safety concerns.

By examining these limitations, the paper establishes a conceptual framework applicable not only to the automotive industry but also to current discussions surrounding LLMs. The lessons drawn from these challenges contribute to a broader understanding of the perils and limitations within AI sub-industries.

Introduction: Driving AI's Winter

Until large language models (LLMs) took the crown with OpenAI's launch of ChatGPT in November 2022, autonomous vehicles were considered the greatest possible application of artificial intelligence (AI) and machine learning (ML) in the modern era. Huge investments from both big tech firms and automotive manufacturers resulted in billion dollar capital valuations throughout the last decade, each built on a similar promise: that a world of fully-autonomous cars would be possible by 2020 (Adams 2015, Metz and Griffith 2022). A series of highly public failures - ever since ChatGPT's launch - has pushed this dream further into the distance, as money and interest has drained away. New plans, updated legislation, and revised timelines - scratch 2020, how about 2025? - appear just as fanciful (UK Department of Transport 2022).

To demonstrate: in October 2022, Ford shut their autonomous vehicle division - Argo AI - down, absorbing the project into other Ford initiatives (Hawkins 2022). In December 2022, newly installed Volkswagen Group CEO Oliver Blume was forced to pitch a revised software and vehicle platform strategy to an increasingly concerned board, after numerous failures to transition to electric vehicles since the diesel emission scandal in 2015 (Reuters 2022). In October 2023, California's Department of Motor Vehicles suspended Cruise's 'robotaxi' operating license in San Francisco, after an incident with a pedestrian (Hawkins 2023), and following a massive citizen-led protest, which included "blinding" the cars by putting traffic cones on their hoods (Keer, 2023). Tesla, never far from controversy, was forced into two huge recalls in December 2023 and February 2024 - one affecting their Autopilot system, another concerning instrument panel displays - affecting more than 4 million vehicles in total (Krisher 2023, Hawkins 2024). Then, in January 2024, autonomous vehicle platform provider and chip supplier Mobileye issued a profit warning, after demand from car companies fell (Aglionby and Healy 2024). In February, another tech giant - Apple - cancelled its decade-long "Titan" Connected Vehicle project, reportedly shifting the workforce to GenAI (Roth 2024).

Taken individually, these incidents might simply amount to ordinary industry turbulence, the consequence of internal business strategies (organizational restructures, scrapped product lines, diverted capital) or external market dynamics (imposed regulatory orders, changing customer demands). Together, they arguably constitute a crisis: a crisis of the *viability* of both connected and autonomous driving, a crisis of the *applicability* of ML and AI to real-world domains, and a crisis of *sustainability* for the automotive industry at large. On its face, this heralds the dreaded "AI winter" once prophesised by a lead industry player (Shalev-Shwartz et al., 2018: 1). Our paper examines these failures and more, in order to situate, and contextualise, their collective occurrence within broader technological shifts of computational and media infrastructures.

We propose four, non-mutually exclusive, central types of limitations contributing to this crisis. Firstly, *technical limits* in ML and computer vision work that has surfaced the perceptive inadequacies of autonomous vehicles (McCosker and Wilken 2020). Secondly, *economic limits* in attempts to 'platformize' automotive operations depending

on a variety of innovations such as vehicle subscription models and enhanced chip manufacturing (Hind and Gekker 2022, Hind et al. 2022). Thirdly, financial limits in respect to funding of technological projects dependent upon huge, more-or-less speculative investment decisions (Marx 2022). And lastly, *regulatory limits* as local and national bodies seek to impose safety restrictions on operations for wider social benefit, resulting in the industry's renegotiation of the conditions of what is perceived possible (Tennant and Stilgoe 2021). Our paper further expands on these limitations by drawing on the cases outlined above and connecting them to the recent turn to platforms and infrastructure scholarship in media studies.

Technical limits

Perhaps most obviously, CAVs failed to deliver on their basic promise: taking away driving responsibilities from the human and bestowing them safely upon the machine. Computer vision and fleet learning (the ability of one vehicle to learn from the experience of others) have so far not been able to guarantee a smooth transition into such reality. Beyond the technological issues at hand, STS and media scholars have long been observing the discrepancy between the given of a specific technology and its wider understanding by users, in various type of technological *imaginaries* (Jasanoff and Kim 2013, Bucher 2017, Egliston and Carter 2022). Often, they do not stand up to the hype exacerbated by traditional and social media (Funk 2019). Here we see perhaps a clear empirical indication to the hype's limit: a specific imaginary consistently failing to deliver.

Economic limits

Much of the CAV industry grew out of either new nimble technological player attempting to "disrupt" the car marker or traditional manufacturers attempting to keep their position. This is nonetheless often done by collaborating with outside actors, such as Honda's collaboration with Sony to launch a new series of EVs in North America (Hawkins, 2023). A central theme in the development of such vehicles was their linking to broader plans surrounding the platform and gig economy, with their interrelated business models. Yet, those have been proven unsustainable with central actors - from Uber to Deliveroo - having to downscale and re evaluate their approaches in recent years (Vallas and Schor 2020).

Financial limits

Anticlimactically, the bloom of CAV might be seen as just another "zero interest-rate economy" instances, where venture capital was willing to borrow cheap money on moonshot projects in the hopes of quick returns. What happened with CAV closely resembles what has been described as "financialisation" or "assetisation" (Sadowski 2020, Birch and Muniesa 2020) of the digital economy. CAVs were always intended as a method of data extraction on top of their car-function, treated like assets to generate additional rent instead of mere commodities to be sold. Similar to what has happened in the housing market, the introduction of pre-mediated digital surveillance and enclosure

(Nethercote 2023) has severely impacted how the automobiles were developed and deployed.

Regulatory limits

Particularly of interest here is the rapid public opinion turnaround surrounding CAVs. From a technology of possibility and liberation they became strongly associated with "solutionism" and big tech, as citizen groups exerted additional pressure on the policy makers to stop or limit vehicles experimentation. This very much parallels the documented shift in another infrastructural issue, namely the construction of Data Centers, their environmental impact and resource drain (Rone 2023, Van Es et al. 2023). AV testing, it seems, is quite similar to the latter, where while physically located in a specific locale, give very little tangible benefits for this space, acting instead as a 'node in others' networks, both built in and left out'. (Jonhnson 2019, 75).

Ultimately, the paper builds a conceptual framework for understanding the limitations and perils of AI (sub-)industries. While focusing on the automotive domain, the lessons can be relevant to the current focus on LLMs as well.

References

Adams, Tim. 2015. 'Self-Driving Cars: From 2020 You Will Become a Permanent Backseat Driver'. *The Observer*, 13 September 2015, sec. Technology. https://www.theguardian.com/technology/2015/sep/13/self-driving-cars-bmw-google-2020-driving.

Aglionby, John, and Euan Healy. 2024. 'Mobileye Shares Plunge on Profit Warning'. 4 January 2024. https://www.ft.com/content/0dca91eb-7a78-49eb-ae63-3b427e5104fa.

Bucher, Taina. 2017. 'The Algorithmic Imaginary: Exploring the Ordinary Affects of Facebook Algorithms'. *Information, Communication & Society* 20 (1): 30–44. https://doi.org/10.1080/1369118X.2016.1154086.

Egliston, Ben, and Marcus Carter. 2022. 'Oculus Imaginaries: The Promises and Perils of Facebook's Virtual Reality'. *New Media & Society* 24 (1): 70–89. https://doi.org/10.1177/1461444820960411.

Es, Karin van, Daan van der Weijden, and Jeroen Bakker. 2023. 'The Multifaceted and Situated Data Center Imaginary of Dutch Twitter'. *Big Data & Society* 10 (1): 20539517231155064. https://doi.org/10.1177/20539517231155064.

Fourcade, Marion, and Kieran Healy. 2016. 'Seeing like a Market'. *Socio-Economic Review* 15 (1): 9–29. https://doi.org/10.1093/ser/mww033.

Funk, Jeffrey. 2019. 'What's Behind Technological Hype?' *Issues in Science and Technology* 36 (1): 36–42.

Hawkins, Andrew J. 2022. 'Argo AI, Driverless Startup Backed by Ford and VW, Is Shutting Down'. The Verge. 26 October 2022. https://www.theverge.com/2022/10/26/23423998/argo-ai-shut-down-ford-vw-av-self-driving.

———. 2023a. 'Sony and Honda Just Announced Their New Electric Car Brand, Afeela'. The Verge. 5 January 2023. https://www.theverge.com/2023/1/4/23539863/sony-honda-electric-vehicle-afeela-ces-reveal-photos.

———. 2023b. 'California DMV Suspends Cruise's Robotaxi Permit "Effective Immediately"'. The Verge. 24 October 2023. https://www.theverge.com/2023/10/24/23930629/california-dmv-suspends-cruise-robotaxi-permit-safety.

———. 2024. 'Tesla's Latest Screwup Involves Making the Font Size of Its Braking System Too Small'. The Verge. 2 February 2024. https://www.theverge.com/2024/2/2/24059114/tesla-recall-brake-system-font-size-power-steering.

Hind, Sam, and Alex Gekker. 2022. 'Automotive Parasitism: Examining Mobileye's "Car-Agnostic" Platformisation'. New Media & Society, July, 14614448221104209. https://doi.org/10.1177/14614448221104209.

Hind, Sam, Max Kanderske, and Fernando van der Vlist. 2022. 'Making the Car "Platform Ready": How Big Tech Is Driving the Platformization of Automobility'. Social Media + Society 8 (2): 20563051221098697. https://doi.org/10.1177/20563051221098697.

Jasanoff, Sheila, and Sang-Hyun Kim. 2013. 'Sociotechnical Imaginaries and National Energy Policies'. Science as Culture 22 (2): 189–96. https://doi.org/10.1080/09505431.2013.786990.

Johnson, Alix. 2019. 'Data Centers as Infrastructural In-betweens: Expanding Connections and Enduring Marginalities in Iceland'. American Ethnologist 46 (1): 75–88. https://doi.org/10.1111/amet.12735.

Kerr, Dara. 2023. 'Armed with Traffic Cones, Protesters Are Immobilizing Driverless Cars'. NPR, 26 August 2023, sec. Business. https://www.npr.org/2023/08/26/1195695051/driverless-cars-san-francisco-waymo-cruise.

Krisher, Tom. 2023. 'Tesla Recalls Nearly All Vehicles Sold in US to Fix System That Monitors Drivers Using Autopilot'. AP News. 13 December 2023. https://apnews.com/article/tesla-autopilot-recall-driver-monitoring-system-8060508627a34e6af889feca46eb3002.

McCosker, Anthony, and Rowan Wilken. 2020. *Automating Vision: The Social Impact of the New Camera Consciousness*. New York ; London: Routledge/Taylor & Francis Group.

Metz, Cade, and Erin Griffith. 2020. 'This Was Supposed to Be the Year Driverless Cars Went Mainstream'. *The New York Times*, 12 May 2020, sec. Technology. https://www.nytimes.com/2020/05/12/technology/self-driving-cars-coronavirus.html.

Nethercote, Megan. 2023. 'Platform Landlords: Renters, Personal Data and New Digital Footholds of Urban Control'. *Digital Geography and Society* 5 (December): 100060. https://doi.org/10.1016/j.diggeo.2023.100060.

Reuters. 2022. 'VW CEO to Present Software "reality Check" to Board on Dec. 15, Report Says'. Automotive News Europe. 6 December 2022. https://europe.autonews.com/automakers/vw-ceo-present-software-reality-check-board-dec-15-report-says.

Rone, Julia. 2023. 'The Shape of the Cloud: Contesting Data Centre Construction in North Holland'. *New Media & Society*, January, 14614448221145928. https://doi.org/10.1177/14614448221145928.

Roth, Emma. 2024. 'Apple's Electric Car Project Is Dead'. The Verge. 27 February 2024. https://www.theverge.com/2024/2/27/24084907/apple-electric-car-project-titan-shuts-down.

Sadowski, Jathan. 2020. 'The Internet of Landlords: Digital Platforms and New Mechanisms of Rentier Capitalism'. *Antipode* 52 (2): 562–80. https://doi.org/10.1111/anti.12595.

Shalev-Shwartz, Shai, Shaked Shammah, and Amnon Shashua. 2018. 'On a Formal Model of Safe and Scalable Self-Driving Cars'. arXiv. https://doi.org/10.48550/arXiv.1708.06374.

UK Department of Transport 2022. 2022. 'Self-Driving Revolution to Boost Economy and Improve Road Safety'. GOV.UK. 2022. https://www.gov.uk/government/news/self-driving-revolution-to-boost-economy-and-improve-road-safety.

Vallas, Steven, and Juliet B. Schor. 2020. 'What Do Platforms Do? Understanding the Gig Economy'. *Annual Review of Sociology* 46 (1): 273–94. https://doi.org/10.1146/annurev-soc-121919-054857.