### Autonomous Vehicles

The current state of Autonomous Vehicles as a whole is, frankly, an absolutely huge subject.

The simplest and most core of the idea is that a vehicle can, with the assistance of an onboard computer and sophisticated sensor technology, act in accordance with its surroundings to take action without the direct input of a human driver.

The general classification of autonomous vehicles comes under a five tier system, with each tier having specifics of what the vehicle can do, from simple driver assistance tools all the way up to fully automated trips between places without the need for human intervention.

In depth discussion of the technology is easiest with a knowledge of these tiers, which are laid out below.[[1]](#footnote-0)

#### Tier 1

Driver assistance technology is the most common and longest existing of autonomous vehicles, and some of these technologies have been around since as early as the 1950s.

These are relatively simple technologies such as cruise control, anti-lock brake systems (ABS) and stability control. These are all systems that will add convenience to a driver’s commute and safety while still requiring a human to stay in complete control of the vehicle.

#### Tier 2

The second tier of vehicle autonomy is the limited automation of one feature at a time in limited circumstances. Some variations of this technology have been around since around 2000 and the most well known of these technologies is automatic emergency braking, which will use sensors in the front of the car to automatically slow or stop the car when an obstacle is sensed in front of the car, such as a slower vehicle in the lane in front, a stationary obstacle sitting in the road, or in some cases an animal or person moving into the path of the vehicle.

#### Tier 3

Tier 3 is the highest version of autonomous vehicle technology that is available to the general public, with several large car manufacturers currently developing and improving their current offerings. Tier 3 allows for the onboard computer handling two or more simultaneous functions driving the vehicle, such as cruise control, automatic braking, and lane keeping.

Vehicles with this level of technology are able to maintain current actions, such as following a lane, sticking at a specific speed, and potentially avoid low speed collisions, but still require an active driver in control of the vehicle. Many of the vehicles of this level have driver monitoring implemented, so that if the driver is not paying appropriate attention to the operation of the vehicle, it will slow and move itself off the road to prevent potential accidents that the computer cannot handle by itself.

#### Tier 4

Tier 4 automation technology is still largely in development. It is able to largely take control of the vehicle, take full control of entire trips, and importantly does not require continual oversight from a human driver. A vehicle with Tier 4 automation is mostly able to handle emergencies and changes of circumstances, especially when in a controlled environment, but will notify the driver if and when anything occurs that it is not able to take care of by itself. With a vehicle of this type the driver would be free to undertake other tasks while being driven but should be awake and ready to take control if it is required.

#### Tier 5

Tier 5 automation, simply put, is complete and total automation of the vehicle. A tier 5 automated vehicle would be able to take any and all actions required to undertake travel completely alone without any input from a human whatsoever.

As stated above, tiers 3 and 4 are the most heavily under development at this time, with tier 3 being available to the public and being improved and refined while in use, and Tier 4 being actively under development but only available for use under strictly controlled circumstances.

Generally they use a combination of a number of different sensors including RADAR, LIDAR, and ultrasonic sensors to be able to tell what is going on around them, and utilise machine learning to improve and adapt based on what actions have been taken in similar circumstances previously.

A very large amount of the improvements in the quality of vehicle automation in the near future is going to come from machine learning, with Tesla making great strides in this department as they currently have the largest user base with all of their current model vehicles having their Autopilot installed as a standard. Machine learning takes cases where either an onboard computer tries something new, or records what the human driver’s intervention is, and records it for future use so that it can improve its reactions in future. It then will send the information back to the manufacturer where it is propagated across the entire range of vehicles, often on a per-manufacturer basis.

As an addition to this, there is a small number of firms working on a technology called “Vehicle to Everything communication” or V2X, which extends the idea of vehicles talking to each other, and adds traffic lights, weather services and other road services to the mix, allowing the vehicle to know more easily in real time what is happening around it, including traffic and road conditions, and with enough autonomous vehicles on the road, nearly eliminate the incidence of traffic accidents.

There are many potential impacts of wider improvement and implementation of autonomous vehicle technology, across several different industries.

To taxis in the short term it will make the driver’s job a lot easier, with the ability to simply input a destination and watch to make sure nothing happens. Unfortunately as the quality of the automation progresses, the drivers themselves will become less and less necessary, eventually reaching a point where an entire fleet will be controlled from the head office with no need for human oversight.

Similar could be said for the Trucking industry, with a huge pool of jobs that will be made simpler and less tiring on long drives in the short term, with there already being speculation that the local driver providing input in case of an emergency could be replaced by a remote driver overseeing large numbers of trucks and monitoring them for the need for human input.

Potentially the biggest industry these improvements will have an effect on will be the IT industry.

There is already a very large number of projects that are utilising machine learning and rudimentary AI in their technological research, and with the sheer size and scope of work being done on autonomous vehicles, the improvements in machine learning could be a driving force (pardon the pun) towards huge improvements across the board for software that will learn and adapt from previous experiences. Improvements in machine learning software for cars can potentially lead to improvements in a wide array of uses such as virtual personal assistants, email and spam filtering, and a whole variety of other applications.

On a more personal level, improvements in self-driving vehicles will have a huge impact to me on both a personal and a professional level.

A vehicle that is able to travel autonomously would mean being able to focus on other tasks while travelling, either locally or over long distances, which would alleviate boredom, fatigue and time that could be spent in other ways while travelling. It would open up the ability for me to more regularly visit friends and family in other cities and states across the country without losing valuable study and work time to travel.

To some of my family members the biggest benefit would be similar; the ability to conduct business, communicate with clients and continue working while travelling to collect mail or visit clients would be invaluable.

1. Kaslikowski, A. (2019). *The Current State of Autonomous Vehicles | Digital Trends*. [online] Digital Trends. Available at: https://www.digitaltrends.com/cars/the-current-state-of-autonomous-vehicles/ [Accessed 10 Jan. 2020]. [↑](#footnote-ref-0)