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Research Paper on AI in Driving

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Abstract: ***AI in driving is introduced as a self-driving in automobile industries. This research paper is presents a scient metric and bibliometric analysis on self-driving cars. A self-driving car (sometimes called an autonomous car or driverless car) is a vehicle that uses a combination of sensors, cameras, radar and artificial intelligence (AI) to travel between destinations without a human operator. To qualify as fully autonomous, a vehicle must be able to navigate without human intervention to a predetermined destination over roads that have not been adapted for its use. Companies developing and/or testing autonomous cars include Audi, BMW, Ford, Google, General Motors, Tesla, Volkswagen and Volvo, Tata Motors and Mahindra. Google's test involved a fleet of self-driving cars -- including Toyota Prii and an Audi TT -- navigating over 140,000 miles of California streets and highways. Through an examination of quantitative empirical evidence, we explore the importance of Artificial Intelligence (AI) as machine learning, deep learning and data mining on self-driving car research and development as measured by patents and papers. Alongside the exponential growth in the rate of inventive activities and scholarly efforts, we find evidence for a rapid and meaningful shift in the application of the technologies related to data gathering and processing for the purpose of self-driving cars after 2009. We show that this shift mirrors major changes in the landscape of innovators as well as increasing scholarly attention to the ethical, legal and social aspects of self-driving cars. Research and innovation relating to self-driving seem to be increasingly defined in terms of artificial intelligence, which neglects some aspects of future socio-technical systems that may be required to realise the potential of the technology.***
Keywords: AI car, self-driving, Simulation test, autonomous cars, autopilot car.

I. INTRODUCTION

Artificial intelligence (AI) and machine learning (ML) is now considered to be one of biggest innovations since in microchip. Artificial intelligence is used to be a fanciful concept from science and machine learning world, but now days it's becoming a daily reality of human life.

(AI) Artificial intelligence in cars, self-driven cars or autonomous cars is one of the remarkable applications of machine learning technology.

In machine learning technology cars instantly accommodate changing road conditions, at the same time technology learning new road situation. By continue parsing through a stream off visual and sensor data, on board computers can make split-second decision even faster than trained drivers. The fundamentals of self-driven cars, autonomous cars or AI in cars is same as another industries. You have input features and an output. An autonomous car is also known as robotic and informally as a driver less or self-driving, is an autonomous car capable of full-filling the human transportation capabilities of a traditional car as an autonomous vehicle, it's capable of sensing it's environment and navigating own its own a human make chooses a destination, but it's not required performing a mechanical operation of the vehicle. Autonomous vehicle uses such technologies as a radar, GPS, LEDAR and computer vison advance control system interpret the information to identify appropriate navigation paths. Autonomous vehicle updates their map based on sensor input such that they can navigate through un-charted environments. Some questions naturally arise. How to guarantee AI applications behave appropriately? Would self-driven car crash in some rare situations? Will a robotic cooker burn house? The urgent requirement of reliable artificial intelligence applications attracts increasing attention to these questions. To answer such questions, we need to rethink what artificial intelligence is. Clearly, the definition given at the beginning of this paper is not precise. A more rigorous definition can be given as "Artificial intelligence is the intelligence (that is similar to or the same kind as human intelligence) exhibited by machines (in the same task)".

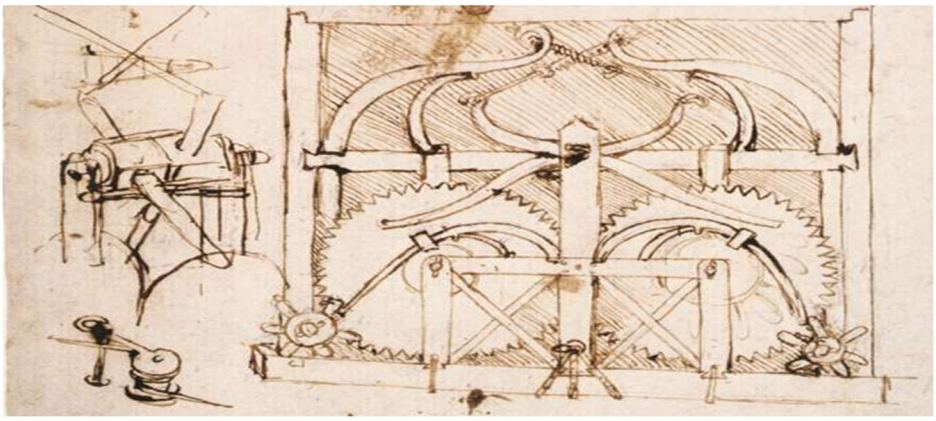
II. THE HISTORY OF AUTONOMOUS CARS

The concept of self-driving or autonomous cars has gained momentum in the last decade. However, it seems that the idea of designing a vehicle that was capable of navigating itself without human input was conceived way back in the Middle Ages. Leonardo da Vinci's sketches of the self-propelled cart was designed to be powered by coiled springs with programmable steering and braking capabilities. Obviously since then, technology has advanced greatly.

Automatically Operated Car

A. Birth of an Idea

The first recorded actual attempt towards building a driver-less vehicle can be traced to 1925, when Francis Houdina invented a radio-controlled car. The "Phantom Auto," as it was known then, was controlled through radio signals sent from another vehicle that drove close behind. About a decade later, an industrialist by the names of Norman Bel Geddes conceptualised an automated highway system wherein cars were controlled via electric circuits built into the pavements. This prototype was successfully tested but didn't take off due to the large financial investment required. During the same time, the Transport and Road Research Laboratory in the UK conceived a similar driverless car and road system that was also successfully tested, and predicted to reduce road accidents and increase road capacity substantially. However, the project was scrapped due to the government's reluctance to fund the project.



B. Taking a New Course

In 1977, The Tsukuba Mechanical Engineering Laboratory in Japan developed a model that moved away from external road technology and concentrated on making the car smarter. The technology comprised of a computer that studied the surrounding environment using in-built camera imagery. This was considered the first stand-alone autonomous vehicle and was capable of moving at a speed of 20 mph.

Then, during the 80's, a German aerospace engineer used artificial-intelligence, and backed by Mercedes Benz, invented a prototype- VAMORs that could self-drive at high speeds. Constructed using a Mercedes van, it was operated through a computer program that was fed off data collected from inbuilt cameras and sensors.

C. The Dream Gets Bigger

Inspired by this success, the Eureka Prometheus Project, the largest R&D endeavour in self-driving cars took off in 1987 in Europe where a number of universities and car manufacturers participated. Ernst Dickmanns and his team demonstrated their twin robot vehicles VaMP and VITA-2 autonomous capabilities when they drove 1000 km at speeds of 130 km on the Paris highway.

Meanwhile, similar other attempts were being made in America, notable among these was the Navlab self-driving car system that used a supercomputer, GPS receiver and video equipment to travel close to 3000 miles in 1995.

In 2000, the DARPA Grand Challenge was announced, offering one-million-dollar prize money to anyone who could build an autonomous vehicle to navigate 150 miles through the Mojave Desert. Unfortunately, no one succeeded in completing this challenge.

D. The Self-Driving Scenario Today

Yet, in 2010 Google announced that they had been working on a secret project testing and developing a system that could help reduce the number of accidents through autonomous driving. Many of the engineers who worked on cars in the DARPA challenge were part of this team. Since then, Google has logged more than one million miles as well as lobbied to help pass legislation and make self-driving cars legal in four US states. Today, there are self-driving cars picking and dropping people in Pittsburg, Phoenix and Boston. Recently, Nvidia in collaboration with Volkswagen, announced a self-driving chip that connects artificial intelligence to production-ready hardware. This is expected to improve the performance of self-driving cars as well as induct attractive features like digital assistants.

Although autonomous car technology has come a long way, with cars having highly advanced driver assistance features like Tesla's Autopilot and Cadillac's Super Cruise, it still needs to be seen whether regulators will allow the unrestricted use of self-driving cars across the world.

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III. HOW TESLA USING IS USING AI (ARTIFICIAL INTELLIGENCE)

Thirteen years ago, in Silicon Valley, a company was born. Its name was Tesla. One simple goal of this company was to prove that electric cars could be better in every way over the traditional fuel-powered cars.
Unlike its competitors, Tesla's biggest USP isn't just producing automobiles but also technologies. Tesla specializes in making use of high-tech technologies to deliver luxurious long-range electric automobiles.
"The advantage that Tesla will have been that we'll have millions of cars in the field with full autonomy capability and no one else will have that."
— Elon Musk

Throughout its journey, AI and Big Data have remained steady partners of the firm. Tesla has taken excellent use of AI and Big Data for expanding its customer base. The firm has made use of existing customer databases for its data analytics using it to comprehend customer requirements and regularly updating their systems accordingly.

Tesla machine learning effectively crowdsources some of its essential data from all of its vehicles as well as their drivers, with the internal as well as external sensors which can even pick up the information about a driver hand placement on the instruments and how they are keep on operating them.
Tesla Machine learning in the cloud is responsible to takes care of educating the entire set of the fleet, while at an individual car level, some of the edge computing decides what action the car needs to take right now. The third level of decision making also exists, with cars able to form networks with some other Tesla vehicles nearby to make sure in order to share some of the local insights and information.
In near future scenario where the autonomous cars are widespread, these networks will most likely also interface with cars from some other manufacturers as well as other systems such as road-based sensors, traffic camera, purge light up mask or smartphones.

IV. ADVANTAGES OF AUTONOMOUS CARS

A. Decreased the Number of Accidents

Autonomous cars prevent human errors from happening as the system controls the vehicle. It leaves no opportunity for distraction, not just like humans who are prone to interruptions. It also uses complicated algorithms that determine the correct stopping distance from one vehicle to another. Thereby, lessening the chances of accidents dramatically.

B. Lessens Traffic Jams

Driverless cars in a group participate in platooning. This allows the vehicles to brake or accelerates simultaneously. Platoon system allows automated highway system which may significantly reduce congestion and improve traffic by increasing up the lane capacity. Autonomous cars communicate well with one another. They help in identifying traffic problems early on. It detects road fixing and detours instantly. It also picks up hand signals from the motorists and reacts to it accordingly.

C. Stress-free parking

Autonomous cars drop you off at your destination and directly heads to a detected vacant parking spot. This eliminates the wasting of time and gas looking for a vacant one.

D. Time-saving Vehicle

As the system takes over the control, the driver has a spare time to continue work or spend this time catching up with their loved-ones without the having the fear about road safety.

E. Accessibility to Transportation

Senior citizens and disabled personnel are having difficulty driving. Autonomous vehicles assist them towards safe and accessible transportation.

V. PROBLEM STATEMENT OF AUTONOMOUS CARS

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VI. TECHNOLOGY USED IN AUTONOMOUS CARS

How does an autonomous vehicle operate and make sense of what it sees? It comes down to a powerful combination of technologies, which can be roughly divided into hardware and software. Hardware allows the car to see, move and communicate through a series of cameras, sensors and V2V/V2I technology, while software processes information and informs moment-by-moment decisions, like whether to slow down. If hardware is the human body, software is the brain.

Tech is broadly categorised as follows in autonomous cars: -

1) *Data Storage:* Data storage, solid state or portable drives for in-car and data centre use. Specialised design for Autonomous Vehicle development.
2) *Drive-by-wire:* Electronics and controllers to interface between processing and robotic control of your vehicle. Steer, brake, accelerate using by-wire interfaces for specific vehicles or as an open standard.
3) *Positioning:* Including satellite positioning and inertia measurement – Locate your vehicle, back up the system and fine tune with antennas.
4) *Power:* Supply, voltage change and signal cleaning and power management.
5) *Processing:* Component and system level processing, from exciting and world-leading engineering companies with first hand AV development experience.

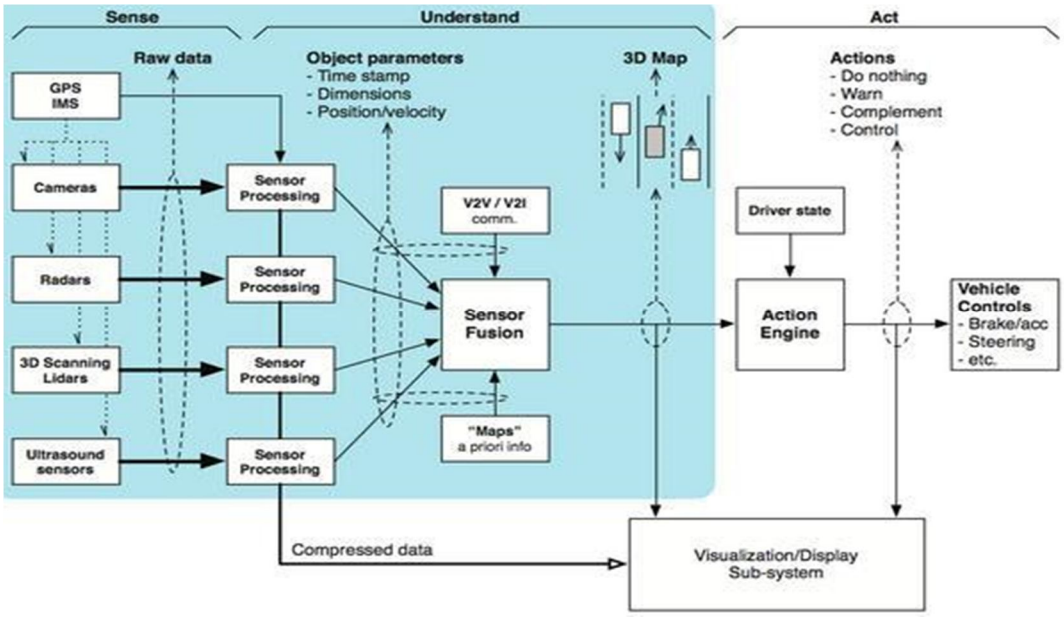
6) *Sensors:* Active and passive sensors and payloads, including LiDAR, radar, camera and ultrasonic.
a) Camera: The most common machine vision sensor, mimicking the human eye
b) LiDAR: Infrared wavelength laser emitter and sensor system for ranging
c) Radar: Short wavelength, high energy sensor suited for penetrating poor weather and travelling long range
d) Ultrasonic: Using high-frequency audio, the ideal short-range sensor for close object detection.
7) *Software:* Software tools for research, development, testing, simulation and validation.

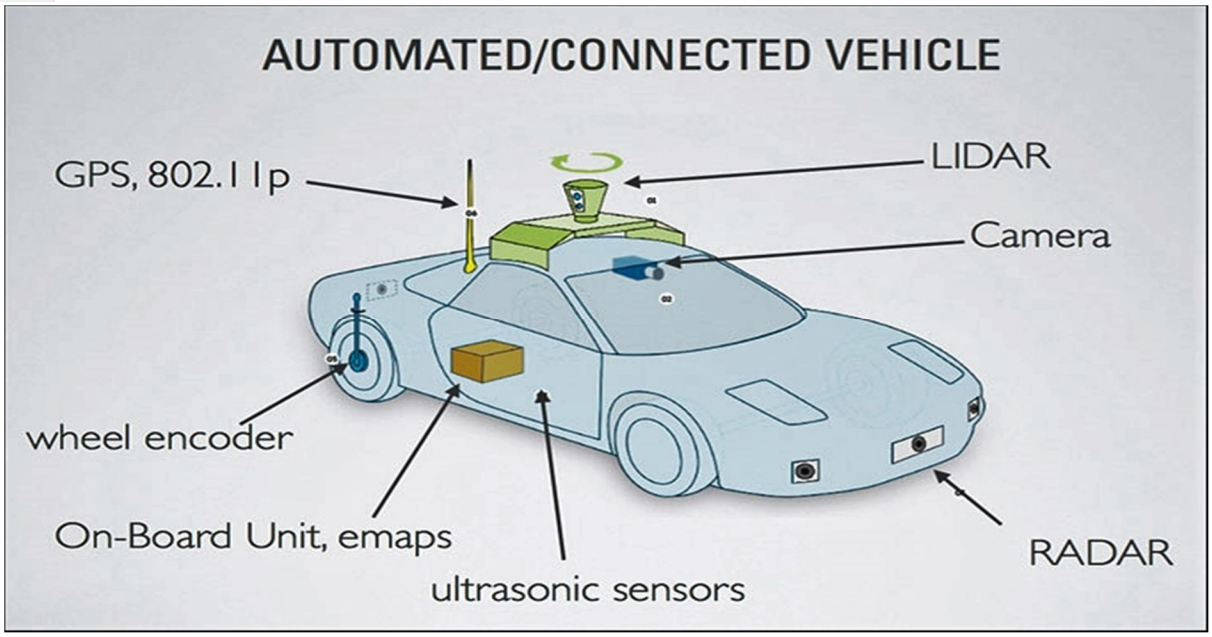
Ouster's OS-1 3D LiDAR sensor captures point cloud data and camera-like images to help autonomous vehicles 'see' their environment.

Autonomous vehicles rely on sophisticated algorithms running on powerful processors. These processors make second-by-second decisions based on real-time data coming from an assortment of sensors. Millions of test miles have refined the technology and driven considerable progress – but there is still a way to go. Autonomous vehicles rely on sophisticated algorithms running on powerful processors. These processors make second-by-second decisions based on real-time data coming from an assortment of sensors. Millions of test miles have refined the technology and driven considerable progress – but there is still a way to go.

A. Functional Block Diagram of Autonomous Cars

The list of parts and their functionalities will be discussed in this section. We'll also look at the exact sensor that was used in the autonomous car for the DARPA Challenge.





VII. CONCLUSIONS

In this paper we analyse the growth of autonomous cars of AI technology and what kind of components and technologies are used to develop an autonomous cars and basic details about all components. Also, we have learned benefits and problem statement about a self-driving car. The dream of creating artificial devices that reach or outperform human intelligence is many centuries old. The development of intelligent agents is making that dream come true for the researchers and as well as for the industry.

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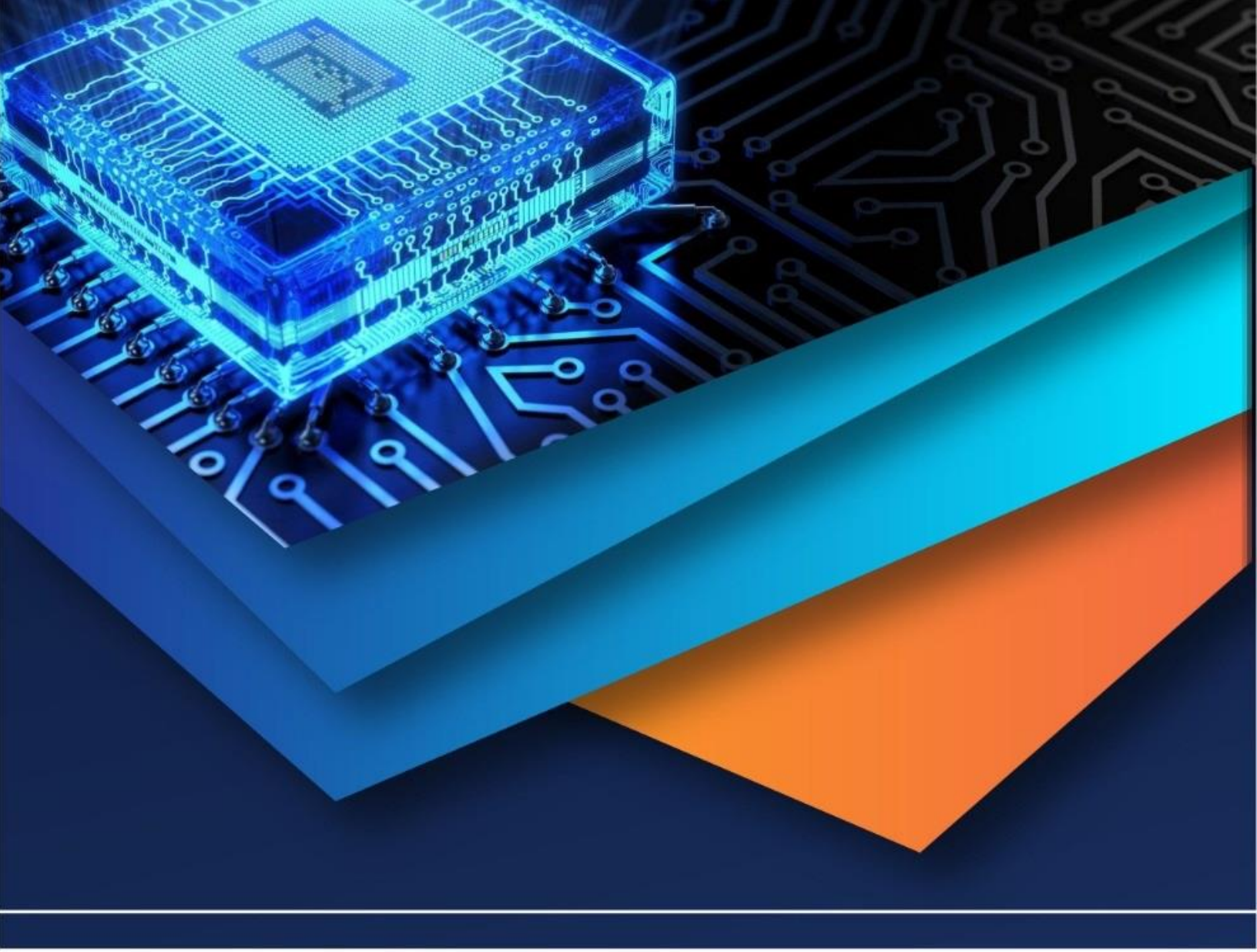

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