

The Emerging Impact of Artificial Intelligence in the Automotive Industry

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1. ABSTRACT

This paper addresses the effects the emerging technology of Artificial Intelligence (AI) has on different markets and demographics in both personal and business dynamics. The purpose of this research is to identify the different markets that will be forced to expand and change because of the development of Artificial Intelligence. The challenge in seeing Artificial Intelligence's specific effects in different markets is mainly due to the status of its development. Artificial Intelligence has been an emerging science since the birth of the field as a formal entity in the 1950's, beginning at Dartmouth College. In the present day, Artificial Intelligence is being implemented more than ever but its effects, both positive and negative, are yet to be fully seen. Our research focuses primarily on six areas of society in the United States: impact on the legal system, crime prevention, security, safety, and types of technology, future improvements. By focusing in on these six core areas of possible effect we can begin to see where AI may continue to grow in the future.

2. SAFETY

The first safety feature of self-driving cars is that they can "see" for the driver. What enables the self-driving car to see for the user is a mixture of cameras and LIDAR (Light Detection and Ranging). The LIDAR device is a constantly rotating laser beam that sends light pulses all around it. It measures the travel time and location of the reflected laser light to find the location and shape of objects around it. The self-driving cars also rely on traditional radar. The self-driving cars use a CPU to collect the LIDAR data, and GPS data to find the precise location of the car, so it can maneuver around people, cars, etc. The AI in the car enables it to make intelligent decisions about what to do in certain situations depending on previous scenarios. What users fail

to realize is that these automated cars that they are driving are still learning. Therefore, they require an attentive driver.

Many drivers who own Tesla cars think that when the car is autopilot that they can get away with doing other tasks because the driver assumes that the AI in the car enables it to make intelligent decisions about every situation. Unfortunately, this is not the case. Part of the problem is due to how these cars are marketed and the other half of the problem is due to the technical knowledge of the general public. When customers hear automated and self-driving cars they think that the car should be fully equipped to handle every possible situation that could occur on the road. For example, the cameras on self-driving cars can have trouble "see" in low-angle sunlight and the lasers on the cars can be affected by fog and snow. Moreover, unusual situations, called edge cases, like accidents, construction, and emergency vehicles can be difficult for the AI to interpret. Also, self-driving cars aren't good at reading human cues like eye contact and hand gestures that can be used while driving. The point that AI car makers should try to get across to customers is that the car is still learning while it is being driven. Therefore, the driver still needs to be attentive even in autopilot. [1]

3. CRIME PREVENTION

AI-motivated facial acknowledgment software will permit police departments and other forms of government to obtain video surveillance from public or privately-owned cameras and even eyewitnesses' mobile devices. This technology is already here. Though not yet prevalent in the United States, China has an enormous system of camera feeds, supposedly more than twenty million. That structure examines for out of the ordinary behavior such as public drunkenness or possible theft. Alternatively, the Police Department in Detroit is allegedly going to be assimilating this software into the department's Green Light monitoring database. The system will monitor surveillance from contributing businesses and organizations. Additionally, after the marathon bombing in 2013, a computerized

system was mounted in Boston, called AIsight. The software monitors surveillance live and alert the authorities if it notices unlawful conduct.

Companies like Motorola Solutions, Axon, and others are jumping on the AI-bandwagon and have executed artificial intelligence into their body cameras. Facial recognition is still in the works because innovators claim that their technology will still only distinguish things or objects and not people yet. For example, in a missing children's case, the technology would recognize their last known clothes worn instead of the child's face, which could obviously be problematic. There are some other incredible things AI is doing right now in the world, not just in automotive. Artificial Intelligence and facial-recognition could ultimately be implemented to alert law enforcement about crimes in development or sightings of sought-after fugitives. Using AI, Ford automotive wishes to patent a driverless police car that traps people breaking the law. Accurate AI requires supercomputers, or a set of computers associated in a network. Likewise, it necessitates a great deal of data for the machines to consume for education, which is where the cloud comes in. Axon CEO Rick Smith states that "In order to make AI work well for law enforcement, the data has to be somewhere it's accessible like in the cloud," "If every agency has its own data, they're not going to have enough to effectively create Artificial Intelligence tools. In a centralized model, you can train the AI." [2]

4. COURT SYSTEM ADAPTATION

The growth of artificial intelligence within the past couple of years has brought about unprecedented evolution in almost every industry as it aims to assist society with everyday tasks as well as predict patterns in life altering diseases. This developing technology will undoubtedly alter not only average consumer's experience but the average employee as well. As the market for Artificial Intelligence has proven [1], society is ready to embrace the new technology for its advantages but has yet to experience all of its challenges and disadvantages. Specifically we have yet to see how the court system will resolve conflicts involving artificial intelligence. In order to see where we are headed as a society in this area we must first examine its recent history, what kind of policy is developing and why our court systems are not yet equipped to address its challenges. We will then address a significant question that will determine the future of AI implementation - when an AI causes harm, who is to blame?

The growth of the Artificial Intelligence and Machine Learning industry worldwide has grown tremendously, even within the past two years. There has been a race to encourage the growth of the industry across the globe beginning in early 2017 [2]. Individual countries are implementing national strategies to respond to the skyrocketing industry. The United States began to lay its own framework towards the end of 2016 in three separate reports [3-5]. These reports addressed the need for research and development, identification of ethics within the industry and more. With this newly developing technology our court system is currently ill equipped to deal with its challenges to society primarily because it has yet to deal with autonomous technology that in some sense, can make decisions for itself. By promoting research and development as well as ethics and fairness, leadership can get a better grasp on where the industry is headed and how we can prevent any large scale challenges it will inevitably present to society.

Artificial Intelligence policy has been defined as "...public policies that maximize the benefits of Artificial Intelligence while minimizing its potential costs and risks," [6]. Policy is created to regulate an industry in a way that will best benefit society. We do this by attempting to maximize the benefits while minimizing its potential to cause harm and finding the appropriate balance in between these two needs. Artificial Intelligence has proven to be beneficial in automating previously human regulated activities while providing greater accuracy. More recently the dark side of this blooming technology has been apparent thus the need for a proper set of industry boundaries.

Currently we live in a world with a court system that, since its creation, has waded through conflicts between humans, government and corporations, never between human and machine. Dr. Gabriel Hallevy, a professor of criminal and hi-tech law at Ono Academic College located in Israel, states: "People are going to get killed, and the legal system's current mainstay—manufacturer liability, which depends on ineptitude or malfeasance in the production process—is ill-equipped to deal with it," [4]. Machine learning has continued to surprise us in ways we never thought it would. A few examples of this include the Cambridge Analytica debacle and Google's AI that has passed the Turing test [8].

This large question of AI action responsibility comes from a hypothetical circumstance that has already happened [9],[10] and will undoubtedly happen again in the future. An AI machine kills another human being, whether it be at their place

or work or elsewhere. How does the court system best serve justice in this scenario? There are typically only two perspectives to take in this hypothetical. The court system is designed to mediate and bring justice between two humans, the state and a human, the state and a corporation, etc.. The court must either change how it views criminal liability as it has held them for as long as it has been in service or put these beliefs as they are on AI machines.

Many have argued that the offending AI should be seen as one would see a dog in a dog-biting scenario, where the owner is held liable. Dr. Hallevy reminds his readers, "Where there is crime, there must be punishment..",[7] he goes on to explain there is no purpose in trying to treat an AI like a human in the sense of punishment- no one gains anything from sentencing a machine to life in prison. The same thing goes for corporations, we can't sentence them to prison terms but they can be fined. He argues this could also be done for the offending Artificial Intelligence. Hallevy states, "*It's my property. Can anyone tell me not to use my property the way I want? Yes!*" [7] The solution he suggests may be the most applicable to the current structure of the legal system. Society will not gain anything from punishing an AI machine like a human would be punished. But treating them like company assets and forcing the company to either discontinue its use or using it to serve society will encourage corporations using Artificial Intelligence to put in more protective security measures. This will be the most productive outcome for both the court system as well as society as a whole. [3]

5. TYPES OF TECHNOLOGY

There are many different types of AI technologies that are becoming the standard in autonomous cars. Cognitive computing can understand, reason, learn and interact much like humans do. Cognitive capabilities would have a deeper understanding of unstructured data. Autonomous cars are being equipped with AI-based systems like voice and speech recognition, gesture controls, eye tracking, monitoring systems, virtual assistance, mapping and safety systems. eyeSight is an AI software that detects driver behavior in driver identification, driver recognition, driver monitoring and infotainment control. eyeSight can detect whether the driver is in the vehicle and the individual driving the vehicle. Infotainment control can be used by speaking or with hand gestures without taking their eyes off the road. These systems like eyeSight give drivers a greater user-experience and these driving experiences generated from every ride is recorded and stored in a database to help companies make more accurate decisions in the future. Companies like Uber who are moving

from driverless automobiles will greatly benefit from a connected database that records the user experience. With smart interactions to drivers, AI can personalize your experience and differentiate individuals. To enhance user-experience, AI can add in Smart Car Manual and Travel Guide. With the Smart Car Manual, drivers can assess information about their car quickly and familiarize the drivers with vehicle's features. The Smart Travel Guide will allow drivers to ask questions about their current locations, destinations and surrounding environment. These features can be easily accessible on the road. AI cloud services ensure that data is always available.

There are hundreds of AI sensors that will be able to detect problems before they affect vehicle operation. If a component is failing, these AI sensors can spot minute changes long before it becomes a hazard. With monitoring of sensors, AI can assess dangerous situations that will protect the driver. Technologies like emergency braking, cross traffic detectors, blind spot monitoring and assisted-steering will protect drivers and pedestrians. CornerCameras enables driverless cars to identify people and objects in blind spots on the road. CornerCameras uses light reflections to visualize objects but does not actually see them. Their movements can be tracked and determine where they are and where they are going. Nvidia's DRIVE PX AI platform can handle over 320 trillion operations per second which means the car will be learning and making accurate decisions about its environment. iSee is working AI technology that adds deep learning and common sense into driverless cars. This is a significant component of autonomous cars because having common sense like human drivers, the AI can adjust to constantly changing conditions like in a chaotic city. With iSee, the car's programming has a special algorithm allowing to collaborate with humans in an open environment. iSee will allow AI to respond to social cues like human do. [4]

6. FUTURE IMPROVEMENTS

If you talk to anyone in the automotive industry, the first thing you will hear about the future of artificial intelligence would be a self-driving car. It is a reality in the near future. The growth and the production of self-driving cars is possibly one of the extreme innovations on the limit in today's automotive engineering industry. AI has the possible influence on the automotive manufacturing supply chain in similarly thoughtful and interesting ways beyond the idea of the self-driving car. "Google's subsidiary, Waymo has been recognized as one of the leaders in autonomous car development with the Tesla both the companies are spending millions of dollars on technology and Research and

Development teams. Both the companies have test vehicles on the road in various cities and they are inching toward the future". TechStory. (2018).

It is said that by the year 2020, about 250 million cars on the road will relate to the Internet. With the new vehicles coming prepared with smart sensors, connectivity applications, big-data enhanced geo-analytical capabilities. The Internet of Things principle will become a serious connection in mixing these different systems into a united operating stage.

"Cloud computing and cloud-based intelligence via AI has the ability to integrate many of aspects of a consumer's life via their vehicle. Big Data, advanced analytics, and other top technological platforms are already coming together via AI to help automotive manufacturing companies produce vehicles that essentially act as a command center for all things driving-related. For example, cloud-based intelligence via AI has the potential to allow drivers to place a take-out order at a restaurant based on their location or projected driving route to allow motorists to place their order well ahead of time". Ostidick, N. (2018).

7. SECURITY CONCERNS

Tech companies, imaginative automakers, and software developers are changing the car industry. The term 'connected car' refers to any automobile with Internet access. Connected cars use the Internet in many ways some cars offer in-car wi-fi this feature mostly been used in buses and public transportation to improve the customer experience. Furthermore, cars collect data and use the Internet to provide GPS location and radio connections. Drivers nowadays appreciate the improved excitement, data choices, and association with the exterior world ignoring the risks. The main concern with connected cars is that the risks include serious injury or even death. [1]

There are many security concerns with using AI in the automobile industry such as Stealing personally identifiable information (PII); if an unauthorized user accesses the financial information, personal trip information, location information, and entertainment preferences. Connection security; connected cars like any other device can be a target for hackers for the data it generates. Manipulating a vehicle's operation; what will happen to the driver is someone can take control of the car, some researchers were able to control the braking and steering of a car by accessing the adaptive cruise control system.

Unauthorized vehicle entry; almost all cars nowadays use keyless systems using mobile applications or wireless key fobs.[2] Mobile application security; cars become more and more compatible with mobile applications which might be considered as a vulnerability increases the risk that privacy and safety will be compromised. Based on the article on Kaspersky " in 2015 two security researchers hijacked a vehicle over the internet. They were able to turn the steering wheel, briefly disable the brakes, and shut off the engine. The implications of this exercise were clear and troubling at the time". [4]

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