It is clear that there will be huge ethical implications in the future of all self-driving car companies once full autonomy is achieved, namely the implicit requirement of programmers to answer the trolley problem and also automation. This report instead focuses on the current day issues of self-driving software, specifically considering whether Tesla has acted ethically in its distribution of its self-driving software, Autopilot.

Ethical issue 1: Should Autopilot and FSD software be available to members of the general public? Has Tesla acted ethically in its distribution of this software?

Before covering the ethical issues surrounding Autopilot, it is necessary to first outline what it is. According to the Tesla website, Autopilot is a generic term for their “advanced **driver assistance** system”, which is powered by 8 external cameras, a forwards-facing radar, and 12 ultrasonic sensors that all serve as inputs to an onboard computer running a deep neural network [1]. Autopilot (AP) and Full Self-Driving (FSD) are two specific types of Autopilot, each offering different features. The most relevant features to this discussion include traffic aware cruise control (AP), autosteer (AP), highway navigation (FSD beta), city street navigation (FSD beta), and traffic light/stop sign stoppage (FSD). The full set of features can be viewed on the Autopilot support page [1]. Both packages fall under the industry standard [2] Society of Automotive Engineers (SAE) level 2 classification of self-driving vehicles, which means **the driver is still required to be fully attentive, with hands on the wheel, ready to take control at all times** [3]. Variations of this message are clearly conveyed multiple times on the Autopilot support page, which states they “…are intended for use with a fully attentive driver, who has their hands on the wheel and is prepared to take over at any moment … these features … do not make the vehicle autonomous.“ [1], as well as in Tesla car manuals, on the in-car display when it is first enabled, and subsequently whenever activated [4].



Figure 1: SAE's Levels of Vehicle Autonomy - Tesla Autopilot commonly classified as level 2 [2]

You may have already been confused to learn that the name Autopilot can be used as a general term for both Autopilot and FSD, or to refer to the specific software package Autopilot [TODO: potentially cut the previous line]. It is also misleading to call these packages Autopilot and Full Self-Driving, as the former implies it is an autonomous piloting software, and the latter a feature complete self-driving software.

In fact, The Center for Auto Safety and Consumer Watchdog launched a request for investigation to the Federal Trade Commission with regards to Tesla’s Autopilot marketing, and a German court recently banned Tesla from using such terms [5].

A survey conducted by the Insurance Institute for Highway Safety (IIHS), of which the results are depicted in figure 2, clearly reveals Tesla’s Autopilot naming is the worst offender amongst level 2 driving software when it comes to misleading the general public [6]. Tesla questioned the relevance of this survey, arguing that whilst the general public may be misled by the term Autopilot, Tesla owners are not [7]. A German company, puls Marktforschung, surveyed Tesla owners specifically, finding that 98% of respondents were aware they had to maintain control of the vehicle at all times and were familiar with the numerous safety warnings and agreements (results shown in figure 3) [8]. It should definitely be noted that 7% of Tesla owners still thought Autopilot meant fully autonomous, not requiring any driver supervision, which contradicts an implied figure of 2% from the earlier questions (100%-98%=2%), questioning the reliability of the answers. 

Figure 2: Results of the IIHS survey depicting the percentage of people who believe certain behaviours are safe whilst a level 2 system is being used - Tesla's Autopilot shown in blue [6].



Figure 3: Results of the ‘puls Marktforschung’ survey 'Awareness and utilization of the Autopilot' [8]

Tesla CEO Elon Musk has also repeatedly neglected his own safety advice by taking his hands off the wheel while Autopilot was engaged in multiple televised interviews, including on 60 Minutes [9], CBS This Morning [10], and Bloomberg [11]. Actions speak louder than words, and with the huge audiences that these mainstream outlets have, it’s morally reckless to normalise this kind of behaviour.

The first confirmed Autopilot death occurred on a Florida highway in 2016, when neither the driver nor the Autopilot were able to detect a semi-trailer crossing the road perpendicularly, resulting in collision. The National Transportation Safety Board (NTSB) determined that the cause of the crash was partly due to the driver’s overreliance on the Autopilot system, stating that there was no human input to the car for 2 minutes prior to the crash, and only a mere 25 seconds of human input for the 37 minutes of Autopilot engagement [12] [13]. The NTSB also criticised the design of Autopilot, in that the driver was allowed to keep it engaged even though they were detected to be not paying attention [13]. Tesla initially either didn’t account for humans abusing their self-driving system, which is morally negligent, or they intentionally decided to not implement better safeguards to protect and combat against driver distraction, which is morally reckless. Tesla has since updated the software to frequently check whether the driver is applying torque to the steering wheel, and provides visual and audible alerts if it doesn’t detect human input, eventually slowing to a stop if driver input remains undetected.

* Explain the steering wheel torque system and show examples of it working
* Discuss its limitations
* Conclude it is still insufficient (evidence via more crashes due to driver attention after implementing)

Since then there have been numerous other fatalities, all

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