

## THE ROLE OF AI IN AUTOMOTIVE ENGINEERING

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The integration of artificial intelligence (AI) into the automotive industry has significantly transformed vehicle design and manufacturing processes. In the early stages of car manufacturing, AI is instrumental in design optimization. Complex algorithms analyze vast datasets, considering factors such as aerodynamics, safety, and fuel efficiency. The results are vehicle designs that are not only visually appealing but also functionally superior [1, p. 12].

AI-powered Computational Fluid Dynamics (CFD) simulations are crucial for optimizing vehicle aerodynamics. By analyzing airflow around the vehicle, engineers can reduce drag, improve fuel efficiency, and enhance overall performance [2]. AI is at the core of autonomous vehicle development. LiDAR, radar, and cameras rely on AI for real-time object recognition. These perception systems enable autonomous vehicles to navigate safely by identifying pedestrians, other vehicles, and road signs [3]. Self-driving cars learn from vast data sets, adapting to changing road conditions and unexpected scenarios. AI algorithms make split-second decisions to ensure passenger safety. AI permeates various aspects of automotive manufacturing: streamlines supply chain processes, predicts demand, optimizes inventory and reduces costs. Machine learning algorithms detect defects during production, ensuring high-quality vehicles. AI transforms the passenger experience by tailoring in-car features, entertainment, and comfort settings based on individual preferences. By analyzing sensor data, AI predicts component failures, enabling proactive maintenance.

As AI becomes ubiquitous, ethical considerations arise. Developers must address biases in AI models to ensure equitable outcomes. Balancing data utilization with privacy protection is critical. Developers must actively address biases in AI models. Fairness ensures that AI systems do not discriminate based on race, gender, or other protected characteris-

tics. Transparency involves making AI decisions interpretable and understandable to users [1, p. 12].

Stricter regulations and robust security measures are necessary to safeguard user data. Beyond design, AI significantly impacts the manufacturing floor. Predictive maintenance, powered by AI, revolutionizes how manufacturers manage equipment reliability.

By analyzing sensor data from production lines, AI predicts equipment failures before they occur. This proactive approach minimizes downtime, reduces maintenance costs, and ensures uninterrupted production. AI algorithms inspect components during production. They meticulously analyze every weld, seam and joint. If any defects are detected, the system immediately flags them for further inspection. This real-time defect detection ensures that only high-quality parts make it into the final assembly. AI tailors in-car features based on individual preferences. From infotainment settings to climate control, vehicles adapt to each driver's needs. Whether it's adjusting the seat position or suggesting personalized music playlists, AI ensures a seamless and enjoyable driving experience [2]. AI powers ADAS features like adaptive cruise control, lane-keeping assistance, and automatic emergency braking. These systems enhance safety by assisting drivers in avoiding collisions and maintaining safe distances.

In conclusion, AI is the driving force behind the automotive industry's evolution. As OEMs embrace this transformation, collaboration, innovation, and ethical awareness will shape the future of mobility.

### **References**

1. Mueller, C. AI Models and Methods in Automotive Manufacturing: A Systematic Literature Review / C. Mueller, V. Mezhuyev // Studies in Computational Intelligence. – 2022. – P. 1–25.

2. The Impact of Artificial Intelligence on Automotive Manufacturing: Enhancing Efficiency and Quality [Electronic resource] – Mode of access: <https://www.automotive-technology.com/articles/the-impact-of-artificial-intelligence-on-automotive-manufacturing-enhancing-efficiency-and-quality>. – Date of access: 04.04.2024.

3. Artificial Intelligence in Automotive Engineering: Why Now? [Electronic resource] – Mode of access: <https://resources.sw.siemens.com/en-US/video-leverage-ai-and-machine-learning-in-automotive-engineering>. – Date of access: 04.04.2024.