**AUTONOMOUS VEHICLES**

An autonomous vehicle - also known as a driver-less car - is a vehicle that can sense its environment and move safely on its own with very little or even no human input. Autonomous vehicles carry several different sensors to see and sense their surroundings, which include radar, LIDAR (Light Detection and Ranging - a sensing method that uses light in the form of a pulsed laser to measure distances), GPS, odometry and inertial measurement units. An advanced onboard computer takes all the inputs from these sensors to identify the roads, road signs as well as obstacles such as pedestrians, other vehicles and roadblocks. Ideally automotive companies want to aim for level 5 automation which classifies as: “steering wheel optional” and require no human intervention at all. At this present moment in time we are at level 2, which classifies as "hands off.” At level 2, the automated system takes full control of the vehicle, however the driver must keep an eye on the road and be prepared to take control straight away if the automated system fails to respond properly. Although this level is called “hands off”, the vehicle still requires the driver’s hands to be on the wheel at all times for the system to engage.[1]

Over the next three years it’s unlikely that we will see much more advancement in autonomous passenger cars on our roads. It is likely to be decades before we reach level 5 advancement. Several car makers and technology companies have concluded that making autonomous vehicles is going to be harder, slower and costlier than they thought.[2] Car makers have made it to the point where their vehicles can easily spot and identify obstacles on the road. The difficult part is preparing the vehicle for unusual circumstances, such as pedestrians crossing the road when cars have a green light and human drivers making illegal turns. What is most likely to happen in the next few years is autonomous industrial, agriculture, construction and mining vehicles.[3] In these situations, there is very little chance for human factors to cause these machines to unnecessarily stop or even accidentally injure or kill someone. Case, which is a company the builds farming equipment has already released a concept tractor which is fully autonomous.

The biggest impact this will have is in the areas where there will be very little factors that will cause death or injury. We'll see major changes in the mining and agriculture fields as there is very little vehicle traffic and most of the time there is plenty of room to move. With the advancement of autonomous vehicles, mining companies will be able to devote more manpower to searching for minerals while the menial jobs like transporting the earth to the sorting facility can be done my machine. This will be a more efficient approach which saves the company time and produces more end product. The downside to this approach is that transport jobs will be lost. In agriculture, autonomous vehicles will improve the lives of farmers as they will not need to spend time struggling to find workers to drive their vehicle or pick produce. Again, this is a situation that has very little risk factor as once the vehicle is programmed and under way it’s likely that no one will around except for possibly a supervisor keeping an eye on the vehicle. This will have major benefits for farmers of the future as they will no longer have to search for reliable employees, and they can spend more time tending to their crops. This creates a greater yield and less down time for the farm.

Another big opportunity for autonomous vehicles will be the taxi/public transport industry. With future technology we will not need drivers and instead be shuttled around in taxis like the ones used in the science fiction movie “Total Recall.” Australia and other countries around the world are already testing out autonomous buses and hope to have them online in Sydney's busiest routes by 2022.[4] According to itsnews.com.au, New South Wales already has driver-less buses in operation in Sydney Olympic Park.

Finally, autonomous vehicles will vastly improve the lives and mobility of the elderly and handicapped. These vehicles will give them the freedom to do tasks such as grocery shopping and will enable them to stay socially active with family and friends. A downside to this is the demand for caretakers will decrease as most people will be able to move about freely without the need for someone to shuttle them around. On the plus side, people who were once unable to find employment due to mobility issues may be able to find themselves a job in the workforce again or even for the first time.

In the short term, I do not see this this technology affecting my daily life directly. I rarely catch public transport, so I won’t be dealing with autonomous buses and trains and I don't see myself owning an autonomous vehicle at any time in the foreseeable future. The only way this may affect me in the short term could be the possibility of sharing the road with an autonomous vehicle. Depending on how reliable their software is, it could be challenging to make an insurance claim when the autonomous vehicle is at fault. In the long term when I'm a lot older, I may need one if I become unable to drive myself around safely. I'd much prefer to travel in an autonomous vehicle than depend on someone to drive me around or catch public transport. Autonomous vehicles have a great ability to change lives in the future. I hope I’m around to see the positive changes they could have on many peoples lives.

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# CLOUD COMPUTING

Cloud computing is the delivery of on-demand computing resources which include everything applications to data centres over the internet on a pay for use basis. This gives users and businesses to scale up or down quickly and easily meet the demand of their enterprise. They only pay for what they use and finally all the IT resources that are needed are self service access.[1]

There are many different service models for cloud computing and they are as follows:

* Infrastructure as a service
* Platform as a service
* Software as a service
* Mobile “back-end” as a service [2]

So from these service models different uses for cloud computing can be used such as storage and data retention on large scale, examples of this is Google Drive and Microsoft OneDrive. Other uses are running virtual machines in the cloud if the business does not have the money to upgrade physical computer equipment. Run software applications in the cloud like Quickbooks and MYOB so that businesses don't need to update all there copies each year it is easier to deploy the software from the cloud.

Some companies like Nvidia, Sony, Microsoft and Google are developing technology to stream video games to players in web browsers, on there consoles or mobile devices using cloud technology. It is still in its infancy but this will impact the video game market by providing games in a software as a service model and give another option for all gamers once the technology is perfected a bit more.[3]

The fast pace that computing technology changes with several upgrades each year brings with it making cloud computing even better as the hardware the data centres and other platforms use is constantly getting faster and faster. The only thing holding it back at the moment is the speed of the internet in places as it is sub-optimal. But with further advances in internet infrastructure this problem can be erased.

The impact of the development of cloud based computing is that options are limited and thus keeps the cost of cloud based systems cheaper. Because this technology relies on a the internet there can be times when there are outages or even downtime and if a business works entirely in the cloud this can cause a problem as they will not be able to access the required software or data.

The most drastic change that cloud computing has brought is the slow decline in IT professionals employed in large businesses because of the outsourced work to cloud based systems there is little need for on site IT personnel so they have become the most effected people in all industries that use cloud computing

This affects me because I use Microsoft OneDrive to store photos and other small files online so I can access them in the eventuality that I have to reformat my computer and I lose some data I can get it back from the backup in the cloud. It will also give me another option to enjoy my hobby of playing video games if I can play them in a simple web browser I don't have to upgrade my computer as often. It would have little impact on my family as they don't use much technology and would not know where to begin with cloud computing. My friends use it all time as one of them uses it for his job all across Australia.

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**MACHINE LEARNING**

Machine Learning Machine learning in essence is the scientiﬁc method of data analysis by computers. It refers to the collection, identification and interpretations of meaningful patterns in data sets without explicit pre- programming. Most dictionaries deﬁne learning as the acquisition of knowledge, understanding or skills through various means such as study, instruction, or experiences. An alternative definition of learning through the psychological perspective is ‘the relative permanent change in behaviour as a result of experience’. Understanding the deﬁnition of learning is fundamental to understanding machine learning and how this process takes place.  
Machines learn via inputs and external information that cause changes within it’s program, data, structure or overall system. When such changes have occurred it can be said that the machine has learnt. Algorithms are used to facilitate machine learning, they are representative of the ‘experience’ portion of learning. As with humans and other species alike, the process of learning begins with an experience, the algorithms represent the experience and are used to develop expertise. This acquired expertise is represented through outputs which are the performed tasks.   
Upon learning of this recent technology one may question it’s purpose and why it even exists. It’s development was prompted by the complexity of programming. If there is already a ﬁxed program written for a function to take place then there is no adaptability of the program to its users. The program would be unable to improve its outcomes based on experiences. Most programs are used by diﬀerent people and their input pattern may change according to the individual’s requirements. Thus machine learning is the best solution to adaptable programming and improved predictions, decisions and performance.   
There are three broad categories of machine learning systems. Supervised learning, Unsupervised learning and reinforcement learning.   
Supervised learning: As the name suggests it is the method of learning where the programmer or teacher has involvement. The computer is given inputs as well as selected outputs, the aim of this process is to ensure the computer is trained generate desired outputs from the inputs presented.  
Unsupervised Learning: A method of machine learning where there are no labels assigned to the algorithm. The data presented to the computer typically consists of only examples. The aim of this process is to allow the computer to discover meaningful patterns in the inputs.   
Reinforcement Learning: This method of learning is where the machine or computer must engage with a changing environment. It reaches goals through trail and error, without explicit outputs by programmer.   
Machine Learning Everyday Use Machine learning is everywhere, although the processes are covert and complex the outcomes are part of the 21st century lifestyle. From anti spam software that can ﬁlter out emails to fraud detection programs that can detect inconsistency and even to simpler tasks such as search engine options. The camera’s that exist today have been influenced by continuously learning, we’ve seen improved facial detection and object recognition by various camera software. We’ve seen in recent times autonomous cars that are equipped with ‘anti-accident’ systems. Machine learning is everywhere as has made daily tasks simpler through improved machine predictions.

The future of ML The founder of this field of technology Hebert Simon stated that “machines will be capable, within twenty years, of doing any work a man can do”. This statement was made in 1965 and holds true today. Computers have surpassed human intelligence in some aspects as they are able to analyse

hundreds and thousands of data sets and find patterns within a short amount of time. The future of ML seems infinitely great as it will only get more precise as more data is received. Industries separate from tech have only recently begun harnessing the power of this new technology, advertising firms have used ML to effectively target their adverts. Medical diagnostic facilities, entertainment industries, ﬁnancial sectors and many more ﬁelds have embraced ML through their software. As time goes on there will be greater improvements to software and machine learning processes to enable more accurate data and predictions from computers. Machine learning has been promised to save lives, increase economy output by adding trillions to the global economy, it’s also been promised to address the current challenges seen around the globe such as climate change and other environmental issues. These advancements will be facilitated by individualised service to users in various sectors, by providing data to these algorithms and machines they can become more accurate in their relevant ﬁelds.   
To assist machine learning in these industries there are a few changes that need to take place. Societal perception is a key area that must be addressed in order for the future of ML to progress seamlessly. As people interact with machines daily the norm in society has shifted to include more technology in daily life. The new driving force to secure the future of ML should be the basic knowledge of its process, key concepts and foundational teaching need to be the priority of all sectors as it will change the negative public perception of machine learning and artiﬁcial intelligence. Lack of understanding of machine learning systems fuel fear and anxiety amongst most people who at times have never even heard of the term ML. These systems are able to perform speciﬁc tasks and in some situations can be used to modify or replace existing human roles. It is evident that the advancement of ML will change how work is traditionally done, when change take place there is usually some level of disruption before the change is adapted to. This will hold true as machine learning become more widely accepted in more sectors. To ensure seamless change industries must account for the changes that aﬀect them respectively as they use ML in unique ways.   
Personal perception of ML Machine learning had previously been an area that cause me some level of distress. I can say that it had been due to the lack of knowledge that I had in this ﬁeld. Although I have a lot to learn of this technology I am more optimistic about its development. I see how it can be used to improve daily life. Simple things that I had overlooked have utilised Machine learning to help its accuracy and eﬃciency. I personally love things to work eﬃciently, the promise of ML is that performing simple and complex tasks will be more eﬃcient with it’s use. Researching this topic has sparked new change within me, I’m more curious about the technical workings of this new technology and what the processes are. I’ve been exposed to a whole new way of thinking andI’m optimistic about the future in regards to ML and artiﬁcial intelligence in general.  
In regards to family member and friends they have not been exposed to the same to machine learning in the same way that I have. They are still apprehensive about it’s implications which is understandable. As I mentioned earlier in this piece the public perception of ML tends to be negative. They have fears that it may take over job prospects and have signiﬁcant presence in all industries. This fear is primarily due to limited understanding, ML needs to be viewed as technology that can assist in making task simpler and improving daily life not as one that threatens or replaces humans. I believe as information becomes more wide spread then people my family and friend included will reduce fears about machine learning and its future.

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**ROBOTS**

Robots are machinery or devices that are designed to make tasks originally performed by humans easier to do, or in many cases remove the need for humans in that role[1]. This can be achieved in a variety of ways from autonomous manufacturing robotics that can perform monotonous tasks with higher precision that humans to exo-skeletal suits that enhance the users strength and endurance.

Robots or more precisely robotics have had a massive positive effect on society, allowing us to develop technologies more advanced than previous generations. They allow us to have a standard of living far greater than we have had at any time in our history, as all of the convenient devices such as TVs, mobile phones, kitchen appliances and even some houses have been put together at least in some part by robots, often completely manufactured by robots.

One aspect of robotics in particular that has encouraged massive growth of the human race is the automation of manufacturing. Due to this automation we have been able to be more efficient and precise with how we construct automobiles, enabling us to make more cars that are safer more economic to make and put less strain on worker. This does have a downside as with automation there are losses in jobs and it is up to companies to transition the workers from their previous role to another new role.

Robotics has enabled humans to:

* Send robots into space to explore other the other planets in our solar system. [2]
* Streamline manufacturing processes by utilising robots to perform repetitive tasks that would be unable to be completed by humans.[3]
* Entertain themselves with completely customised battle bots fighting for glory[4] to high speed, high adrenaline drone racing.[5]
* Create autonomous robots to even further revolutionise many industries.[6]
* Teach and encourage youth to enter the STEM fields.[7][8][9]
* Regain control of their lives through robotic prosthetic limbs allowing previously disabled people to have relative autonomy.[10]
* Allow humans do perform superhuman feats of strength, endurance and speed. Further more allowing us to create and innovate in new directions.[11][12]

These are just a few of the many benefits that robotics has brought to society and I see the robotics industry changing the way live our lives. We could have in house robotic cleaners(think Roomba[13] but able to do much more than just clean the carpet and give rides to curious cats[14]) that free up time for us to innovate in other ways or bipedal robots that roam through disaster zones looking for survivors.

The timeline on when these technologies will be commercially viable is difficult to predict. If we are to follow previous trends, it took the mobile phone 96 years from being on business class airline flights in 1926 to the powerful slim devices we have in our lives now. Robotics and robots will be continuing to evolve interweaving different technologies. Artificial intelligence could be incorporated into packing robots to eliminate the human error element of the packing and shipping industry, which can cost companies millions of dollars.[15][16]

I believe the robotic industry could benefit from open sourcing patents similar to what Elon Musk has done with Tesla’s patents.[17] Patents are designed to protect someones work, while I see the benefit of patents I find when they are used to block companies through lawsuits and legal action[18] they halt progress and delay or stop life altering technology from coming to market. The technological developments that are limiting this technology at the moment are resources. Almost all robots use electricity to control their systems and being quite complex devices they use quite a lot of it, if batteries where developed and released that were cost effective and more electrically efficient then the robots of the future wouldn’t have to rely on a power grid so much and could be deployed into remote areas or third world countries that don’t have reliable power grids.

If an open source mindset were adopted in the robotic industry I would speculate that it would promote creativity and rapid progression with technologies. If you look at some of the huge names in tech like Google, Facebook, Github, Twitter, Redhat and Samsung. These companies have all benefited from open sourcing some of their work[19]. This open sourcing of software allows anyone around the world to collaborate, tinker, change, develop, etc and effectively expand a companies resources to employ everyone in the world who wants to participate. I speculate that this method of collaboration could allow robotics to be improved by anyone at anytime making better, safer and cheaper robots.

If we look at how the main power source behind a lot of mobile robots, batteries, we are limited by our current technologies. Lithium Ion batteries are one of the most efficient and common battery types for consumer products but they have drawbacks one being that lithium is very expensive to mine and refine. There are however exciting technological advancements that claim to allow large batteries to charge in under 5 minutes, be able to charge via Wifi, solar or ultrasound[20]. Other companies are researching how utilise triboelectric nanogenerators(TENGs) to charge devices, TENGs to my understanding are a device or material that sits on the surface of another material that utilises the electrons separating between the two layers as a means of energy generation. If you extrapolate this technology, it is not hard to imagine a robotic exo-skeletal suit that relies heavily on this technology to power itself meaning you would have to carry smaller batteries as you are harvesting energy from your own movement.

These technologies will always be disruptive to the industry that they are being implemented in, but this doesn’t always have to be a bad thing. The automotive car industry has been revolutionised due to the fact that robots have replaced humans, what needs to happen is for those people that have lost their jobs be given the opportunity to retrain into another role, or in a Utopian world view, no one works and everyone shares and uses their skills to create and innovate. I see robots affecting everyone, from CEO’s who reap(and hopefully share) huge profits from automation and streamlining their businesses to people in disaster zones that rely on airborne robots to deliver aid and rescue.[22]

Personally I think advancements in robotics will affect me in wondrous ways, from being able to call an autonomous taxi to my door removing the need to own my own vehicle, to being able to shop confidently online with out the risk of getting my order sent somewhere else, have the wrong product shipped to me, or just damaged due to human error.

I feel it is too early to really predict where this industry is going specifically but my optimistic outlook leads me to believe that the human race is going to benefit in all areas of life, even being able to get out into nature away from technology for people with paralysis. I have high hopes that by the time my newborn is my age we will be able to travel all over the world at a fraction of the economic and environmental cost that we have in these times. She will be able to recover from disease or illness far quicker due to medical nanobots so tiny that you can only see them with a microscope[23]. I have high hopes that robotics combined with other areas of information technology will provide the highest standard of living not only to my child but to every single child in our solar system(and possibly others?). I have reasonable confidence that we will see these advancements within a decade as this industry is only growing bigger by the year.

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