



Bowling alone in the autonomous vehicle: the ethics of well-being in the driverless car

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Abstract

There is a growing body of scholarship on the ethics of autonomous vehicles. Yet the ethical discourse has mostly been focusing on the behavior of the vehicle in accident scenarios. This paper offers a different ethical prism: the implications of the autonomous vehicle for human well-being. As such, it contributes to the growing discourse on the wider societal and moral implications of the autonomous vehicle. The paper is premised on the neo-Aristotelian approach which holds that as human beings, our well-being depends on developing and exercising our innate human capacities: to know, understand, love, be sociable, imagine, create and use our bodies and use our willpower. To develop and exercise these capacities, our environments need to provide a range of opportunities which will trigger the development and exercise of the capacities. The main argument advanced in the paper is that one plausible future of the autonomous vehicle—a future of single-rider autonomous vehicles—may effectively reduce the opportunities to develop and exercise our capacities to know, be sociable and use our willpower. It will therefore be bad for human well-being, and this provides us with a moral reason to resist this plausible future and search for alternative ones.

Keywords Autonomous vehicle · Ethics · Well-being · Attention

1 Introduction

The autonomous vehicle may have profound societal and ethical implications for humans and societies. It may bring many benefits, such as a reduction in accidents, the relief from the stress of driving and greater accessibility for persons who cannot drive. Nevertheless, new technologies raise questions regarding their ethical and social implications. So far, much of the ethical inquiry in the realm of autonomous vehicles has focused on what the autonomous vehicle ought to do, given decisional uncertainty (Lundgren 2021b), in situations in which the autonomous vehicle is required to make a difficult moral choice. Scientific literature on AV technology ethics is dominated by discussions about the trolley problem (Martinho et al. 2021), i.e., the ethics of the vehicle's decision-making process in accident scenarios (Borenstein et al. 2019; Lundgren 2021a). Other ethical discussions address safety (Hansson et al. 2021; Lundgren

2021a), individual autonomy (Dunn 2021; Chiodo 2022), distributed responsibility and accountability (Liu 2017), explainability (Umbrello and Yampolskiy 2022) and privacy (Cunneen et al. 2020; Jannusch et al. 2021).

This paper takes a different direction. It expands the discourse on autonomous vehicles to interrogate how the autonomous vehicle (fully automated, self-driving vehicles¹) will affect human well-being. More specifically, the paper argues that the autonomous vehicle may detract from human well-being by limiting persons' ability to develop and exercise their capacity to know, be sociable and exercise willpower. Persons' well-being may be enhanced by the relief from driving-related stress, from greater safety and greater accessibility, yet this increase might be traded off with a reduction in well-being due to a restriction on the ability to develop and exercise human capacities.

By expanding the ethical discourse to include a philosophical examination of human well-being, this paper aims to contribute to the discourse on wider ethical and moral implications of autonomous vehicle mobility that should receive more attention (Mladenovic and McPherson 2016;

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¹ equivalent to SAE Level 5 automation see (SAE International 2021).

Cohen et al. 2018; Dietrich and Weisswange 2019; Epting 2019a, 2021; Sparrow and Howard 2020).

The paper is divided into two parts. The first part concerns the ethical foundations against which I evaluate the autonomous vehicle. It begins by motivating the need to expand the ethical framework concerning autonomous vehicles toward questions of human well-being. It then proceeds to lay out the foundations for a neo-Aristotelian theory of human well-being grounded in the development and exercise of our human capacities, delineating the environmental, social and spatial conditions necessary for cultivating human capacities. The second part of the paper applies the neo-Aristotelian approach to humans in autonomous vehicles. It demonstrates how one possible future—a single-occupancy autonomous vehicle paradigm—may engender environments that limit the opportunities for developing and exercising human capacities, thereby reducing human well-being.

2 What makes for a good life and why should we care about it?

So far, the discourse on the ethics of autonomous vehicles (AV) has focused mostly on risk mitigation, safety concerns, distributed responsibility, explainability and privacy. Notably, these ethical challenges are essentially directed at the behavior of the *machine*, or the ethical stance of the stakeholders involved in determining how the machine will behave.

The analysis in this paper embarks on a different path. It is interested in the ethical implications *for the person* inside the machine, in non-critical situations; in what persons can be and do inside the machine. This is because, to fully understand the moral dimensions of AVs, we must think about them in their (future) socio-political contexts (Epting 2019b), and ensure that harmful power relations between AV providers and AV passengers do not emerge (Jannusch et al. 2021). Since AV systems will likely affect the socio-political environment in cities, it is imperative to inquire how they will affect the prospects for human well-being.

The following discussion therefore begins with proposing a philosophical account of human well-being. It then reflects on the role that technology plays in determining human well-being, and concludes with the social and environmental conditions that are necessary for human well-being. This will serve the argument in the second part of the paper, which analyses how the AV may end up interfering with the development and exercise of fundamental human capacities that are necessary for the good human life.

2.1 A philosophical foundation of human well-being: Perfectionism, or the human capacities

Philosophers have been occupied with human well-being for a long time. There are diverse approaches to the concept of human well-being: hedonism; human satisfaction; virtue ethics; the absence of alienation from creative activity (Synowich 2019). Within this list, one approach that is particularly relevant to the relationship between technology and well-being is Perfectionism: a neo-Aristotelian approach which holds that humans flourish when they develop and exercise their human capacities while engaging in things that are intrinsically valuable (Hurka 1993, 2011; Kraut 2007; Synowich 2017). Human capacities include rationality, innovation, growth, imagination, creativity, insight and understanding (Kraut 2007).

The well-being of a human, according to this perfectionist approach, comes from exercising these capacities while meaningfully engaging in things that are intrinsically valuable (Bradford 2016a, 2017). Perfectionists explain the relationship between the successful exercise of human capacities and well-being as follows: things like friendship, achievement, knowledge, moral goodness and true beauty as intrinsically valuable (Parfit 1984; Hurka 2002; Fletcher 2016; Bradford 2015). Philosophers sometimes group these things in an “objective list” (Parfit 1984; Fletcher 2016). Objective lists are groups of items that are constitutive of well-being, consisting neither merely in pleasurable experience nor in desire-satisfaction (Crisp 2016). Rather, our well-being is constituted by exercising our capacities toward attaining the goods on the list (Bradford 2017). Knowledge, friendship and achievement are manifested in the exercise of human capacities: the development or excellent exercise of our capacities *is* our good—the more and better we excel at exercising our capacities, the better we are (Bradford 2017).² To illustrate: on the perfectionist view, since knowledge is intrinsically valuable, when we exercise our rational capacity we gain knowledge, and in this way we improve our well-being.

It is worth noting that perfectionism dovetails from the Capability Approach developed by Amartya Sen and Martha Nussbaum’s (Sen 1999; Nussbaum 2000). While both the capability approach and perfectionism are interested in what persons are able to do, the capability approach is interested

² There is a further discussion that could be had on whether the development and exercise of the human capacities is of intrinsic valuable (as part of the process of human perfection), or of instrumental value (as a way of achieving the intrinsic value of the goods on the objective list). Since the focus of this paper is on analyzing how certain human capacities manifest in an AV environment, I do not explore this discussion here.

in ensuring that persons have the opportunity to be and do things (i.e., functionings), not in whether the opportunity is actually used (Hurka 2002). Perfectionism, on the other hand, is interested in the exercise of the capacities, and in the achievement that the capacity allows. The emphasis on *exercising* capacities will inform the discussion, in the rest of the paper, on the kind of things that the AV will enable passengers to actually be and do.

Before moving on to apply perfectionism to autonomous vehicles, I stress that my goal in this paper is not to defend perfectionism as an account of well-being against competing accounts of well-being (e.g., hedonism or desire-satisfaction). Rather, my goal is to demonstrate that perfectionism contains interesting resources for critically examining emerging technologies, and in particular the autonomous vehicle.

The reason for choosing the human capacities version of perfectionism to inquire into the ethics of the AV is that not only does it provide an answer to how one should strive to lead one's life, but, as importantly, it offers an answer to the question of what material, social and political environment is necessary if we take seriously the idea that human well-being is dependent on the full development and exercise of our human capacities. The argument for justifying the perfectionist approach as a normative foundation for AVs is as follows: according to the perfectionist approach, in order to develop and exercise our human capacities (e.g., the capacity to know, love, have meaningful relationships), a person needs to be exposed to things that will trigger the development and exercise of these capacities. Without these triggers, and absent an environment that provides opportunities to develop and exercise our capacities, those capacities are at risk of withering or disappearing (Sypnowich 2016). It follows that an environment that promotes well-being is an environment that provides rich and diverse opportunities for developing and exercising our capacities, whereas an environment that is bland, monotonous and boring will limit the potential of developing and exercising our capacities (Ferdman 2019).

Seen from this perspective, technology forms an important aspect of the environment against which humans develop and exercise their human capacities, as will be discussed in more detail later. Therefore, the perfectionist approach to well-being provides a useful lens for critically examining the AV. It enables us to ask how the AV will contribute to, or detract from, the environment that encourages humans to develop and exercise their human capacities to engage with things of intrinsic value: knowledge, friendship, love and achievements.

Among the human capacities, I focus in this paper on three capacities: the capacity to know, the capacity for sociability and the capacity to will. These capacities were chosen because each of these capacities corresponds to

an item on the objective list—knowledge, achievement, friendship and morality—things that perfectionists typically consider intrinsically valuable and constitutive of well-being. In the following, I provide a brief characterization of each capacity, from a perfectionist point of view. This discussion will serve as the basis for part 2, in which I analyze how the AV may affect the potential development of these human capacities.

2.1.1 The capacity to know

In various perfectionist accounts, knowledge is considered essential for human flourishing and as such it appears on many objective lists of the good (see Fletcher 2016). Perfectionists typically consider *rationality* as a chief human capacity: knowledge is the exercise of our theoretical rationality, and achievement is the exercise of our practical rationality (Bradford 2017). Thus knowledge's inclusion in the objective list is explained: objective list items—knowledge included—are manifested in the excellent exercise of human capacities.

Tom Hurka (1993) proposes that the capacity to know includes the capacity to know things of two types: knowledge of highly abstract principles and knowledge of a multitude of particular facts. The best understanding, according to this view, is a combination of both types of knowledge—the abstract and the particular. This is because it enables to create 'explanatory hierarchy' of knowledge: a hierarchical structure that uses abstract principles to explain particular facts (Hurka 2020). Thus creating complex hierarchies of knowledge is a manifestation of the excellent exercise of the capacity to know.

Furthermore, we educate ourselves not just to gain skills to advance in life, but also because we think it's good in itself to know something about the laws of nature, and the history of our culture, and our place in the world (Kraut 2007). As such, having knowledge is intrinsically valuable. To illustrate: studying Shakespeare equips schoolchildren with a host of 'transferable skills' like reading comprehension and vocabulary, knowledge of literature, history, and culture that will help them navigate the world. Yet studying Shakespeare cannot be reduced to an instrumental exercise. Becoming familiar with the works of Shakespeare is intrinsically valuable; it enriches children's lives and contributes to their flourishing as children as well as to their future selves (Sypnowich 2017). More generally, it is good to know about the world, about one's relation to the world, to know oneself and to have moral knowledge (Hurka 2011, chap. 4).

In sum, since we fare well when we excel at exercising our human capacities (Bradford 2017), we fare well when we excel at exercising the capacity to know.

2.1.2 The capacity for sociability

Friendship, love and morality also appear frequently on objective lists of the human good (see Fletcher 2016). Exercising our social capacity, on the perfectionist view, is an essential part of our well-being. Its successful development and exercise enables us to cultivate friendships, have loving relationships, participate in public life and become moral human beings. In this brief characterization of the capacity for sociability I distinguish between two facets of the capacity for sociability: the capacity for moral understanding, and the capacity for friendship.

The capacity for moral understanding is “the holistic competence of navigating the total moral environment in which one finds oneself at any given time” (Wallach and Vallor 2020, 401). Developing and exercising moral understanding is dependent on *being* with others, because it involves non-cognitive information and analysis: affective empathy (the capacity to have one’s emotional state directly transformed by the experience of another person); motor signaling (touch, gesture, gait, posture); hormone signaling and environmental sensitivity (being physically attuned to warmth, light, sound, motion). The lived, experiencing body provides an immense flow of highly salient data about patterns of moral life (Wallach and Vallor 2020, 401). The capacity for moral understanding therefore is dependent on embodied being with others. The importance of embodiment as a condition for developing and exercising our capacities will become evident in part 2, when I discuss the AV as a potentially disembodied environment.

The capacity for friendship is the second facet of the capacity for sociability. Friendship constitutes a shared recognition and a common pursuit of the good (MacIntyre 1984, 155). In an Aristotelian sense, the highest form of friendship is ‘virtue friendship’ (Aristotle 1984, 1156b 8–9), which is dependent on the existence of mutual understanding, but as importantly, on the understanding that the friendship itself is valuable (Taylor 1995). For Aristotle, sharing the same experiences, in number, kind and diversity, is an essential component for virtue friendship, in order to further develop morally (Kaliarnta 2016). Friendship thus depends on shared activities, activities which must be pursued in part for the purpose of doing them together with my friend (Sharp 2012; Bennett 2017).

Shannon Vallor (2012) argues that cultivating virtue friendships requires patience and empathy: *patience* allows one’s relationships with others to manifest deeper mutual understanding, greater and more lasting commitments, and a feeling that I am willing to connect with the other person on their terms and not just mine. Patience means that my interest in them does not end with their ability to keep me constantly pleased or fascinated. Patience helps to express to the other the depth of my commitment to the relationship

and builds trust and confidence in its future, by showing that the relationship’s continued existence is not wholly dependent on its momentary rewards.

Empathy is the capacity for feeling with and for others, sharing their joys and their sufferings. Being empathetic is perhaps one of the most difficult capacities to cultivate, because it requires maintaining a delicate balancing act between openness to the affective life of others and preservation of adequate emotional resources for oneself (Vallor 2012).

When we develop and exercise our capacity for sociability, we develop moral understanding, patience and empathy which enable us to cultivate friendships and forge meaningful social relationships. Meaningful social relationships and friendships are things of intrinsic value, which promote our well-being when we have them. Part 2 will examine how the environment that the AV creates may negatively impact persons’ ability to cultivate moral understanding and friendship.

2.1.3 The capacity to will

On a perfectionist view, the pursuit of a good is itself good: activities aimed at the good gain intrinsic value in virtue of their relation to the goods toward which they are aimed (Hurka 2003). Therefore, according to Bradford (2015, 2016b), ‘achievement’ gains distinctive value when aimed at the good, and as such, belongs on the objective list of things that are intrinsically valuable and constitutive of well-being. Further, in order to achieve, a person needs to exercise their capacity to will; the capacity to will is chief among the human capacities: when we exert great effort to overcome difficulty, we exercise this characteristic human capacity in an intrinsically valuable way; engaging in *difficult* activity requires that we *excel* in exercising our will. The capacity to will is therefore critical as a capacity to overcome difficulty in order to achieve something that is intrinsically valuable (Bradford 2015).

In addition, the best achievements are the most difficult (Hurka 2020), because an achievement is better when it requires other achievements: “you have to go through many steps and exercise different skills to complete them” (Hurka 2016, 383). The greater the effort required for a person to achieve her goal, the more her well-being is enhanced by its achievement (Keller 2004). Moreover, the capacity to will contributes to well-being in another way: developing and exercising our human capacities (e.g., to know, to be sociable) itself requires the capacity to will. This can be partly explained by the interdependence of the capacity to will and other capacities: the conditions that require the exercise of the will to a high degree are also, plausibly, the conditions that require a high-level exercise of other human capacities (Hirji 2019). For example, cultivating virtue friendships requires exercising the capacity to will, since it requires

cultivating patience. “Virtue is a constant process, requiring the maintenance of rigorous habits of good behavior and motives, slipping would be quite easy, especially in times of duress or change, times when our good habits are most threatened” (Sharp 2012). The immediacy and physicality of face-to-face communication often forces us to be patient even when we would rather ‘tune out’ or ‘switch off’. As humans, we need situational opportunities to move us in the right direction, that is, that will make us exercise our patience in the development of friendship. Historically, and across cultures, the social strains and burdens of face-to-face conversation have been providing precisely the kind of situations that make us cultivate patience (Vallor 2012) by triggering the capacity to will ourselves into cultivating patience.

The next section argues that the environment that persons inhabit structures the conditions and the triggers against which they can develop and exercise the capacity to will, to know and be sociable. Technology, as will be discussed below, is a critical component of this environment and can shape whether and how people develop and exercise their capacities.

2.2 Technology and the human capacities

The previous sections outlined a philosophical approach to human well-being—perfectionism—which holds that the successful development and exercise of our human capacities to know, to will and to be sociable promotes human well-being. The following section examines what role technology would play in this perfectionist approach.

In order to embark on this analysis, I introduce Robert Nozick’s “experience machine” thought experiment:

“Suppose there was an experience machine that would give you any experience you desired. Super-duper neuropsychologists could stimulate your brain so that you would think and feel you were writing a great novel, or making a friend, or reading an interesting book. All the time you would be floating in a tank, with electrodes attached to your brain. Should you plug into this machine for life, pre-programming your life experiences? [...] Of course, while in the tank you won’t know that you’re there; you’ll think that it’s all actually happening [...] Would you plug in?” (Nozick 1974, 42–43).

According to Nozick, we should resist plugging in, because we want to *do* certain things, not just have the experience of doing them, and we want to *be* a certain way. Floating in the tank does not tell one anything about oneself: Is she a caring person, courageous, intelligent, etc.? Beyond having experiences as a certain kind of person, it is important for oneself to *be* that person, and living life in the

machine is devoid of that kind of being. Living an embodied life is the manifestation of doing things and being a certain person, whereas living inside the experience machine is merely having the *experiences* of these things.

Nozick’s thought experiment allows us to reflect on technology’s role in promoting human well-being. In the thought experiment, we use some technology—a machine—that maximizes our pleasures or desires. Nevertheless, upon reflection, we have reason to reject this technology because it actually undermines our human well-being. Instead of encouraging us to develop and exercise our human capacities as embodied beings, the technology actively blocks our ability to actually exercise our human capacities. Following this line of argument, I propose the following as a depiction of technology’s role in determining human well-being:

Technology should contribute to creating environments that provide conditions for using our senses, realizing our embodied self, and thereby developing and exercising our human capacities in meaningful and well-rounded ways.

In order to develop a human capacity, we need to be exposed to things that will trigger the capacity and sustain it, and in order to sustain a capacity, it needs to be exercised. Without exercise, a capacity is at risk of deterioration and even extinction. The environment one inhabits therefore has to be such that creates the conditions for humans to develop and exercise their capacities (to know, be sociable, to will, etc.). This environment includes the social relations and the physical objects that surrounds a particular agent. In a material sense, the environment we live in includes buildings, open spaces, streets, views, other people, noises, smells, climate. In the social sense, the environment we live comprises of values, norms, cultural practices, legal rules, interactions with other people. The material and the social environment provide the background that triggers (or inhibits) the development and exercise of our human capacities. The background against which persons develop and exercise their capacities is the ‘socio-spatial opportunity structure’ (Ferdman 2019).

The socio-spatial opportunity structure is typically cumulative and path dependent in its impact on capacity development: the opportunities that one is surrounded by directly encourage the development and exercise of certain capacities and discourage the development and exercise of other capacities. It is therefore plausible that over time the capacities that one has developed will continue to shape future decisions with regards to what things to engage in. The socio-spatial opportunity structure, therefore, needs to continuously provide diverse and high-quality opportunities for persons to develop and exercise their human capacities.

Open-minded spaces (Walzer 1986) will generally provide diverse and rich opportunities for developing and

exercising human capacities. Open-minded spaces are environments that present opportunities for various activities and interactions, stimulate the senses and encourage learning. Typically, they are “designed for a variety of uses, including unforeseen and unforeseeable uses, and used by people who do different things and are prepared to tolerate, even take an interest in, things they don’t do.” (Walzer 1986, 470–71). An open-minded space will be characterized by a well-functioning public space, which includes lights, sounds, smells, touches, colors, shapes, patterns and textures of the natural and man-made fixed, semi-fixed and movable elements, balancing between variety, novelty, order and coherence. Open-minded spaces provide external stimuli of various types, through physical objects, sculptures or street views, such that prompt social interaction among strangers (Goffman 1963). This setting encourages engagement with persons, things and ideas in multiple and complex ways.

Single-minded spaces, on the other hand, will likely limit the opportunities for developing and exercising human capacities. Single-minded spaces are bland, monotonous environments “designed by planners or entrepreneurs who have only one thing in mind, and used by similarly single-minded people. Entering space of this sort we are characteristically in a hurry” (Walzer 1986, 471). Because single-minded spaces are monotonous and bland, containing less opportunities to trigger one’s senses or interact with others in meaningful ways, the propensity to develop and exercise human capacities in diverse and nuanced ways is lower compared to open-minded spaces (Ferdman 2019).

Depending on how it is designed and used, technology may be a component of either open-minded or single-minded environments. If it contributes to an environment that provides opportunities for developing and exercising our capacities (to know, be sociable, to will, etc.), it will promote well-being. If, on the other hand, technology is a component of a bland, monotonous environment, it will reduce well-being. To the extent that our capacity development and exercise is dependent on open-minded environments, we should want two things from technology: first, that it helps to create open-minded environments, and second, that it will not engender single-minded environments. In the following, I argue that one plausible future of AVs is at risk of engendering a single-minded environment, and thereby reduce human well-being.

3 The AV as a potential single-minded environment

There are many possible futures of autonomous vehicles. Autonomous vehicles could be small, carrying one person (single-occupancy AV); large, carrying multiple passengers, or medium-sized, also carrying more than one passenger.

The transportation system could be made up of a combination of vehicle types, sizes and passenger occupancy. In this paper I choose to focus on one possible future, namely a future of a transportation system dominated by single-occupancy vehicles, where most vehicle trips are made alone. Importantly, it is not my intention in this paper to argue that single-occupancy AVs will become the dominant transportation paradigm. Rather, I am *assuming* this as a possible future, because this provides an opportunity to explore what this possible future might mean for well-being. The focus of this paper, in other words, is the implications for well-being given a possible future of single-occupancy AVs dominating the transportation landscape. Why choose one possible future rather than exploring all possible futures? For one, lack of space prohibits developing a sustained argument for well-being implications of other possible futures (pooled rides, public transport AVs). Another reason is that a single-occupancy AV paradigm is not only a possible future but a plausible one, for reasons provided below. Therefore, if it is a plausible future, it is important to interrogate what it may mean for human well-being.

Before moving on, a further note on the scope of the argument in this part of the paper. This argument henceforth focuses on the effects of single-occupancy AV travel on the passenger, during the ride itself. As such, it does not cover the potential implications of AVs on the well-being of pedestrians or cyclists. Moreover, the spill-over effect of travel, i.e., well-being generated from being able to reach out-of-home activities, is also not accounted for here. For example, while there might be a potential increase in the well-being of persons with disabilities or the elderly due to the ability to use the AV to reach places, this type of well-being is not accounted for in this paper. The reason for focusing on the ride itself is that this offers an opportunity to examine more closely how human capacities manifest themselves when persons are inside the AV.

The argument in this part of the paper proceeds as follows: a single-occupancy AV paradigm is a possible and plausible future. In this plausible future, the environment created inside the vehicle will have characteristics of a single-minded environment. This single-minded environment may limit passengers’ ability to develop and exercise their human capacities (during the ride). The upshot is that a single-occupancy AV paradigm may detract from human well-being.

3.1 Individual preferences for single-occupancy AV rides

While there is much uncertainty regarding the future of AVs, there are two trends that point to the possibility that single-occupancy AVs may become a dominant transportation paradigm. There is some emerging evidence to suggest that

given the choice, persons might prefer single-rider options over multi-rider options (pooling or public transport). For example, a recent study shows that ride-hailing services (Uber and Lyft) add to overall vehicle mileage (ride-hail increases overall trips). The pattern suggests that patrons prefer single-rider option over multi-rider options, and that this is likely to endure in a world of AVs, given that auto users tend to switch to solo services due to considerations of travel time, reliability, comfort and privacy, whereas pooled options (sharing a ride with others) mainly draw patrons from sustainable modes like public transportation (Schaller 2021). Another study also finds that autonomous pooled ride-hailing might not be as appealing to commuters as autonomous solo ride-hailing (Khaloei et al. 2021). It is also plausible that persons who currently drive alone are more likely to continue commuting alone when using AVs (Wang and Akar 2019). If indeed individual preferences continue to favor solo options, and absent a policy of mixed transportation modes, it is plausible that this may contribute to a transportation system where single-occupancy AVs become a prevalent, or even the dominant, mode of transport.

3.2 A political economy of the AV

While the scholarly literature has not attended to the political economy of the AV, there is a growing body of non-academic writing suggesting that ‘Big Tech’ (Google, Amazon, Facebook) is interested in marrying its technology with the autonomous vehicle platform, in order to capitalize on passengers’ data and attention (Nylen 2021). One industry report forecasts that the overall revenue pool from car data monetization might add up to \$450–750 billion by 2030 at a global scale (Michele Bertonecello et al. 2016). Another industry report predicts that in the US, AV revenue will reach \$2.3 trillion by 2030, of which 70% is estimated to occur from selling experience to the passenger (Edwards 2018). ‘Big Tech’ already profit off persons’ data and location. As such, gaining a foothold in the auto industry could serve as a lucrative market for further monetizing personal data and passenger attention. I stress that this brief review is not a descriptive account of the political economy of the AV industry. Rather, it is meant as an opportunity to reflect on a plausible future in which corporations have a huge stake in shaping the economic and operational environment in which AVs will operate.

The reason for reflecting further on a future where corporations have a vested interest in monetizing data harvested during AV rides is as follows: harvesting and manipulating human attention and reselling it to advertisers has become a major part of our economy. For example, according to the Wall Street Journal, the advertising ‘Triopoly’ of Google, Facebook and Amazon collect more than half of

all ad dollars spent in the U.S. (Hagey and Vranica 2021). Because targeted marketing can result in more purchases compared to unpersonalized marketing (Matz et al. 2017), the winning strategy in this game is gathering chunks and subsequently slivers of our unharvested awareness (Wu 2017). The more social media users engage with the addictive-by-design media platforms, the more attention social-media companies can sell to advertisers, and the more data about the users’ behavior they can collect for themselves (The Economist 2017), in order to increase personalized advertising.

To the extent that the attention economy is becoming a major part of our economy, it is likely that attention-corporations will seek to capitalize on the advertising platforms offered by new technologies. One such platform is the interior of the AV, where the passenger is captive in a space that will be covered in screens, and where the vehicle can offer ‘tailored trips’ based on the passengers data (Tumlin 2016). Offering tailored trips is an interesting byproduct of the attention economy, because it may shape the transportation market in such a way that builds-in a bias toward single-occupancy vehicles.

A single-occupancy vehicle is a vehicle that carries only one passenger at a time. In a single-occupancy situation, the AV can capitalize on the passenger’s attention and offer individualized content and individualized routes, which are more profitable for the corporation (Ferdman 2020). High-occupancy vehicles—vehicles that carry multiple passengers, such as buses or trains—cannot provide the platform for tailored advertising. In high occupancy vehicles there are multiple passengers, each with their own unique tastes and habits, which makes it harder to target particular individuals on the vehicle’s interior screens, and virtually impossible to offer customized trips.

The ‘attention economy’ is an ethical issue, since “attentional patterns should reflect moral considerations and support aims like inquiry and happiness” (Gardiner 2022). In other words, attention is a virtue that should be directed at things of intrinsic value, much in line with the Aristotelian approach to virtue. Furthermore, attention has another ethical aspect: having one’s attention means having some sort of control over that person (Goldhaber 1997). Attention determines which possibilities a person takes seriously and which environmental features they are sensitive to, monitor for, and neglect (Gardiner forthcoming). It follows that having one’s attention is also having control over, and even shaping, which possibilities a person takes seriously and which environmental features they are sensitive to, monitor for, and neglect.

Technology’s constant interruptions and precisely-targeted distractions, which are purposefully addictive-by-design, are taking a major toll on our human capacities—our ability to think, to concentrate, to solve problems, and

be present with each other (Centre for Humane Technology 2018). ‘Attention merchants’ (Wu 2017) who purposefully manipulate persons’ attention are in effect limiting these persons’ opportunity to develop and exercise their human capacities, and as a result, are contributing to the decrease in those individuals’ well-being. The next section examines the relationship between single-occupancy vehicles, attention and (dis)embodiment.

3.3 Single-occupancy AVs and the human capacities

This section argues that single-occupancy AVs may engender single-minded environments that will work against the human capacities to know, be sociable and the capacity to will. I examine each capacity in turn.

3.3.1 The AV and the capacity to know

If knowledge is best when abstract principles are used to explain a multitude of facts using explanatory hierarchies (Hurka 1993), the capacity to know is exercised to the fullest when it is applied in creating explanatory hierarchies of facts and abstract principles. A passive mobility mode such as an AV will likely suppress the development and exercise of the capacity to know, by creating an environment that is poor in opportunities that would trigger the capacity to know (during the ride). In order to develop this argument, I will compare the AV to active mobility modes such as walking and cycling, and, on a different vein, to driving. This will help distinguish between mobility environments that are conducive or disadvantageous for the capacity to know.

Active mobility modes like walking or cycling create a unique combination of embodied physical movement in an environment that triggers the human senses in multiple ways. Walking and cycling involve kinaesthetic apprehension—awareness of the position and movement of the parts of the body by means of sensory organs. Evidence from neuroscience shows that a moving body creates embodied cognition: a synergetic effect of cognitive and motor components, which helps make neurological connections in the brain, assists the long-term memory formation, integrates cognitive, motor, and sensory information between the left and right hemispheres of the brain and influences long-term memory recall (Geršak et al. 2020). Thus walking and cycling literally create space for knowing in the brain.

But walking and cycling are not just about the moving body. They are also about where the body is moving in: the environment the pedestrian or cyclist is moving through, which holds diverse information about the place. Here the theory of affordances—a theory in ecological psychology—is helpful in explaining the importance of an information-rich environment. The affordances of the environment are what the environment offers the animal, what it provides

or furnishes, either for good or ill (Gibson 1979). An affordance is a resource that the environment offers an animal (in our case, a person), that has the capabilities to perceive and use it. Affordances are meaningful to animals in that they provide opportunity for particular kinds of behavior (Chemero 2003). We can therefore frame the pedestrian/cycling environment as an environment which provides affordances for the pedestrian/cyclist: walking or cycling provide opportunity for knowledge of both types—the abstract and the particular. The capacity for knowing is developed by the pedestrian/cyclist in the act of walking/cycling, from observing and being immersed in the material and social environment of the streetscape. Walking or cycling, as embodied movement, create a setting which is rich in opportunities for acquiring knowledge and organizing it in an explanatory hierarchy (Ferdman 2021).

Inside the vehicle (car or AV), on the other hand, knowledge acquisition is restricted to two senses only: sight and sound, and the landscape is inaccessible to the other senses. Inside the vehicle “[t]he sights, sounds, tastes, temperatures and smells of the city are reduced to the two-dimensional view through the car windscreen” (Sheller and Urry 2000, 747), making the interior of the vehicle poorer in terms of exposure to things that trigger the human capacity to know, compared to a lively, outdoor urban environment. Furthermore, the body inside a vehicle is immobile, limiting the opportunity for kinaesthetic understanding—learning with the senses. The interior of the vehicle, therefore, decreases the opportunity to exercise the capacity to know, in two ways: first, the passenger is not moving their body, which decreases the opportunity for kinaesthetic learning. Second, it decreases the affordances—the quantity and diversity of information that the environment projects to the passenger. As such, the interior of the vehicle creates an environment that leans toward single-mindedness, decreasing the possibility of creating explanatory hierarchies, thereby limiting the opportunity for exercising the capacity to know.

It is worth reflecting on the possibility that while the AV offers little the opportunity to exercise the capacity to know kinaesthetically, perhaps it will nevertheless provide opportunities to exercise the capacity to know by using the ride to read, imagine or think. However, the likelihood of actually engaging in these activities may be low. The reason, as discussed in Sect. 2.3.3 below, is that given that the attention economy seeks to generate user engagement with media platforms, this may leave less time and mental resources for the passenger to spend the ride reading or thinking.

3.3.2 The AV and the capacity for sociability

Recall that the social capacities include the capacity for moral understanding and the capacity for friendship. I will analyze each in turn. The capacity for moral understanding

is “the holistic competence of navigating the total moral environment in which one finds oneself at any given time” (Wallach and Vallor 2020, 401). As discussed above, developing and exercising this capacity requires *being* with others, because to exercise this capacity one needs to understand and be sensitive to non-cognitive information, which is more accessible in face-to-face interaction. Mobility can play an important role in cultivating the capacity for moral understanding. Mobility and sociability are connected, since “being a social and embodied practice, mobility in part influences the sense of being connected to people and places through which an individual travels” (te Brömmelstroet et al. 2017, 4). As soon as persons leave their door, they are “linked-in-motion” (Jensen 2015), negotiating their way through spaces and around other people.

Here again it is useful to demonstrate how the AV may suppress the capacity for moral understanding by demonstrating how moral understanding can be nurtured in embodied mobility settings, like pedestrian or cycling environments compared to driving or riding an AV.

Walking and cycling are beneficial for the development and exercise of the capacity to be social, as they are operationalized in the public sphere where other people are occupying the same shared space. In public spaces, walking and cycling trigger trust-enhancing social interactions. For example, in order for pedestrian order to be possible, pedestrians must create a tacit contract between themselves, through social and collaborative processes. Through collaborating in the creation of pedestrian order, they have to trust each other to act like competent pedestrians. Streets are therefore ‘trust-building’ environments. Body techniques and social cues, in this respect, are oriented to a social order that pedestrians respect and reproduce (Ferdman 2021).

Furthermore, walking or cycling enable the creation of a rich social public space, because persons have to be co-present while on the move. Being co-present requires using non-verbal communication, making eye contact, making and interpreting social gestures, exposure to other lifestyles and learning to respectfully co-habit shared spaces. Walking and cycling in public spaces are based on voluntary, embodied, active participation in continuously creating, interpreting and re-creating the rules of inhabiting public space.

In contrast to walking or cycling where persons inhabit shared spaces with others, persons inside vehicles—especially a single-occupancy vehicle—will be shielded from interaction with others. Social interaction in the vehicle will be possible when the vehicle contains multiple passengers. But if single-occupancy AVs become a dominant transportation mode, this will decrease the opportunity to share the vehicle with others. In a single-occupancy vehicle environment, the potential for exercising the capacity for moral understanding with persons inhabiting the same space will

therefore be low to non-existent, compared to walking or cycling.

Furthermore, trust-building that is cultivated between pedestrians or urban cyclists is based on voluntary and active embodied participation, the conditions for which will be absent in the AV. In fully automated vehicles, the passenger is passive, in the sense that she is not required to participate in the creation or adherence to the rules of the road. In a single occupancy AV, the passenger would not have to use non-verbal communication, make eye contact, or interpret social gestures of others. So the element of social co-creation of social rules while the passenger is on the move is absent in this AV setting (Ferdman 2021). What we remain with instead is a person with minimal to no embodied interaction with other persons while on the move.

That the AV will undermine the capacity for moral understanding may have worrying implications for public space. Single-occupancy vehicles create a space in which persons are physically in the public sphere, yet at the same time they are encapsulated and detached from other people. In a political economy of corporate owned single-occupancy vehicles, space that was previously public, available to anyone with a car, would increasingly be controlled by the large corporations that provide mobility services (Sparrow and Howard 2020). Yet it is in the public sphere that we exercise our social capacities, and it is in the public sphere where we learn that there are others, and we learn how to behave around others and to respect their existence and difference from oneself (Kohn 2004). So a driverless mobility paradigm that insulates individuals from other people, minimizes those chance interactions with ‘the other’. It will likely contribute to engendering an environment in which persons do not need to inhabit public space with persons who are not like themselves, and where contact with others is minimal or non-existent. While this is also an implication of current car-dependent mobility paradigms, even before the emergence of the AV, I argue that the AV might accelerate the negative implications of the privatization of public space. This is due to the worry that a single-occupancy AV dominance will come at the expense of public transport, thus reducing the opportunity for developing the capacity for moral understanding.

The second type of social capacity is the capacity for friendship. The capacity for friendship requires the cultivation of patience and empathy (Vallor 2012). In previous sections I argued that single-occupancy AVs may create a single-minded environment which may suppress the potential for cultivating human capacities. The case of cultivating friendships in a single-occupancy AV environment is less straightforward compared to the other capacities, because, one may argue, authentic virtual friendship is possible (Elder 2014; Kiliarnta 2016), and an AV passenger could dedicate their AV ride to cultivating online friendships, and in this

way they will be developing and exercising their capacity for friendship.

Nevertheless, there is reason to be sceptical about the potential to develop meaningful virtual friendships while occupying the AV. In general, cultivating meaningful friendships on social media might be difficult to achieve for two reasons. First, social media is currently designed to provide us with escape routes from any interaction that has lost its momentary appeal. It intentionally and explicitly liberates us from the uncomfortable strains and burdens of conventional communication, and as a consequence, it discourages the cultivation of patience, which is necessary for the creation of meaningful social relationships (Vallor 2012).

Second, online friendships provide less opportunity for empathy compared to embodied friendships. Empathy—feeling with and for others—requires balancing openness to the affective life of others against preserving emotional resources for oneself. Here too, there is some empirical evidence that it is difficult to cultivate empathy on social media, due to the rapidity and shifting attention patterns of digital media consumption (Vallor 2012). All this points to the possibility that spending time on social media and communicating with online friends during an AV ride is not going to provide the right sort of opportunities to develop and exercise the capacity for meaningful friendship.

As such, the environment created by single-occupancy AV mobility might be unfavorable for the development and exercise of the capacity for sociability in two senses: first, it will insulate the passenger from others, eliminating the need to cultivate moral understanding. Second, the disembodied, online social environment inside the AV will limit the potential of cultivating patience and empathy, which are necessary for the achievement of meaningful friendships.

3.3.3 Single-occupancy AVs and the capacity to will

Recall that on the perfectionist view (Sect. 1.1.3), the capacity to will is characterized as the capacity to exert effort in order to overcome difficulty, toward achieving something that is intrinsically valuable (Bradford 2015). To the extent that the attention economy will create addictive-by-design environments in order to capitalize on persons' attention during the AV trips, this will potentially create obstacles for developing and exercising the passenger's capacity to will. This is because in order to develop and exercise one's capacity, the environment one inhabits needs to provide the necessary cues and triggers for the development of the will, and to minimize cues that suppresses the will. Single-occupancy AV travel may create an environment that does the opposite.

Persons tend to overestimate their willpower in general (Loewenstein and Schkade 1999) and their willpower to resist temptation in particular (Hesmat 2012). So while persons may imagine or even fully intend to spend the AV trip

doing meaningful things, in reality they may be tempted away from engaging in activities that require willpower. To the extent that the attention economy is precisely in the business of taking advantage of the difficulty to resist temptations, it is plausible that the attention economy will purposefully exploit the all-too-human weakness of will, and divert the AV passenger's attention away from meaningful activities, toward engaging with the addictive-by-design platform. Importantly, developing and exercising our other capacities (to know, to be sociable), is dependent on the capacity to will, and so the addictive-by-design setting of a single-occupancy AV ride (enclosed, disconnected from other people, surrounded by screens, lured into media platforms) may hurt not only the exercise of the capacity to will but the potential for developing the other capacities, as follows.

Recall that in the discussion on the potential for exercising the capacity to know during an AV ride, I raised the possibility that the passenger might read or think during their ride, thereby exercising the capacity to know. Yet this may prove optimistic. The attention economy might plausibly jeopardize persons' capacity to will, by tempting the passenger into engaging with social media and other addictive platforms during the ride. Being engaged in these platforms means that the passenger will not be spending the ride reading, imagining or thinking. In other words, the attention economy's exploitation of weakness of will might engender an environment that will curtail the passenger's opportunity to develop and exercise their capacity to know.

In sum, this section argues that the environment engendered by single-occupancy AVs may become a single-minded environment, offering few opportunities for developing and exercising the human capacities necessary for well-being: the capacity to know, the social capacities and the capacity to will.

4 Final Remarks

The question that this paper investigates is how a plausible future of single-occupancy autonomous vehicle might impact persons' ability to develop and exercise their human capacities to will, know, and be sociable. I have focused on this plausible future because I believe that it gives us an interesting insight into how AV technology, if left unregulated, may have ethical consequences for human well-being.

One of the upshots is that the governance of autonomous vehicles needs to critically examine the implications of a single-occupancy AV paradigm on human well-being, and tailor policy accordingly, in order to capture the benefits of autonomous vehicles (safety, relief from driving-related stress, greater accessibility) whilst avoiding the creation of single-minded environments. My hope is that the analysis in this paper provides us with a reason to think critically about

driverless technology. If single-occupancy driverless technology ends up creating single-minded environments, then we, as moral agents, have reason to resist it, and to come up with alternatives—technological or otherwise—that create open-minded environments, which offer the opportunity to develop and exercise our human capacities and thereby improve our well-being.

In illuminating a perspective of autonomous vehicle technology, I also hope to contribute to the ongoing discussions regarding the governance of AV (Himmelreich 2020; Brändle and Schmidt 2021; Rodríguez-Alcázar et al. 2021). Rodríguez-Alcázar et al. (2021) argue that the governance of AVs is a political problem, where the ultimate criteria for governing AVs should be provided by the general ends pursued by the political community as a whole. The argument in this paper, namely that a single-occupancy AV paradigm may detract from well-being, may provide important insights for this political debate. Among the general ends pursued by the political community as a whole, the conditions for human well-being through capacity development can serve as one general end to be balanced against other general ends in the political philosophy debate on how AVs should be governed.

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