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Original Article (Review Article)

# Exploring Artificial Intelligence in the Automotive Industry: A Bibliometric Analysis, Systematic Review, and Future Research Directions

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## Abstract

The aim of this study is to explore artificial intelligence in the automotive industry through a bibliometric analysis, systematic review, and identification of future research horizons. In this research, 179 international articles indexed in the Web of Science and Scopus databases were analyzed. The methodology consisted of two stages: first, a bibliometric analysis was conducted by VOSviewer software to identify thematic clusters in the literature related to artificial intelligence and the automotive industry. Second, a qualitative systematic review was carried out to provide deeper insights into these clusters. The findings revealed a significant focus on autonomous vehicles, deep learning, and machine learning as key artificial intelligence technologies. Four thematic clusters were identified: AI-based automotive ecosystems, core AI technologies and security, connectivity and resource management, and advanced vehicle technologies. In particular; safety, resource optimization, and legal frameworks emerged as key areas within these clusters. This study identified four emerging research areas that will play important roles in shaping the future of artificial intelligence in the automotive industry and provide transformative opportunities to address existing knowledge gaps.

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## Extended Abstract

### Introduction

The automotive industry, which stands at the forefront of technological revolution, is undergoing a profound transformation through the integration of artificial intelligence (AI) (Gao & Bian, 2021; Nascimento et al., 2020). The role of AI as a key driver of innovation, efficiency, and safety in this industry has become increasingly evident, as vehicles are no longer merely means of transportation but are evolving into intelligent entities capable of perception, decision-making, and communication (Li et al., 2019). This transformation heralds a new era in the transportation sector in which AI-enabled vehicles provide enhanced safety, improved efficiency, and superior user experiences (Demlehner et al., 2021; Naz et al., 2022).

The convergence of the automotive industry and artificial intelligence has led to the rapid expansion of AI-based solutions and applications, including autonomous driving, predictive maintenance, and advanced driver-assistance systems (ADAS) (Li et al., 2023). These innovations have significantly improved road safety, optimized energy consumption, and redefined transportation solutions (Banerjee et al., 2023; Mehta et al., 2024). The successful implementation of AI in this industry promises technological advancement, economic growth, environmental sustainability, and improved social welfare (Dumitrascu et al., 2023; Shahedi et al., 2023). From advanced driver-assistance systems to in-vehicle voice recognition technologies, AI-driven technologies have enhanced vehicle performance, safety, and comfort (Mehta et al., 2024). Moreover, consumer expectations for AI-enabled features in vehicles have increased, prompting automotive companies to invest more heavily in research and development (Demlehner et al., 2021). The market for artificial intelligence in the automotive industry continues to expand, reflecting the growing recognition of its transformative potential (Jain & P. Kulkarni, 2022).

Recent review studies have examined the use of artificial intelligence techniques, such as machine learning and deep learning, to address various challenges in the automotive industry. For instance, Damaj et al. (2021) focused on the application of AI in vehicle maintenance and diagnostics, proposing AI-based models for fault detection, prediction of remaining useful life, and maintenance of automotive components.

Bibliometric analysis quantitatively maps publication trends and identifies key patterns and influential research areas, while systematic review provides a deeper examination of thematic clusters and conceptual developments (Van Eck & Waltman, 2017). This combined approach offers a more comprehensive understanding of the field and helps researchers and practitioners navigate the evolving landscape of artificial intelligence in the automotive industry more effectively. Therefore, the main research question of this study is: How can artificial intelligence in the automotive industry be explored through bibliometric analysis, systematic review, and the identification of future research horizons?

## Theoretical Framework

### Artificial Intelligence

Artificial intelligence enables the transformation of data into information, information into knowledge, and knowledge into intelligent action, thereby facilitating the development of decision-support systems in conditions characterized by uncertainty and intense competition. From a theoretical perspective, artificial intelligence can be considered a strategic resource within the frameworks of the Resource-Based View (RBV) and dynamic capabilities theory, through which organizations enhance their capacity for analysis, innovation, and responsiveness to environmental changes (Mahmood, 2023).

Hayatmehr et al. (2026) examined the impact of the application of artificial intelligence and intelligent learning on the strategic thinking skills and academic performance of management students, considering the moderating role of individual ethics. The results indicated that the use of artificial intelligence tools has a positive effect on strategic thinking (including systems thinking, creative thinking, future-oriented thinking, and critical thinking), intelligent learning, and academic performance. The mediating role of strategic thinking—particularly critical thinking and future-oriented thinking—was confirmed in the relationship between the use of artificial intelligence and academic performance, as well as between intelligent learning and academic performance. Furthermore, individual ethics not only positively influences intelligent learning but also plays a moderating role in the relationship between intelligent learning and strategic thinking (systems thinking, critical thinking, and future-oriented thinking). This study provides novel insights into the application of artificial intelligence tools in developing strategic thinking skills and performance, offering valuable implications for researchers, managers, students, and organizations.

Zolghadr et al. (2025) investigated the development of a model for the application of artificial intelligence in the export of electronic industry products. The findings showed that all composite reliability indices were above 0.7 and the convergent validity values for most constructs exceeded 0.5. The results of the hypothesis testing also indicated that all relationships among the model's constructs were fully supported at a significance level of  $p < 0.001$ . Moreover, to evaluate the overall model fit and measure the structural model, the Goodness-of-Fit (GoF) index was applied. The GoF value was reported as 0.815, indicating a strong model fit.

### Research Methodology

In this study, 179 international articles indexed in the Web of Science and Scopus databases were analyzed. The research methodology consisted of two stages. First, a bibliometric analysis was conducted by VOS viewer software in order to identify thematic clusters within the literature related to artificial intelligence and the automotive industry. Subsequently, a qualitative systematic review was carried out to provide deeper insights into these identified clusters and to further interpret the main research trends and developments in this field.

### Research Findings

To analyze the findings, VOS viewer software was employed to identify thematic clusters within the literature related to artificial intelligence and the automotive industry. The results revealed a significant concentration of research on autonomous vehicles, deep learning, and machine learning as core artificial intelligence technologies in the automotive domain.

Four major thematic clusters were identified:

1. AI-based automotive ecosystems
2. Core AI technologies and security
3. Connectivity and resource management
4. Advanced vehicle technologies

Within these clusters, safety, resource optimization, and regulatory frameworks emerged as particularly prominent and influential areas. The findings indicate that research in this field is increasingly moving toward integrated, intelligent, and sustainable mobility systems.

Furthermore, the study identified four emerging research domains that are expected to play a critical role in shaping the future trajectory of artificial intelligence in the automotive industry. These areas provide transformative opportunities to address existing knowledge

gaps and to advance both theoretical development and practical implementation in AI-driven automotive systems.

### **Conclusion**

The present study was conducted with the aim of exploring artificial intelligence in the automotive industry through a bibliometric analysis, systematic review, and identification of future research horizons. The findings are consistent with prior studies (Hayatmehr et al., 2026; Zolghadr et al., 2025; Ahmadi Alinoudehi et al., 2025; Heidariyan et al., 2025; Haghighi, 2024; Rahimi Klor et al., 2024; Hasan & Ojala, 2024; Akbari Emami et al., 2023; Etemadi et al., 2023; Neethirajan, 2023), confirming the expanding strategic role of artificial intelligence across industries.

In particular, Hasan and Ojala (2024) demonstrated that AI management contributes to improved resource reconfiguration, reduced transaction costs, and the advancement of global sustainable development. These findings reinforce the view that artificial intelligence is not merely a technological tool but a transformative strategic capability within the automotive ecosystem.

Moreover, legal concerns surrounding the development of AI-driven vehicles require further scholarly attention. For instance, in the event that an autonomous vehicle causes an accident, critical questions arise regarding liability—whether it lies with the manufacturer, the software developer, or the vehicle owner. Existing legal frameworks may struggle to keep pace with rapid technological advancements. Given the diversity of regulatory systems across countries, this issue poses additional challenges for automotive companies operating in multiple jurisdictions. Therefore, aligning legal regulations with technological progress in the automotive industry represents a significant and promising avenue for future research.