Journal of Harbin Engineering University
ISSN: 1006-7043

Vol 45 No. 11
November 2024

Artificial Intelligence in Cars is Driving the Auto Industry an AI Revolution

Swarupa Arjya[1*], Amit Jain Biswal[2] , Mamuni Arya[3], Rajalaxmi Panda[4]
1Computer Science Engineering, GIET, Ghangapatana, Bhubaneswar, 752054, Odisha, India
2 Mechanical Engineering, GIET, Ghangaptana, Bhubaneswar, 752054, Odisha, India
3 Mechanical Engineering, GIET, Ghangaptana, Bhubaneswar, 752054, Odisha, India
4Computer Science Engineering, ABIT, Cuttack,753008, Odisha, India
*swarupaarjya@gietbbsr.edu.in

Absract:
In the world of technology, self-driving cars and artificial intelligence (AI) are frequently discussed together. To put it plainly, one cannot talk about one without talking about the other. Although artificial intelligence (AI) is being adopted at a dizzying rate in many industries, how it is used in the automotive sector has grown to be a contentious topic. Artificial intelligence is being used by automakers worldwide in almost every stage of the production process. AI in action can be seen in robots that assemble an automobile's basic parts or in autonomous cars that utilize vision and machine learning to safely manoeuvre around traffic.
Keywords: Automobile; Manufacturing; Automation.

1. INTRODUCTION

Every automaker is vying to develop AI and self-driving systems, and a plethora of startups and tech companies are racing to develop them as well [1]. AI and machine learning are being employed in a number of ways in the design and operation of vehicles, despite the majority of people believing that personal, autonomous autos are simply the way of the future [2]. In the automotive industry, artificial intelligence is going to revolutionize everything. These are complex capabilities that enable machines to perform tasks that humans would find easy to complete. In order to build cars, it will encourage robots to understand input such as images, sounds, and patterns. AI-powered devices will be able to overcome complex problems (Morgan).

The emergence of artificial intelligence has led to a notable transformation in the automotive industry. Autonomous vehicles and industrial robots are commonplace sights on today's highways [1]. According to Lin et al. (2018), driverless vehicles are expected to become commonplace on highways across the globe within the next 20 years [2]. AI has the power to change nearly every aspect of the car-making process, including project management and research. Robots and machines are already in use in the worldwide car industry, though for a restricted range of job [3].

The automotive industry is currently going through a significant upheaval. In order to maintain a competitive edge in the market, aspirational producers have started incorporating advanced technology into their goods and processes. Today's cars incorporate a variety of IoT applications and technology, such as: i) sensors that collect data on driver behavior and vehicle condition; ii) complex machine learning (ML) algorithms that transform the collected data into insightful reports; and iii) the use of the data to segment customers and present tailored offers [4].

2. LITERATURE REVIEW

AI, or artificial intelligence, could seem like a novel idea. However, the transportation industry has long used AI apps. Most current cars have a Global Positioning System (GPS) (GPS). This technology uses information from satellites to pinpoint our location on Earth. To determine the best path from point A to point B, GPS uses artificial intelligence [3].To do this, AI systems have developed the ability to predict the best routes from enormous amounts of data. They then combine this information with data from real-time user input. This includes things like the speed at which you drive the entire way. The two types of data can then be used by people to obtain exact and accurate information on their route journey [1].

Automakers lose a lot of money when their equipment break down. Production stops, making it impossible for workers to finish their allocated responsibilities on time. AI-based algorithms

provide a good way to stop these kinds of disastrous things from happening in the car factory. These algorithms make it simple to feed in any kind of vibration sensor data, allowing anomalies to be identified before a significant mechanical failure. When it comes to identifying anomalies in the machinery, AI-based technologies will be quicker and more effective than people. They may identify an issue and provide details regarding the condition of the equipment fast. This will help to lower annual maintenance costs, improve equipment availability, and lower inspection costs [4]. Productivity in the automotive industry is rising as a result of technical advancements and the use of computers in conjunction with robots. According to Wu et al. (2018), increased processing power and an increased number of algorithms will facilitate the creation of flexible robots that can work alongside humans by adjusting to changes in the production environment. Since robot-only zones are superfluous, collaborative robots are a great way to save space and design in the automotive industry. Development costs will drop when humans can work alongside robots. These cooperative robots can help humans with jobs that aren't fully mechanized. Productivity could rise as a result by as much as 20% [1] .Most quality checks are carried out by humans, and throughout this procedure, a number of errors might happen. Furthermore, the quality inspection requires a lot of time. The best strategy to speed up the quality management system is to use AI-enabled visual quality control. This will help identify defects and raise concerns while also lowering the likelihood of human error. The hardware will visually inspect the product and offer excellent quality control on machine components, automotive bodywork, metal surfaces, and other goods [5].By adding input, the AI system may update both its quality control and evaluation. AI-based computers are able to detect up to 90% of quality difficulties, while people are only able to identify a small number of quality control issues [1]. Operations that provide business support are crucial to a company's success. Support services like IT, finance, car payment calculators, and human resources can all be automated with AI. The automotive industry stands to gain from automation and the efficient application of artificial intelligence (AI) in business support functions. Thanks to automation, the company may benefit from increased scalability, quicker speed, more accuracy and consistency, and easily traceable results [4].

3. ANALYSIS

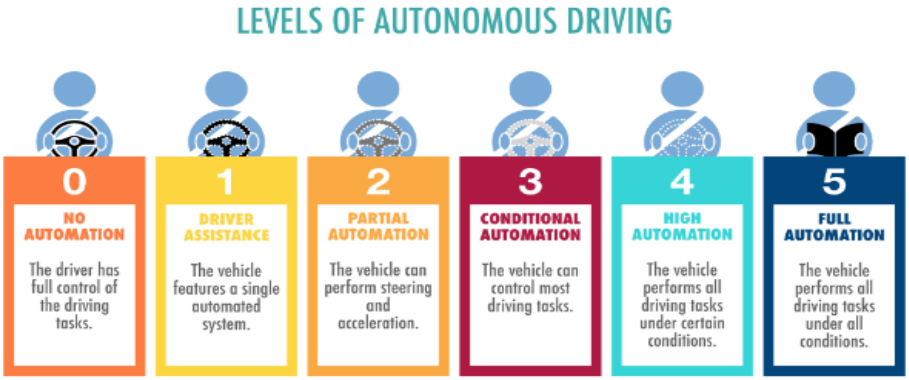

Fig-1 Level of Autonomous Driving

There are six tiers of vehicle automation. There is no automation at level 0; all driving is done by the driver alone. In the first level, integrated safety systems help the driver. This is known as driver assistance. In Level 2 automation, most driving is still done by the driver, but in some situations, the car takes over. The third degree of automation is called conditional automation, and it allows the car to do some driving tasks. At all times, the driver needs to be ready to take over. The automobile performs most driving functions at the fourth degree of automation, which is the highest

level of automation. It is possible that the driver will still need to exercise judgment. Full automation is described in the fifth level, where thecar operates autonomously, requiring no input from the driver.

INDIA AUTO INC PRODUCTION		
FISCAL	**UNITS PRODUCED**	**% GROWTH**
FY2014	2,15,00,165	
FY2015	2,33,66,246	8.67%
FY2016	2,40,16,599	2.78%
FY2017	2,53,16,044	5.41%
FY2018	2,90,94,557	14.92%
FY2019	3,09,15,420	6.25%
FY2020	2,63,53,293	-14.75%
FY2021	2,26,52,108	-14.04%
FY2022	2,29,33,230	1.24%

Table-1 Indian Auto Production comparison

The aforementioned data makes it evident that advances in manufacturing plant technology have enabled a consistent improvement in automobile output throughout time. Both the coronavirus epidemic and the financial crisis are to blame for the negative percentage change from 2019. Nonetheless, as indicated in Figure 2 below, the provisional worldwide production statistics for 2021 predicts a rise in vehicle manufacturing.

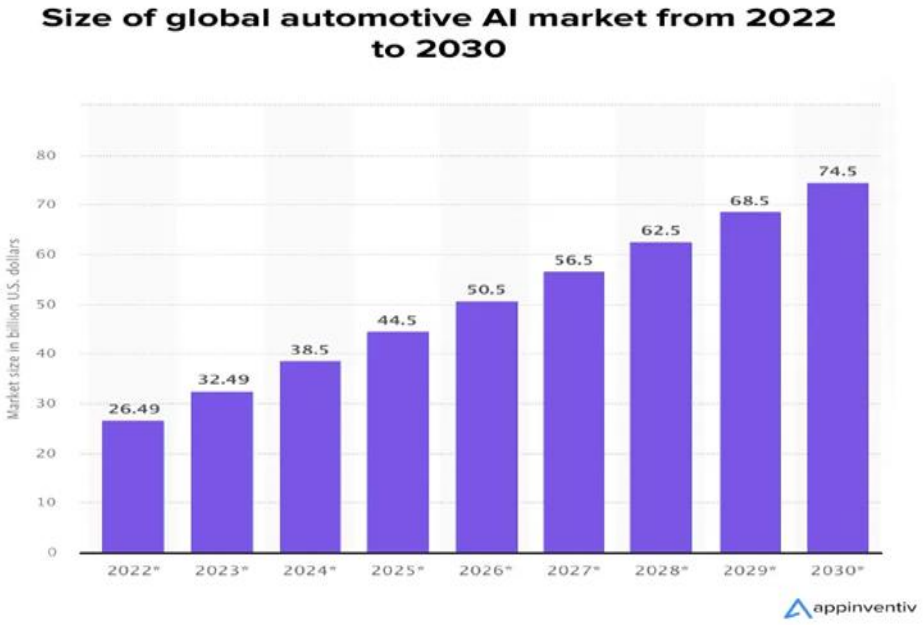

Fig-2 Global Market of AI Vehicle

4. PREDICTIVE MAINTENANCE

Predictive maintenance is among the best instances of how data science can benefit the automotive sector. For instance, the information gathered by a car's sensors may indicate increased overheating, friction, or noise. These issues could also lead to a certain auto component failing later on. The machine learning algorithm monitors these events on a regular basis and determines how frequently they happen. It also accurately

predicts when the car or component will break down based on the data. The driver may arrange for routine maintenance and have the vehicle inspected in order to minimize a problem. This instance of auto predictive maintenance is noteworthy.

Predictive maintenance is another tool used by fleet management companies to protect each vehicle's return on investment and reduce expensive repairs. According to Wu et al. (2018), automakers are gradually integrating predictive maintenance into their vehicles to boost customer satisfaction, encourage adherence to maintenance plans, and enhance brand awareness [5]. Engineers have worked with OEMs all over the world over the years to develop software that precisely calculates the amount of car part maintenance that is required. Statistics on Driver Behavior Numerous helpful in-car insights can be obtained using automotive apps built on artificial intelligence and deep learning [4].

5. CONCLUSION

Stability, pricing constraints, and growing competition are all elements that are impacting the car sector. Automakers can increase their market share significantly by taking even little steps. There are numerous opportunities because data science is becoming more and more of a game-changer in the automotive industry. Analytics has shown to be an extremely effective tool in the manufacturing value chain [6]. To fully realize the promise of data science, evaluation and collection of data from various functions across the industrial life cycle are essential. Accordingly, developing insights requires an end-to-end analytics approach that incorporates labour analytics, asset or inventory management, and production strategy [7]. Drivers may receive advice for developing auto maintenance from machine learning systems. Based on past events, it is feasible to predict when an event or problem will recur.

REFERENCES

[1] Sherif, A. B., Rabieh, K., Mahmoud, M. M., & Liang, X. (2017). Privacy-preserving ride sharing scheme for autonomous vehicles in big data era. *IEEE Internet of Things Journal*, *4*(2), 611-618. https:// doi.org/ 10. 1109/jiot.2016.2569090.

[2] Lin, P., Wooders, A., Wang, J. T., & Yuan, W. M. (2018). Artificial intelligence, the missing piece of online education. *IEEE Engineering Management Review*, *46*(3), 25-28. https://doi.org/10.1109/emr.2018.2868068.

[3] Morgan Stanley. (2021, November 15). *Auto industry is ripe for disruption*. https://www.morganstanley.com/ideas/car-of-future-is-autonomous-electric-shared-mobility/.

[4] Harvard Business Review. (2017, July 18). The business of artificial intelligence. https://hbr.org/cover-story/2017/07/the-business-of-artificial-intelligence.

[5] Wu,K., Sasidharan, L., Thor, C.P., & Chen, S. (2018). Crash sequence-base drisk matrix for motorcycle crashes. *Accident Analysis & Prevention*, *117*, 21-31.https://doi.org/10.1016/j.aap.2018.03.022

[6] OICA. (2021). *2012 statistics | www.oica.net*. www.oica.net. https://www.oica.net/category/production-statistics/2012-statistics/.

[7] Hou, Xiankun. "Artificial Intelligence in Cars Powers an AI Revolution in the Auto Industry." Transactions on Computer Science and Intelligent Systems Research 2 (2023): 19-22.