



# DRIVERLESS

*"Technology is neither good nor bad; but nor is it neutral"*

E J WHITTON  
REF. 33615859  
BA Design

Video at top of page : JohnnyCab in Total Recall 1990<sup>2</sup>

***“Autonomous cars create and maintain a map of their surroundings based on a variety of sensors situated in different parts of the vehicle. Radar sensors monitor the position of nearby vehicles. Video cameras detect traffic lights, read road signs, track other vehicles, and look for pedestrians. Lidar (light detection and ranging) sensors bounce pulses of light off the car’s surroundings to measure distances, detect road edges, and identify lane markings. Ultrasonic sensors in the wheels detect curbs and other vehicles when parking.***

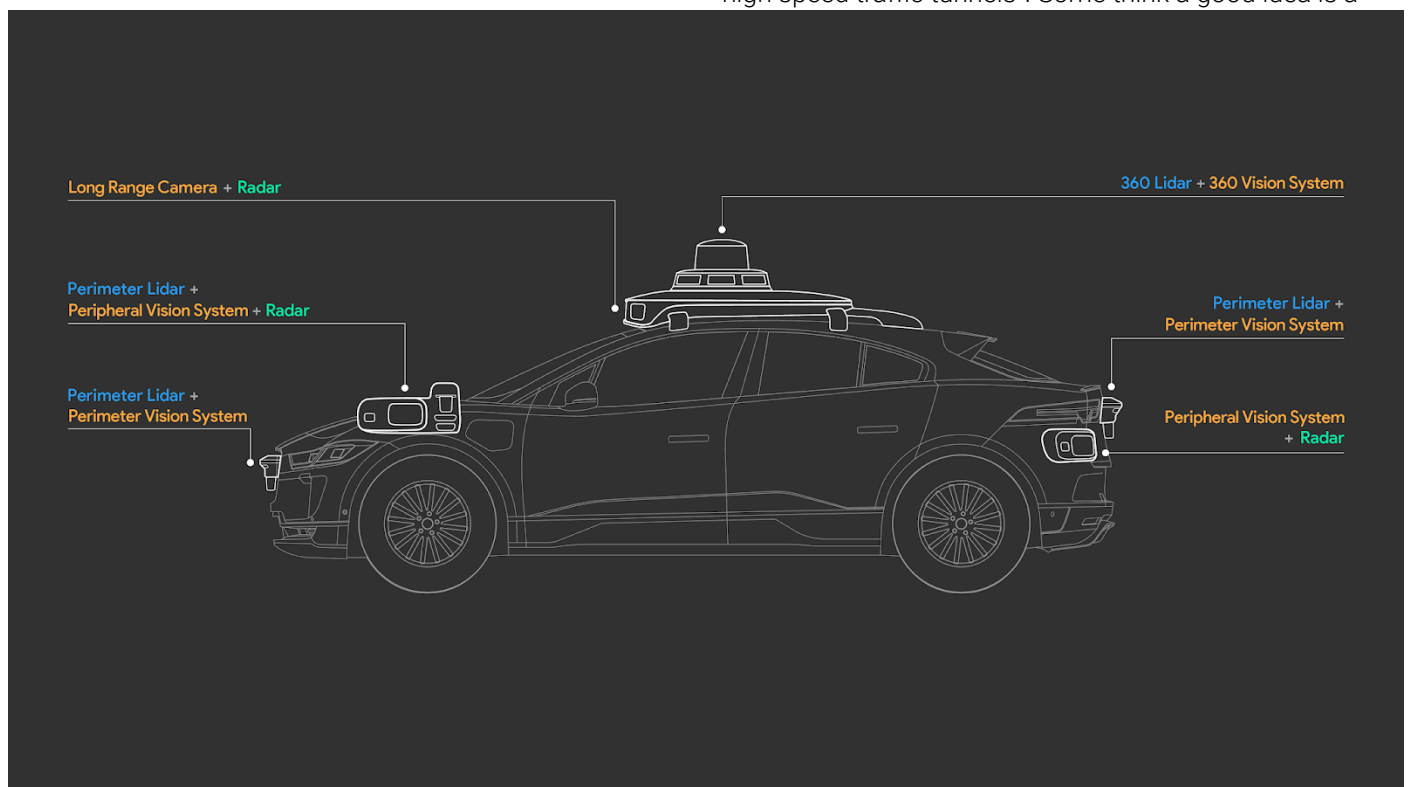
***Sophisticated software then processes all this sensory input, plots a path, and sends instructions to the car’s actuators, which control acceleration, braking, and steering. Hard-coded rules, obstacle avoidance algorithms, predictive modelling made with machine learning from large data sets and training, and object recognition help the software follow traffic rules and navigate obstacles.”***<sup>3</sup>

Are self-driving cars a step too far? It is such an emergent technology, no one can quite predict how they will impact society. The almost free reign that Tech giants are given

these days, because of their power, influence and speed compared to traditional power constructs, means that we will likely see a lot of driverless cars before understanding their implications for us and for infrastructure. In this essay we will take a look at how autonomous cars are different to normal cars, their implications on the individual, society and infrastructure, and speculate on who replaces the driver and their moral instinct on the road, is it the car, the engineer or the company that makes it, or the market.

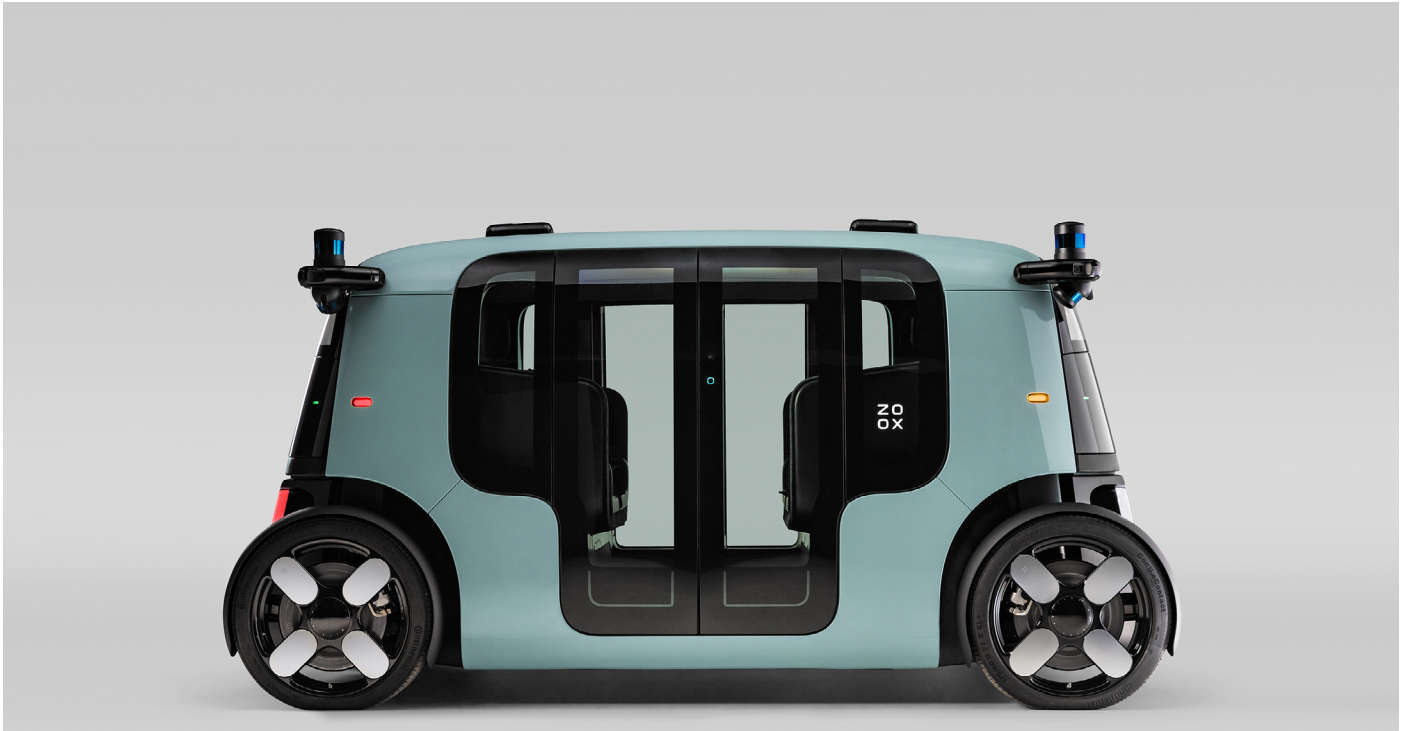
## The Car, The Driver, The Driver-Car

There have also been some absurd and laughable concepts for different driverless cars; some looking like toasters The Amazon Zoox<sup>4</sup>; some being beds to sleep in while traveling (Volvo 360c)<sup>5</sup>; Some grand concepts are unashamedly world changing. Elon Musk’s Tesla is a sleek looking car with hidden driverless capabilities (currently being tested and trained in the US in a beta anyone can apply to) the vision of these conventional looking cars is to have exclusive access to The Boring Company’s high speed traffic tunnels<sup>6</sup>. Some think a good idea is a



***“Introducing the 5th-generation Waymo Driver: Informed by experience, designed for scale, engineered to tackle more environments”*** Google’s Waymo hardware on a Jaguar I-Pace.<sup>59</sup>

“Zoox was founded in 2014 and was acquired by Amazon for roughly \$1.2 billion in June 2020”<sup>60</sup>



taxi system such as Google’s Waymo and Uber, no-one owning their own car and just ordering driverless cars to any spot<sup>7</sup>, a concept that could be arguably socialist or feudal depending on ownership and money, also bringing into light the status of cars as traditional symbols of individuality and liberation.

***“The car shapes the built environment, cuts through the landscape, dominates the soundscape, is a key commodity in production and consumption. Despite this prominence the car, unlike for example information technology and its impact, has largely been ignored by sociology as a component of social being and social action in late modernity.”<sup>8</sup>***

That has changed with the internet of things and the part the driverless car will and does play in society.

Cars are currently commodified and sold as extensions of yourself, dehumanised and presented as a free and roaming creature, such as in adverts. This assemblage view of self-empowerment is key to the semiotic view of the car’s role in human society, merging and transcending human ability.

That is, somewhat, our current view of the car, or at least the way the market sees the car, but a description of a car does not need a driver. A car is a car whether a driver is in it or not since what constitutes a car is not limited to the

access and mobility of a human occupier and operator. The car assemblage is broader than even its four wheels, recognisably car-like form with headlights and indicators. Those features are still existent while parked in a garage, and functioning as a statement piece of iconography, human individualism. A car is either; fuelled by a pump station, that is supplied by lorries filled with petrol, petrol which is supplied by conglomerate energy, oil and refinery companies; or it is fuelled with electricity that is supplied via a cable connected to a grid and generators operated by energy companies. The car is designed and manufactured by automotive companies with many technologies being developed to accommodate production. Therefore, the driverless-car is still a car when unoccupied and why ANT social scientist Tim Dant is careful to separate the three roles of: the Car, the Driver, and their temporary assemblage, Driver-car.<sup>9</sup>

***“In these cars, the driver should be redefined as a “user-in-charge”, with very different legal responsibilities, according to the law commissions for England and Wales, and Scotland.”<sup>10</sup>*** A new UK Law commission into redefining the responsibility of a car.

There is tension from the coming and going of these different roles and their own different forms of agency in the stages of automotive development in history.

We can consider (Reductively) there being a triptych of contrasting social being-assemblages with the horse-cart, the automobile, and now the driverless car. These social beings would perhaps be named in the same guise as Dant's driver-car like; driver-cart-horse, driver-car, owner-car. I could consider the horse rider-horse relationship as having come before driver-car-horse, but I would argue it incomparable as the affordances offered by horses in horse riding are far different from that of a cart or car, since horses can traverse over rough terrain and through close trees while cars and carts are generally dependent on the smooth surface of road and car-orientated infrastructure.

***“Field of safe travel’: It consists, at any given moment, of the field of possible paths which the car may take unimpeded. Phenomenally it is a sort of tongue protruding forward along the road. Its boundaries are chiefly determined by objects or features of the terrain with a negative ‘valence’ in perception – in other words obstacles.”***<sup>11</sup>

Tim Dant critiques Gibson's psychologist's perception of the driver as being hard to grasp, saying that is likely more of one in a police helicopter looking down on the road or a child playing with toy cars on a track.

This is a truer perception of the driverless car with a map in its data bank. That, with Gibson's descriptions of the field “minimum stopping zone” characterised with a positive valence and obstacles with a halo of avoidance having a negative valence, Gibson's perception is much more descriptive of one of an AI, because of its oversimplification of a humans perception of the road.

***“The mobility and locomotion of the car are dependent on the affordance of a driver; it would be more precise to say that it is the assemblage of driver and car that affords mobility.”***<sup>12</sup>

## The Pedestrian Vs Car World Arena

The car has modelled the modern landscape. It is something said by many people in referring to the roads between places and the setting out of all infrastructure. It is one of the main jobs of government to decide, budget and build for accommodation of cars between localities. The car concerns many people in their day-to-day decision making, filling up petrol, finding parking spaces near work, MOT and paying for insurance etc. The car is easily

described as essential, it has seeped into the foundations of civilisation irreversibly.<sup>13</sup>

The changing and updating of infrastructure has happened alongside the development of the automobile. Horses tread on dirt paths, harder surfaces would ruin hooves and cripple the horse. Carts wheeled slowly along cobbled roads since the cart could break on unpredictable dirt paths. The early car and faired similarly, but as the car got faster and safer, roads were tarmacked and sculpted into curving shapes to accommodate speed and ease of steering.<sup>14</sup>

Current infrastructure is built on the assumption of a tension existent between drivers and between drivers and pedestrians. This tension is made up of both trust and distrust, and an understanding of mutual human predictable unpredictability. Tension, because there are rules on the road that everyone must follow; which can slow speed for safety; which can be broken. This tension is what allows people to get places in a safe and fast manner but also means there is compromise, that things can go wrong, people occasionally get hurt(causing tension). Driverless cars do not partake in this system, and this could and/or does causes a few things.

As shown in We Love You Waymo, an episode from Malcolm Gladwell's Revisionist History series, in a driverless utopia, there is the potential for an oversafetificaton of the road. Gladwell demonstrates jumping in front of Waymo, in order to show the potential contradictions of driverless transport.<sup>15</sup> One amazing selling point of driverless tech is safety and the elimination of human error in driving. But this selling point contradicts the ways of the road, the constant compromising that driving is. Waymo can predict and account for many things and you could describe it as ultimately safe, and a society that can trust all cars to stop will no longer look as they cross the road and traffic will be stopping constantly. The tension is also between drivers rather than cars, this can be described as a kind of respect, and it is easy to foresee bored kids seeing an empty driverless car and lobbing bottles at it. This is one future to speculate upon, and the social and infrastructural impact would be dramatic either way, good or bad. If safety is truly one of the main drives for this tech to integrate into our infrastructure, then the human factor/obstacle will likely need removing entirely, and roads will look more like trenches lifted roadways or tubes like in Futurama and Elon Musk's The Boring Company's(TBC) traffic tunnel<sup>16</sup>. The car in the TBC instance will be a completely illogical skeuomorph, with

**“Tesla is making 12 passenger electric vans for the Boring Company as part of the initial proposal for the Loop tunnel project.”** A Tesla car enters Las Vegas Convention Center Loop.<sup>61</sup>



rail like systems seeming more sensible, and the tunnel system only functioning if the traffic on the surface is still bad, effectively installing a classist road system.

***“We expect autonomy to place few requirements on infrastructure due to the cost and other burdens on early adopters. It will be applied in a way that adapts to the existing infrastructure.”***<sup>17</sup> The prediction of UK government transport agency.

## **Agency, Authority, Responsibility, Complicity and Culpability**

In his essay Where are the missing masses- Latour

discusses the agency of the seatbelt in his car, offering this as an example of the difficulty of discovering the truest source of authority that the object has in its function to prevent the car starting when undone. Is he being stopped by the seatbelt, the whole car, the programmer, the designer, himself, policy makers, society?<sup>18</sup>

Another example by Latour comes from Foucault’s body-weapon complex, the debate as to which of them, the gun or citizen, is the one that kills. Latour argues that there is a merging of human and non-human, a “citizen-gun” which kills. Neither would kill without the other.

***“Purposeful action and intentionality are not properties of objects, but neither are they properties of humans either. They are properties of institutions, apparatuses, of what Foucault called dispositifs. Only corporate bodies are***

**able to absorb the proliferation of mediators, to regulate their expression, to redistribute skills, to force boxes to blacken and close. . . . Boeing 747s do not fly, airlines fly.”<sup>19</sup>**

Latour does not blame the individual or the gun, he blames the system in place that accommodates and enables killing, though both the citizen and the gun could be thought complicit. This is the view of technological determinism as opposed to social constructivism, that the technology and systems we create in turn change society rather than technology being created to accommodate a changing society.

Though I agree With Dant’s opinion that this statement reaches too far and fails to grasp a solid notion of a trace back of the operation of choice<sup>20</sup>, I think it can be used in beginning to describe how technology is justified and constructed through the abilities of corporate bodies despite lack of moral decision making or ethical consideration. Technology is realised through corporate disposition, and any social impact is often sparsely considered since there is just no need for it. Driverless cars achieve a few corporate goals, they could fill a labour market of lorry drivers, and they create a new market for a desirable product. These justifications fill the space of the ethical and moral judgement that a human considering social impact would make, society seems

to trust corporations to introduce world changing tech that can edit social norms. I think I begin to touch upon a reason behind my initial feelings of mistrust on the subject of driverless cars, since I think to use a driverless car is to delegate your own moral decision making on the road to this corporate economic system that replaces human moral decision making. This opinion, of course, compares the likeness of two systems, AI machine learning and the development of tech, with economic drive and corporate power.

hey Alexa. booloop. What should I wear today? What should I eat? Where am I going? A driverless lifestyle, A driverless society, A driverless personality. AI and advancing robotics are increasingly relieving us of many tasks and menial drudgeries, but maybe at this point the technology will stop empowering us and we start empowering the technology. What will you be doing instead of the menial drudgery of driving your car? Being productive? Sleeping? Just sitting and thinking? A am I warning about a negative shift in our cultural values, infrastructure and society caused by unstoppable technological development?

***“As automation makes our lives easier and safer, it also creates more complex systems and fewer humans who understand those systems. Which means when problems do arise—people can be left unable to deal with them.***

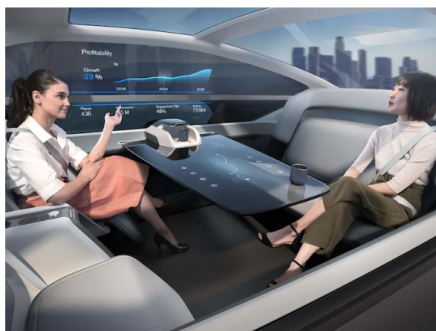
## Making the most of your time

The 360c envisions a variety of experiences based on your needs



### Enjoy

360c includes several mood settings designed to help you relax or party on your journey, with all the creature comforts you need.



### Work

A mobile, fully connected meeting place and workspace means you can get things done on the move.



### Sleep

Travelling overnight for a morning meeting? Why not book a sleeper vehicle that will deliver you to your final destination fully refreshed?

*Human factors engineers call this “the automation paradox.”<sup>21</sup>*

## Who is the Moral Decision Maker?

AI is a general-purpose technology, meaning it can be applied to a wide range of contexts. The use of AI is obviously not bad in itself. For example, AI used to identify irregularities and disease in body tissue. A doctor, using this knowledge found using the AI, can make a human decision for what happens to the patient.<sup>22</sup> I can liken the driverless car to doing both things.

***“Maybe it’s not such a good idea to pin the fault on just one person or one factor. The totality of the circumstances may add up to the reality that fault lies with many parties. Any time someone dies people want to have someone to blame. What they don’t want to hear is the possibility that no one is at fault. Accidents do happen and perhaps all of this is just the inevitability of using machines instead of people to drive cars.”<sup>23</sup>*** A quote from a Forbes new reporter in response to the 2018 Uber incident later discussed.

To allocate AI the task of moral decision making is questionable because of the complex nuances of different but similar situated contexts. Perhaps you are driving past a pond in duckling season, or down a road that a fatal road accident happened the previous day. Should driverless cars stop for everything? Tech companies don’t want them to stop for everything, because that would mean that generally they will go slower than cars being driven by humans (imagine you recognise a driverless car, you can step out in front of it knowing it will slow down for you and no-one in it is going to climb out and swear at you. (It is to do with predictability and trust, how much should driverless cars trust people and how much unpredictability should they account for. It goes from them assuming that pedestrians will only cross at crossings, to them assuming all pedestrians are suicidal and about to jump in front of them.)). But that idea means that driverless cars are given the same authority on the road as drivers in cars. Cars and humans, equals. Should it be government or companies or industry regulators that sets out robot laws and take responsibility, or individual user/owners.

***“All social media platforms insist they are ‘platforms’ not***

***‘publishers’ which means that, unlike newspapers, they aren’t legally liable for the content they host. Protection (known as the ‘mere conduit’ clause under EU law) is extremely important for companies like Facebook or Youtube, because without it they would have to somehow check the billions of pieces of content uploaded to their sites. As a result they are hesitant to intervene too much in cleaning out divisive or misleading media, in case lawmakers conclude they are behaving like publishers and regulate them as such. Algorithms give the impression of being neutral and can’t be held to account.”<sup>24</sup>*** Described by Jamie Bartlett of DEMOS democracy think tank.

At the point of utopianism, the start of the internet, it was thought it was going to be great for democracy. Free speech, freedom of information. Many predicted that the internet would prevent monopolies rather than culture them. The popular thinking repeated by futurists was that the net was decentralised and connected, leading to competition and distributed marketplace. Cut to now...

Uber running billion-dollar losses for years so that when all competition fails, their low prices will rise (Growth before profit). Monopolies like Amazon and Google now rule the internet, power coming from their internet of things and political lobbying. When Transport for London withdrew the licence for Uber to operate in London, they petitioned, and with so many people dependant on their convenience, quickly were able to pressure the authorities into taking back their decision.<sup>25</sup> In Edinburgh and Barcelona, AirBnB operate on such scale that entire communities have vanished in city centres.<sup>26</sup> Perhaps Driverless cars should be regulated by something more trustworthy, like government, but does the government have any power in the tech realm to even try.

***“The nightmare scenario would involve infantilised consumer-citizens hooked on and desperate for cheap and accessible goods and services, with no questions or strings attached - millions of convenience addicts ready to mobilise at a moment’s notice if an update alert tells them to.”<sup>27</sup>*** Your decisions are becoming non-informed and not based on an individual interest. This is bad for society, democracy. The direct influence the tech has and the direct influence the tech company has on individuals and government mean that the changes enacted are set a foot by powers only loosely morally justified and thought out by a few tech people.

***“Over the years, the big tech firms have very carefully cultivated the Californian ideology: even though they***

***are massive multi-billion-dollar corporations with huge PR teams, they pitch themselves as anti-establishment; even though they are built on a model of data extraction and surveillance capitalism, they purport to be promoting exciting and liberating technology; even though they are dominated by rich white guys, they talk of social justice and equality.”<sup>28</sup>***

Lots of people agree that we don't know what the exact impact of driverless cars on the road will be, including those making them and legislating them. This is something, if thought openly a few generations back, would have caused panic and rejection by authorities and public, but now tech companies have free reign and can test on society their new ideas, and if they stick and we are ensnared, then it is too late and we keep them even if we later start to uncover problems. Silicon valley has infected society with promises that disruption is liberation, total individualism is empowerment and gadgets equal progress. This can only be argued as being occasionally true and definitely not definite.<sup>29</sup> Are driverless cars just a new thing to sell, like electric cars, which have been critiqued as not yet being entirely environmentally friendly due to the battery disposal problems and manufacturing emissions and waste.<sup>30</sup> I don't think tech is bad, I think the system of market system for tech development is bad.

The potential of AI and uses of machine learning, such as the dangers of driverless cars, have long been examined and uncovered in their unshackled, unethical use and deployment.

***“AI classifications of people are rarely made visible to the people being classified,” ImageNet Roulette’s creators, artist Trevor Paglen and Kate Crawford, co-founder of New York University’s AI Institute, said, “ImageNet Roulette provides a glimpse into that process - and to show the ways things can go wrong.”<sup>31</sup>***

One on Paglen's projects looking at the uses of AI, this one called ImageNet Roulette examines the bias that can form from machine learning. ML uses large data sets to correlate similarities and produce algorithms capable of recognising specific things. Paglen's project used Amazon Mechanical Turks (people online being paid pennies to do menial tasks) to go through a massive profile picture library and tag photos. On the site, I can upload a picture and the algorithm will try and tell me what it is. This simpler AI is analogous to AI used by police to profile people, often coming to racist outcomes that are biased. This bias comes from a few things in the development of the AI; the programmer's position in being able to

make 'tags' associations; the Mechanical Turks (which in America are largely white women); and the library. This project highlights one way that AI is being used unethically, by police and by social media sites profiling their users and pushing certain material. It may not be obvious how this applies to automated cars, but it shows how AI can be developed, deployed and then depended upon in society before serious faults are pointed out. It also can be used to point out the different data sets of different geographical locations and the danger of using driverless cars taught in San Francisco in places like London.

***“Californian prosecutors filed two counts of vehicular manslaughter against the driver of a Tesla who went through a red light, while using Autopilot, hitting another car and killing two people - the first time someone has been charged with manslaughter when using a partially automated driving system.”<sup>32</sup>***

Many people think that driverless technology is impossible to integrate safely, and doubt it will last long without major shifts in the workings of the technology or infrastructure.<sup>33</sup>

Recently there have been small pushes for more ethical codes of development in how AI, ML is used and made. There is artificial-intelligence safety group OpenAI who do research and gain funding to establish ethical practice and call-out unethical practice. But this is quite widely seen as contradictory to neo-liberal market practice and an ethical washing stunt by Elon Musk who has large stakes in many Silicon valley tech startups that use AI technology, since OpenAI is largely funded by him and until recently he had an active role in the institution.<sup>34</sup> In academic science and medical practices there are rules, creeds and moral codes of conducts that research and work is done too. These are not laws but social standards which institutions and individuals recognise. These have been lacking in the tech industry due to rapid development and neo-liberalism. For example, in software development there is a mindset to produce working code as quick as possible, cut corners and a neglect for efficiency and quality.<sup>35</sup>

With the driverless car, road accidents become far more systemic failings than personal ones, and the question of culpability is difficult. I would encourage anyone working in the ML space to be acutely aware of the limitations of the systems they're building, communicate them clearly to all stakeholders and do their best to prevent systems that have the potential to do harm (even unintended) being



*"The driver is called AI – artificial intelligence. AI did all the driving, from start line to finish line,"*<sup>63</sup>



pushed live. Everyone working in tech should seriously consider what they won't build and stick to it.

## Cars With Personalities

*"The car uses a number of technologies to 'drive' itself including 5 lidars, 2 radars, 18 ultrasonic sensors, 2 optical speed sensors, 6 AI cameras, GNSS positioning and is powered by Nvidia's Drive PX2 brain, capable of up to 24 trillion A.I. operations per second to be programmed by teams' software engineers using complex algorithms."*<sup>36</sup>

I thought it weird that anyone would want to engage with a sport that doesn't even have humans competing. The skill would perhaps come from the engineers, though you can already argue that the design and engineering of Formula 1 cars is more important than the driver's skill. If in fact

the fans cheer the cars as individual objects, backed by engineers, rather than cheering the engineers, then the car is honoured like a human driver. I think it is an interesting way of approaching the question of trust or distrust of a non-human object.

*"We take special pride in revealing a functional machine that stays true to the initial concept shared, a rarity in automotive design and a testament of our determination. It's a great feeling to set this free."*<sup>37</sup> - Daniel Simon, Roborace Chief Design Officer.

A formula E affiliated automobile race called Roborace was launched a few years ago. There is one car design, driverless, and the teams compete based on the coding and indexing of the software on board the vehicle. The Race is both meant to showcase and spearhead driverless technology and also be an engaging sport for viewing.

Is this the future of racing? Almost definitely not. But

to see the role of the race car driver under threat is interesting. With Formula 1 being arguably largely decided based on the car's technology, the drivers can be considered more as personalities, and much of the race car drivers' role in the sport is out of the car, with publicity and exposure. Consider online personalities like Miquela on Instagram<sup>38</sup>, a fake and largely computer-generated person, can the race car, itself, take on this entire role and would it garner the same respect that a human race car driver would.

***"The car uses the v2v technology to exchange some basic information. From that technology they know which speed the opposite car is travelling. Whichever car is following it needs to get really close to the leading car and it needs to stay very close. There are specific thresholds to how close that should be, but it needs to be really close in the trigger zone. And if it does it, the car will be granted the right to overtake. So then when it goes on the long straight it then computes the overtaking line and just does the overtake."***<sup>39</sup>

You could argue that this kind of racing is safer. You could even wonder what the point of it taking place in the real world is when the only deciding factor is code. In fact, the racing and development is largely virtually simulated, with live development happening like a Twitch gamer stream, a 3D rendered race track and modelled cars.<sup>40</sup>

Could you code Lewis Hamilton's driving style into the car? Jeremy Clarkson? Since it's conception, the car has been a statement, like wearing specific clothes, your car you can choose to reflect your identity, at least, that is how they are marketed. Maybe your driverless car could have a preset driving style to reflect your identity. If I want to associate with James May, I press the James May button on my dashboard. If all that determines who wins a race is driving style, then why not just code it?

In a similar sense, synthetic music has replicated musical skill and experiences for decades. When synth music first surfaced, many people exclaimed questioning what the point of listening to music made digitally is. These people romanticise the humanity in human skill and acoustic instruments and consider this an integral part of music, but fast forward a few decades and there isn't a song in the charts that isn't constructed almost entirely through digital synthetic noises and sampled recorded noises, and skill is recognised in a DJ pressing play, based on the performance and setting. There are a few points from this: When the romantic and individual quality in music is

synthesised, it is reproduced as a recording or code and the artist no longer has to repeat the production of that sound. There is also the guitar pedal preset, which takes all the tech and settings from a particular artist and replicates their individual sound. Taking this idea and applying it to car driving, I don't think is quite as absurd as it sounds, for the way in which a driver drives determines speed and comfort, and an artist or driver is still associated with the driving.

Another point, similar but different, is when the ergonomic fit of the machine interface is nullified, a different kind of fit can be considered. The driver becomes the user, and the relationship between the vehicle and the user is different. These factors are points I plan on exploring in my studio practice, since it would be interesting to see what influence the 'user' having over the car makes sense.

With all human labour automated, and human personality and features being simulated, I can start on Matrix like "we're all entering a simulation" type talk. But these theories are bleak and have obvious contradictions to them. I think driving is inherently risky, we all accept that driving comes with a certain level of danger and there is the possibility of things going wrong. This is a compromise we make in order to get places quickly. Racing cars has two objectives in a sense, one to win and one to go as fast as possible. Roborace achieves the first one, there is some winning, but there is no going fast, at least no one going fast. Most sports represent or simulate a real world task that humans do, and I can appreciate a race car driver's abilities because I drive myself.

With Roborace threatening the job of race car driver (however mild the threat may seem) begs a look at jobs. ***"While this race to automate the car accelerates, it jeopardises an enormous workforce, estimated at between 3.8 million in the United States alone."***<sup>41</sup> Driving has, for a long time been seen as a skilled profession, which is part of many jobs beyond delivery services, one that would not be possibly automated. But now with AI technology, it is thought that up to 80% of jobs will be automated in the next 20 years. The argument in defense of this is an emphasis on the production of new modes of labour and a more educated and adaptable work construct. Rather than seeing it as a threat, some people like the idea of embracing automation as a chance to "redesign the very essence of work". Von Roeder thinks that this new technology will enable us to develop lifestyles which are more creative and satisfying, with less emphasis on making money and providing.<sup>42</sup> This is a utopic analysis, speculating on how AI can make the world

***“Uber was ahead of rivals such as Google and Tesla in the race to develop “robotaxis”. But it suffered a serious setback in legal battles as Google’s self-driving car project Waymo sued Uber for alleged technology theft.”<sup>64</sup>***



better, and I understand it, but it seems impossible to me with the trajectory of tech development in its neo-liberal sense. Von Roeder's idea is one of social constructivism and misses the foresight gained when observing how labour markets are changing due to Silicon valley disruption. Firstly, there are problems that will be caused by this shift that we cannot yet understand. Problems that will, again, end up being solved by tech. Secondly, the Silicon Valley mentality perpetuates the neo-liberal philosophy of self-development and bettering, extreme work ethics. This will not suddenly stop when we hit 80% automated jobs, especially when it is those people who preach working hard to gain success and power in tech who are the ones in charge of this labour-market-changing tech.<sup>43</sup>

***“David Autor’s Barbell-shaped economy, a kind of extreme inequality.” In which those working and funding tech gain considerable wealth and power while many scabble to fill “non-routine” jobs, one which require a lot of sensorimotor skills, serving the rich food and tying their shoe laces, jobs that robots can’t do.”<sup>44</sup>***

It is less likely that we will have more fulfilling jobs with automated labour, and more likely we will all become Mechanical Turks teaching robots to recognise things.

The people profiting from AI tech and “disruption” won’t stop in their efforts to further gain capital. The fundamental problem with this tech Utopian ideal is: what is making it possible is happening for the wrong reasons.

***“Autonomy will make road vehicles smarter, create opportunities for new services such as last-mile delivery by drone and deliver fully autonomous urban transport. We anticipate that the urban transport system, air transport, rail freight, ferries to and from UK islands and 90% of motorway HGVs will be fully autonomous by 2050.***

***Use of automated goods vehicles is likely to begin in depots and in motorway platoons before more widespread usage. The UK Heavy Goods Vehicle Platooning (HELM) real-world trials of platooning are scheduled to complete in 2022<sup>45</sup> UK transport agency.***

## Case Study: Who is Responsible?

I could case study Uber and the incident in 2018 of an uber self-driving car out on a training drive hitting a pedestrian and killing them.

***"The back-up driver of an Uber self-driving car that killed a pedestrian has been charged with negligent homicide.***

***Elaine Herzberg, aged 49, was hit by the car as she wheeled a bicycle across the road in Tempe, Arizona, in 2018.***

***Investigators said the car's safety driver, Rafael Vasquez, had been streaming an episode of the television show The Voice at the time.***

***Ms Vasquez pleaded not guilty and was released to await trial.***

***Uber will not face criminal charges, after a decision last year that there was "no basis for criminal liability" for the corporation.***<sup>46</sup>

Uber and its shareholders claimed, at first, that the pedestrian was at fault. The main argument coming from the fact that the car had right of way, and secondly, a confidence in the technology they have been developing, that the cars capabilities in reducing error on the road means that it was truly the pedestrian's fault. The things involved in this incident are the following: the "driver"; the pedestrian; the bicycle; the car; the TV show The Voice; the road junction and infrastructure that the incident took place at; Uber's development team; Uber; Uber's shareholders and CEO; US and state government, National Highway Traffic Safety Administration. Uber and its shareholders changed their line once the full situation was made clear They used to be able to safely argue that the car did all it could since it was being supervised by a person who could vouch for that real time, but the person was not truly present.

This offers a real and very current hurdle society faces in the implementation of driverless cars on to normal roads, current infrastructure and amongst human drivers. Who is culpable when an incident occurs? Policy makers who dictate rules for driverless cars? the Companies that manufacture the cars? Their CEOs? their designers? Their engineers? The "driver"(if there is one)? Everybody who owns one? In defence of the Uber car, You can argue that a reduction in road accidents is a good thing even

if occasionally they still occur, and you can argue that human drivers kill people every day. But to have that thought betrays a misunderstanding of culpability. The self-driving car doesn't kill anybody. The human "driver" who employs it and the engineers who develop it do. Enter again: Foucault's body-weapon complex. who is doing the killing? The gun? The human with the gun? Or the society/system that enables killing with guns.

You can argue the engineer is not at fault, since the worker is not responsible for the will of their employer(soldier following orders etc). It's a good caveat to consider, but I think I would still put blame on the engineer. A truck driver who runs over a child in the course of executing his orders is still at fault: allegory that aligns the driver to the engineer, whose job it is to produce driving that is safe. Though you can also hold accountable the policy makers who enable the deployment of potentially dangerous and/or unethical tech which is incapable of moral decision making and which is designed to replace moral decision-making humans.

***"Robots could not fly sheriff's patrol aircraft, not when many Sheriff's Department' duties had at least the potential for causing harm to humans." ... "The joke of it was the Spacers had never gone in much for automating their equipment, because it was the robots who were going to operate it anyway." ... "This made the manual job of flying far more complex."***<sup>47</sup>

This is a quote from Isaac Asimov and Roger MacBride Allen's novel Caliban, in which robots are used in all general parts of life. The quote is good for describing the neglect of tech developed for the market, but I am using it here to describe how the driving of a car is a tense and precarious thing, and how robots are not answerable for acts of harm whether intended or not. It is also a good quote for understanding the policy making behind technology and how that will influence driverless cars. Isaac Asimov is famous for his three laws of robotics which he uses in his science fiction novel I-robot.

### ***First Law***

***A robot may not injure a human being or, through inaction, allow a human being to come to harm.***

### ***Second Law***

***A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.***

### ***Third Law***

***A robot must protect its own existence as long as such***

The Apple's project Titan self-driving car is rumoured to have no steering wheel or pedals, and the interior has a U-shaped seating plan.<sup>65</sup>



**protection does not conflict with the First or Second Law.**

These three laws are set out by government and are seen as the will of the people. It is a genuine discussion as to whether driverless cars do or do not conform to these laws in present, since the Uber incident was able to happen. The pedestrian in the incident, and people in future incident, could be helped if a moral code is structured within software to prevent accidents, by law. This is something hard to do, because of its complexity and the capabilities of traditional government. Asimov, in his novels, plays with the idea as to whether robots are answerable to these three laws, or the people who make them are. The point is that robots are made in such a way that they are incapable of breaking these three laws in any logical sense. The only present day and real world example of how this looks is in the previously mentioned Waymo safe protocol, a future speculated to look very different to now and which would need extensive infrastructural

changes to operate. Only when the robot was deemed to have a conscience was it seen to be capable of moral thought and answerable itself.

***"The SAE uses the term automated instead of autonomous. One reason is that the word autonomy has implications beyond the electromechanical. A fully autonomous car would be self-aware and capable of making its own choices. For example, you say "drive me to work" but the car decides to take you to the beach instead. A fully automated car, however, would follow orders and then drive itself."***<sup>48</sup>

The way AI technology and machine learning is used is to block out anything that isn't voice on a teams call, or recognise disease patterns in MRI scans, it is dependent on recognising patterns set out by a programmer and is incapable of developing new ones. This means that there is no way to view this technology compared to human

cognitive decision making and “conscience”.

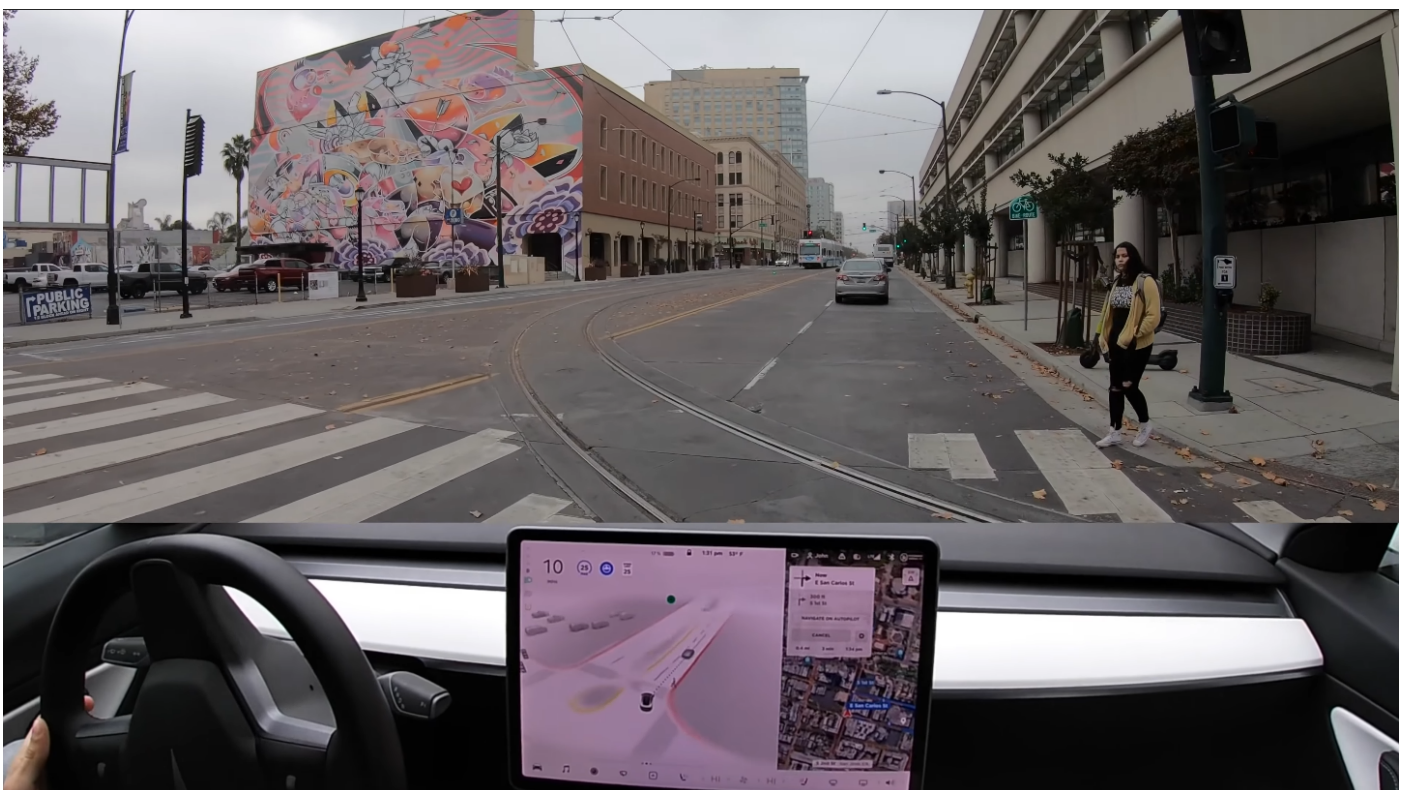
An interesting consideration linked to that of policy making is car insurance. Speaking to Jamie Criddle, a supervisor of a team developing policies for driverless cars at a car insurance provider, told me that there are concepts to involve manufacturers in specific new deals in the way car insurance is provided. For example, 91% of new car buyers paid on finance last year and do not actually own their cars.<sup>49</sup> Some manufacturers are voicing an idea to combine finance payments and insurance policies to include warranty protection and to reduce the responsibility of the driver, as a selling point for driverless cars.

In the uber incident’s moment, moral judgement was needed. The role of the human driver is not just that of operator of the machine, but also that of one with the authority of moral instinct. This is something that machines/AI/robots do not have, and if they ever do, there would be no reason for humans anymore. We can delegate moral decisions to machines in some cases, usually when they are obvious decisions. But driving at speed around unpredictable humans takes

moral instinct, where the action needed in two very similar situations can be radically different. This moral instinct gives us an authority, which is easy to assign responsibility to when something goes wrong. It is difficult to translate this authority onto a driverless car. In this instant, the Uber car was under development and under the supervision of the company developing it, therefore the company and specific people whose confidences enables the deployment of the car had some obvious responsibility that was eventually avoided and placed completely on the operator.

***“If anything goes wrong, the company behind the driving system would be responsible, rather than the driver.”<sup>50</sup>*** A new UK Law commission into redefining the responsibility of a car.

But when driverless cars are being privately bought and used, I think it will end up being the owner of the car who is responsible, and sometimes the company that made it, for example, this can be considered in relation to the different concepts of the uses of driverless technology. Tesla’s are individually owned so the person who owns the car would



Tesla self-driving open beta user gets close to pedestrian crossing with right of way.<sup>66</sup>

be almost fully responsible for it (depending on warranty and insurance) while the Uber and Waymo taxi systems, when deployed, would have almost all responsibility. I don't like this because the same thing is happening as when companies screw things up and just get fined money because no individual person is to blame. To be realistic, the likelihood is that Uber had budgeted potential lawsuits in the early development of its driverless technology, and therefore this incident had minimal impact financially, few lessons will have been learnt and justice not fully served. Only now that Google has sued for technology theft have Uber's driverless car division come into problems.<sup>51</sup>

## What if Bezos has a Grudge Against You? Can You Trust Your Car?

There are many things that you can consider, be amazed by, or sceptical of with the coming of autonomous driving. Something I have neglected to address is hacking. There have already been high profile IoT examples of cardiac devices, a baby monitor and home webcams and of course cars being hacked<sup>52</sup>, what if that becomes the danger? Tesla's have on board V2V (vehicle to vehicle) communication and the UK government are considering V2V infrastructure as a new possibility on motorways.

***"We expect excellent connectivity on all transport to allow travellers to be more productive on the move and improve real-time tracking of goods. Some bespoke transport connectivity infrastructure will deliver significant value, such as digital rail signalling; however, most connectivity is expected to be delivered through cellular or satellite. Low-earth-orbit satellite communications will assist in all transport connectivity, especially in rural or remote areas, including at sea. This increased connectivity will be a key enabler of multiple functions and services across the transport system. All-vehicle connectivity will remove the need for some physical infrastructure such as motorway gantries."***<sup>53</sup> UK transport agency.

This will add a new dependence on the IoT and exploitable network. Consider the autonomy of a driver-car, let alone an autonomous car, uses of V2V tech remove this autonomy, what if the network is downed or hacked?

Driverless cars add one more intimate space that is hooked into the internet, harvesting data for Google in your Waymo, Apple in your Apple self-driving car.<sup>54</sup> Google and Apple already have your location data to be fair, since they

provide the software for the majority of all GPS enabled smart phones, but who knows what they can learn from a space entirely provided by them, you are sitting on their seats, you are driving at their speed and seeing the view out of their window. Perhaps they decide to drive past a shop they know you are tempted by, or they drop you off at your location at exactly the same time as someone else. The IoT is more than the risk of Jeff Bezos driving you off a cliff.

In a more realistic and pressing way, the Tesla FSD (full self-driving) autopilot is in beta and anyone with a Tesla (and can fork out \$12,000) in the US can apply to 'test' it. In the race to get autonomous cars on the road, the main competitive factor between companies is training the technology, getting as many cars on the road and farming road data. Google's Waymo data is limited to its trained drivers, and their concept is the taxi system. While Tesla has no such concept and Tesla's are farming data from all their sold cars, and specific data from the FSD enabled ones. You could say this is clever but consider this proof of how data is extracted from anywhere, value that you do not get a cut from despite owning your Tesla. The other factor to consider comes from the danger the beta poses on the road, prompting the DMV in California to reconsider driverless policy.<sup>55</sup> The beta can be applied for by anyone with a Tesla and videos have emerged of a few sketchy moments of neglect at the wheel.<sup>56</sup>



**ELECTRICITY MAY BE THE DRIVER.** One day your car may speed along an electric super-highway, its speed and steering automatically controlled by electronic devices embedded in the road. Travel will be more enjoyable. Highways will be made safe—by electricity! No traffic jams . . . no collisions . . . no driver fatigue.



# Final Words

I actually like the car-share, taxi concept. Professor of computer engineering Toby Breckon has told me that one of the main things that his project team with Jaguar Land Rover is worrying about at this very moment is how do you know it is safe. What if your car was to rock up and be covered in vomit or with a puncture? ML AI could probably be created to recognise the contents of a 'carriage' (the word Breckon used instead of car during our conversation) but surfaces could look clean and be riddled with disease. He said someone would have recognised this problem due to covid-19 and reported it in a meeting, and it is one of many design considerations on a list yet to be given thought.

But my worry is the larger picture in this instance, with the possibility of society becoming dependant on a system of infrastructures that are privately owned. There are examples of good systems of collectively owned infrastructures, such as rail systems and social housing. but all cars and potentially all roads being controlled and owned by Uber or Google scares me and can be likened to the housing crisis and renting, where use of it made exclusive and prices are hiked, many being left behind. You could perhaps nationalise a system like this, but the money and pace of the tech industry has shown us that it is hard to rein them in, observing things from the Uber TFL petition<sup>57</sup> to the entire social media publisher or not publisher debate and effort to regulate.<sup>58</sup>

I like the car-share concept because it can work on a localised model. Using it can have a positive environmental impact, with the idea that cars and individuals do not feel compelled to make long journeys in a car but can get an efficient and fast long distance transport and then use a car from the train station for the last leg. Less need for concrete motorways, less fuel consumption, encouraged local community services. It's a simple thing but it is one that would change the culture of how the car is used dramatically. I understand car-sharing is not dependant on driverless technology, but driving is something you must learn car to car, but more importantly, if you are in a remote place needing to access transport, a driverless car can come to you, meaning you do not need to access the network with your own car which you are bound. You do not need to return to the car.

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