**IT Technologies**

Autonomous Vehicles

Autonomous vehicles are defined in the Merriam – Webster dictionary as being ‘an unmanned vehicle designed to operate without guidance according to pre-programmed instructions’. In order to envision and subsequently create a machine that can essentially perform the complex task of driving without human input or ‘guidance’, state of the art technologies have had to be invented and implemented in cars and other vehicles. Furthermore, the technologies that have been developed as part of autonomous vehicle research are state of the art due to their complexity, as developers have had to integrate advanced software and machine learning capability with traditional vehicle hardware as well a variety of different camera, radar, and sensor systems, in order to create a true self driving vehicle that performs all the functions necessary to not only drive a vehicle but also be aware of the vehicles surroundings and all the threats and obstacles that vehicles can face on the roads. State of the art Machine Learning and Artificial Intelligence technology play an essential and crucial part in the systems that make an autonomous vehicle a reality. These advanced technologies are used to make rapid decisions on the road that would traditionally be made by a human driver, such as moral decisions and decisions that can potentially affect the safety of occupants inside an autonomous vehicle. In present day, autonomous vehicles are currently being developed and tested around the globe, with many traditional automobile manufacturers and newer start-ups working on their own autonomous vehicles. The current state of machine learning and autonomous technologies allows many self-driving vehicles to perform almost all the tasks and operations required to be considered ‘fully-autonomous’. In many vehicles, this is in the form of functions such as: ‘lane-keep assist’ (which allows the car to track road markings and follow them without human steering input.), automatic breaking (which allows the car to use radar and cameras to sense the distance between the vehicle and another vehicle or obstacle and apply the brakes if necessary.), and in some vehicles, full self-driving capability in scenarios such as highway/freeway driving (meaning that the vehicle is in full control of steering, acceleration, braking, indicating and changing lanes without human input). Furthermore, automotive manufacturers such as Tesla, Volvo and Mercedes-Benz have been developing and integrating Artificial Intelligence systems to enable autonomous vehicles to be able to use cameras to identify and follow road signs as well as enabling them to ‘see’ and avoid other road users such as pedestrians and cyclists. In the near future, autonomous vehicle technology, specifically advances in Machine Learning and Artificial Intelligence, will likely enable autonomous vehicles to make ‘human-like’ decisions on the road such as moral choices in the event of a possible accident and be fully self-driving without any requirement of human input or interaction. Moreover, the future of autonomous vehicles will be defined by the way in which these vehicles interact and communicate with each other. Technology that will enable vehicle to vehicle communication is still in the early stages of development but should be operational in the next 3 years, thus its implementation into vehicles will be vital to make autonomous vehicles not only possible, but a viable solution to replace human drivers and make driving safer. In order for autonomous vehicles to be a commercial success and a viable way to get around, a variety of technological advances will have to be made. This includes rapid development and improvement of Artificial intelligence and Machine Learning technology as well as further development of radar, camera and other sensor systems. Crucially, the parallel technological advancement of software and hardware in autonomous vehicles will enable them to first and foremost exist and be a safer more efficient way to travel.

As growing numbers of autonomous vehicles are developed, tested and eventually released to the public as consumer products, they will overwhelmingly impact the way in which people travel and interact with their cars. The potential of autonomous vehicles to change the very landscape of modern society is vast, given that by putting human trust into the hands of artificially intelligent machines, humanity will test the very advancement of technology that enables autonomous vehicles with their own lives. Furthermore, human trust in driverless vehicles will be a crucial factor if they are to be a success. This hinges on the successful development of artificial intelligence as moral decisions on the road formerly reserved for a human driver will now be carried out by the vehicle. However, the potential benefits of autonomous cars and other vehicles is tremendous. Erik Coelingh, Volvo’s Senior Technical Leader for Safely and Driver Support Technologies, stipulates that the era of driverless cars will ‘transform our lives in more ways than one’ and that the advent of autonomous vehicles will improve our lives in three key ways: 1. Roads will be safer; 2. Traffic and fuel efficiency will greatly improve; 3. People will have more free time. The direct impact of autonomous vehicles will be a dramatic shift in the way people use and interact with cars. This may take the form of autonomous ride sharing, whereby owners of vehicles will be able to send their cars to pick up paying passengers and/or autonomous cars will be able to pick up their owners simply with a request through an app or remote. As a consequence of the era of driverless cars, many professions revolving around driving a vehicle may disappear. This may include taxi drivers, professional chauffers, bus drivers, truck drivers, etc. Therefore, people in these professions may find themselves out of a job. However, new technological and maintenance positions may be created as a result of autonomous vehicles being widely adopted.

In the not so distant future, driverless cars will most likely have a profound impact on my life. I may own a self-driving car and thus, will be able to make money by sending it out to sell rides to other people. Furthermore, the way I use my car will drastically from present day, whereby I would be able to simply enter a desired destination and my car would just simply be able to take me where I need to go. Using public transport would also be quite different from the current system. Bus, train and tram drivers would all be obsolete and therefore catching these forms of transport would involve trusting the Artificial Intelligent systems in these modes of transport to get me to my destination. The era of self-driving vehicles would dramatically change the way in which my family and friends travel. For example, my family could send their car to provide ride share services or when going shopping could send the car to park itself, etc. Requesting a self-driving car remotely, may become a norm, with thousands of cars traveling on roads on route to their owners or on their way to pick up passengers. In the event of an emergency for example, one of my family members may be able to just simply request the family car come to his/her location and be able to travel to a hospital. Subsequently, autonomous vehicles may fundamentally change the way that I hang out and socialise with friends, as a driverless car may allow me for example, to call and request it to come to my location to pick me and/or my friends up from one location and take us to another.

**References**

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