

AI AND VISION FOR SELF-DRIVING CARS

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Abstract. *This paper explores the intersection of AI and vehicles, also on the smart city, with a focus on the potential benefits and challenges of using intelligent transportation systems and automated mobility to create sustainable, user-centered transportation systems. We have provided an overview of the use of artificial intelligence (AI) in cars. It explains that AI enables machines to mimic human functions such as reasoning, learning, planning and creativity, and can be used to improve mobility provision and transform urban landscapes. The brief also discusses the history of AI in cars, current examples of the use of AI in popular car brands, and the potential of AI to save lives and prevent accidents. In addition, it addresses some of the challenges and risks associated with implementing AI in cars, including the need to build trust and manage risk. To realize this vision, AI-based mobility solutions must be designed with the human user in mind and based on a deep understanding of society's needs and preferences.*

Keywords: *artificial intelligence; smart transport; self-driving; safety; innovation.*

Introduction

The "Empire of Artificial Intelligence" is coming incredibly fast with epochal changes in electric cars and also self-driving cars. In no more than 10 years, major car manufacturers will completely abandon the production of diesel and gasoline cars. More and more countries and/or local administrations are already announcing that, in the near future, the circulation of cars with combustion engines will be prohibited. It is very important for every man to know now what the future (while it will be, rather short) of diesel and gasoline cars."

Artificial intelligence is the ability of a machine to imitate human functions such as reasoning, learning, planning and creativity. Artificial intelligence allows technical systems to perceive the environment in which they operate, process this perception and solve problems, acting to achieve a certain goal. The computer receives the data (already prepared or collected through its own sensors, such as a video camera), processes it and reacts. Artificial intelligence systems are able to adapt, to a certain extent, behavior by analyzing the effects of previous actions and operating autonomously [1].

A few years ago, the automobile was used strictly as a means of locomotion. For some time now, the car has been performing more and more functions. It parks itself, drives itself, communicates with other cars or can be used to shop directly through it. The performance of automobiles, especially electric ones, can also be modified remotely via the Internet. It's just that for all these wonders, specialists are needed for the development of automobiles at a higher level.

History of AI used in cars

The history of artificial intelligence in cars can be traced back to the 1980s, when General Motors developed an experimental vehicle called the "Prometheus" that used a computer-controlled navigation system. However, it wasn't until the 2000s that AI began to be used more widely in cars, with the introduction of features such as adaptive cruise control and lane departure warning systems [2]. In recent years, AI has become even more prevalent in cars, with the development of self-driving cars that use AI to navigate and make decisions on the road. AI has allowed cars to become smarter and more autonomous, giving them the ability to perceive their surroundings and make decisions based on that information. The use of AI in cars has the potential to revolutionize the transportation industry and make driving safer and more efficient [3].

Present state of AI used in cars

The present state of AI used in cars is rapidly advancing, with many new and innovative technologies being developed and implemented. One of the most significant advances is the development of autonomous driving systems, which use AI to control a vehicle without any human input. This technology has the potential to revolutionize the transportation industry, making travel safer and more efficient while reducing congestion and emissions. Another area where AI is being used in cars is in driver assistance systems, such as adaptive cruise control, lane departure warning systems, and collision avoidance systems. These technologies use AI to detect potential hazards and assist the driver in avoiding accidents. AI is also being used to improve the overall driving experience, with features such as predictive maintenance, intelligent navigation systems, and voice-activated controls [4]. Despite the many benefits of AI in cars, there are also some concerns regarding safety and security. Critics worry that the reliance on AI systems in cars could lead to accidents and other safety issues, as well as the potential for hackers to gain access to sensitive data or even take control of vehicles. Additionally, there are concerns about the ethical implications of AI in cars, such as issues of privacy, bias, and accountability. To address these concerns, researchers and developers are working to create more robust and secure AI systems, as well as to develop ethical guidelines for the use of AI in cars. Overall, the future of AI in cars is promising, with the potential to make driving safer, more efficient, and more enjoyable.

Another promising area of AI development in the automotive industry is the use of natural language processing (NLP) and sentiment analysis to improve the in-car experience. By analyzing the driver's tone and language, the car can adjust the temperature, lighting, and even music to create a more personalized and comfortable environment. This technology also has the potential to improve communication between drivers and their cars, making it easier to access information and control various features hands-free.

Furthermore, AI is being used in the automotive industry to improve the manufacturing process, from design to production. By using AI to analyze data and simulate different scenarios, manufacturers can optimize the production process, reduce waste, and improve quality control. This technology also enables the creation of more customized and tailored vehicles, as AI can help manufacturers identify the most popular features and designs based on customer data and feedback.

AI-Integrated Car Models from Leading Manufacturers

Several car manufacturers are incorporating AI technology into their vehicles. Here are a few examples:

1. **Tesla:** Tesla is known for its advanced Autopilot system, which uses AI to enable autonomous driving. The system can steer, accelerate, and brake the car automatically, and can even change lanes and park itself [5].
2. **Audi:** Audi's AI-based Traffic Jam Pilot system can take over driving in slow-moving traffic situations, allowing the driver to relax and take their hands off the wheel [6].
3. **Toyota:** Toyota's Guardian system uses AI to enhance the driver's capabilities, rather than replacing them entirely. The system can intervene to prevent accidents, but still requires the driver to remain in control of the vehicle [7].
4. **BMW:** BMW's iDrive system uses AI to personalize the driving experience for each individual driver. The system can learn the driver's preferences and adjust settings accordingly, such as the seat position and climate control [8].
5. **Mercedes-Benz:** Mercedes-Benz's MBUX system uses AI to provide natural language voice control and personalized recommendations to the driver [9].

These are just a few examples of how AI is being integrated into cars by different manufacturers. In addition to the major car manufacturers that have integrated AI into their vehicles,

there are also several emerging startups that are using AI technology to create innovative and unique cars. For example, Boston-based startup, Optimus Ride, has developed a self-driving shuttle that uses AI-powered sensors to navigate urban environments safely and efficiently. Another startup, Nuro, has created a small, autonomous delivery vehicle that can transport goods from local businesses directly to customers [10]. These AI-driven vehicles not only provide practical solutions to modern transportation challenges, but they also offer a glimpse into the future of autonomous mobility. As more companies continue to explore the possibilities of AI in the automotive industry, it is clear that the integration of AI technology will only continue to grow and change the way we think about transportation. Another interesting fact is that AI technology is not just limited to self-driving cars. Porsche's new electric Taycan model, for example, uses AI-powered cameras to adjust the car's suspension on the fly, providing a smoother and more comfortable ride. Additionally, Ford has developed an AI-powered "pothole mitigation" system that uses sensors to detect when a wheel is about to hit a pothole and adjusts the suspension in real-time to prevent damage.

AI in Cars - Examples of Both Life-Saving and Fatal Incidents

One real-life example of how AI has potentially saved lives is in the case of Tesla's autopilot feature. In 2016, a Tesla Model S driver in Germany suffered a medical emergency and lost consciousness while driving on the Autobahn. The car's autopilot system was able to detect that the driver was unresponsive and safely pull the car over to the side of the road, preventing a potentially fatal accident. Another example is the case of a Tesla Model X that was involved in a collision with a concrete barrier in California. The car's autopilot system was able to sense the impact and automatically apply the brakes, reducing the severity of the crash and potentially saving the driver's life. While AI in cars has the potential to save lives and prevent accidents, there have also been cases where AI technology has failed and caused harm. In 2018, an autonomous Uber vehicle struck and killed a pedestrian in Arizona due to a combination of software errors and the backup driver's inattention [11]. Another incident involved a Tesla Model S on autopilot crashing into a semi-truck in Florida in 2016, resulting in the death of the driver [12]. These cases highlight the need for continuous improvement in AI technology and its implementation in vehicles, as well as the importance of human oversight and responsibility.

Conclusions

In conclusion, artificial intelligence has become an integral part of the automotive industry, particularly in the development of autonomous vehicles. The use of AI technology in cars has revolutionized the way we drive and commute. With AI-powered sensors and systems, cars can detect obstacles, avoid accidents, and even make decisions in complex driving situations.

Furthermore, AI has enabled the development of advanced driver assistance systems (ADAS) such as lane departure warning, adaptive cruise control, and automated parking, which have made driving safer and more convenient. While there have been incidents where AI in cars has caused harm, there are also numerous cases where it has saved lives and prevented accidents. However, the success of AI in cars depends on responsible implementation, continuous improvement, and collaboration between humans and machines. The future of AI in cars looks promising, with ongoing research and development in areas such as autonomous driving, predictive maintenance, and personalized user experiences. As AI technology continues to evolve, it is crucial to prioritize ethical considerations, transparency, and accountability. By doing so, we can ensure that the benefits of AI in cars are maximized while minimizing the risks. Ultimately, the success of AI in cars will depend on striking the right balance between technological innovation and human responsibility. Additionally, AI is also being used to improve the efficiency of engines and reduce emissions.

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