

การศึกษาภาพรวมงานวิจัยด้านขนส่งสาธารณะไร้คนขับ: การวิเคราะห์บรรณมิติ
จากฐานข้อมูลเว็บออฟไซน์ซ์ (2556–2567)

EXPLORING THE RESEARCH LANDSCAPE OF DRIVERLESS PUBLIC TRANSIT:
A BIBLIOMETRIC ANALYSIS BASED ON WEB OF SCIENCE (2013–2024)

เค่อเค่อ โฮว¹ สืบชาติ อันทะไชย² และ รชต สวนสวัสดิ์^{*2}

¹บัณฑิตวิทยาลัย มหาวิทยาลัยราชภัฏอุดรธานี

²คณะวิทยาการจัดการ มหาวิทยาลัยราชภัฏอุดรธานี

Keke Hou¹ Subchat Untachai² and Rachata Suansawat^{*2}

¹Graduate School, Udon Thani Rajabhat University

²Faculty of Management Science, Udon Thani Rajabhat University

(Received: August 18, 2025; Revised: January 22, 2026; Accepted: April 1, 2026)

บทคัดย่อ

ด้วยการเร่งตัวของกระบวนการสร้างเมือง รูปแบบขนส่งสาธารณะแบบดั้งเดิมได้เกิดการเปลี่ยนแปลงอย่างมีนัยสำคัญ ดังนั้น ขนส่งสาธารณะไร้คนขับจึงได้รับความสนใจเพิ่มขึ้นจากทั้งนักปฏิบัติและนักวิจัย อย่างไรก็ตาม ยังขาดการทบทวนวรรณกรรมเชิงระบบที่ครอบคลุมเกี่ยวกับการประยุกต์ใช้ขนส่งสาธารณะไร้คนขับ ในประเด็นนี้ การศึกษานี้ใช้การวิเคราะห์บรรณมิติ (bibliometric analysis) เพื่อวิเคราะห์สถานะงานวิจัยปัจจุบัน ประเด็นวิจัยสำคัญ และแนวโน้มการพัฒนาในอนาคตของยานพาหนะไร้คนขับในบริบทของขนส่งสาธารณะ โดยอาศัยบทความที่เกี่ยวข้องจำนวน 125 เรื่องจากฐานข้อมูล Web of Science ประการแรก จากการวิเคราะห์ความถี่ร่วมของคำสำคัญ ได้ระบุกลุ่มประเด็นวิจัยหลัก 4 กลุ่ม ได้แก่ การจัดตารางเวลาที่เหมาะสม การยอมรับของผู้ใช้ ความต้องการและความชอบของประชาชน และกรอบทางเทคนิค นอกจากนี้ ผลการวิเคราะห์ยังแสดงให้เห็นว่าจีนและสหรัฐอเมริกาเป็นประเทศที่มีผลงานวิจัยโดดเด่นที่สุด โดยความร่วมมือระหว่างประเทศมีแนวโน้มเพิ่มขึ้นอย่างต่อเนื่อง สุดท้าย การศึกษานี้ได้อภิปรายถึงความก้าวหน้าทางเทคโนโลยี ผลกระทบทางสังคม และความท้าทายเชิงนโยบายที่เกี่ยวข้องกับการพัฒนาในอนาคตของขนส่งสาธารณะไร้คนขับ พร้อมทั้งเสนอแนวทางเพื่อส่งเสริมการประยุกต์ใช้อย่างแพร่หลาย ผลการวิจัยช่วยเสริมสร้างองค์ความรู้ในสาขายานพาหนะไร้คนขับ และให้ข้อเสนอแนะเชิงนโยบาย นวัตกรรมทางเทคโนโลยี และการพัฒนาที่ยั่งยืนของระบบขนส่งสาธารณะไร้คนขับ

คำสำคัญ: ยานพาหนะไร้คนขับ, ระบบขนส่งสาธารณะ, การวิเคราะห์ข้อมูลเชิงบรรณานุกรม, แนวโน้มการวิจัย

ABSTRACT

As urbanization accelerates, the traditional public transit model has undergone significant transformation, and driverless public transit has attracted attention from practitioners and researchers. However, a systematic review of the applications of driverless public transit has yet to be conducted. Through bibliometric analysis, this study systematically analyzes the current research status, hot topics, and future tendencies regarding driverless vehicles in public transit areas, based on 125 relevant articles collected from the Web of Science database. Firstly, through keyword co-occurrence analysis, four major research clusters

are identified, i.e., optimization scheduling, user acceptance, public demand preference, and technical framework. In addition, the results show that China and the United States are the leading contributors, with international collaboration steadily increasing. Finally, this study analyzes the technological advances, social influences, and policy challenges of the future development of driverless vehicles in public transit areas and proposes strategies to promote their widespread application. These findings advance knowledge in the field of driverless vehicles and provide implications for policy formulation, technological innovation, and the sustainable development of driverless public transit.

Keywords: Driverless Vehicles, Public Transit, Bibliometric Analysis, Research Trends

INTRODUCTION

As global urbanization rapidly accelerates, urban traffic problems are becoming increasingly serious. It has become one of the primary obstacles to urban development, such as traffic jams, environmental pollution, and resource consumption (Herrenkind et al., 2019). These challenges highlight the limitations of traditional public transit modes, which lack flexibility and efficiency. They cannot cope with the escalating travel demand constrained by factors such as the state of roads, vehicle flow rate, and service frequency (Oliveira et al., 2021). Against this backdrop, the rapid advancement of artificial intelligence and 5G communications has significantly progressed the development of driverless technology. This progress means the technology is not only confined to the laboratory but also becomes a practical application, inciting revolutionary changes in public transit modes (Xie et al., 2022). As one of the main applications of driverless technology, driverless buses and taxis have multiple advantages. They can enhance road safety, alleviate traffic jams, improve the user experience, and reduce emissions (Jo et al., 2024). Accordingly, driverless buses and taxis have attracted global attention from governments, researchers, and enterprises. Driverless transit has become a crucial direction for the future development of public transportation (Cheng & Lai, 2024).

In contrast to traditional transit systems, driverless public transit relies on highly automated driving systems and operates without human drivers, thereby enhancing operational efficiency and reducing operating costs. Driverless vehicles in public transit systems exemplifies an emerging Vehicle-as-a-Service model, offering passengers flexible, efficient, and sustainable travel choices through shared and automated transport. Autonomous driving technology has become a critical direction in urban transportation development (Schandl et al., 2024). Its integration with public transit is expected to elevate the intelligence, efficiency, and sustainability of transportation networks. Based on driverless vehicles, public transit agencies can offer innovative solutions to the increasingly diverse transit challenges. It also

provides more possibilities for the development of next-generation transit services to meet the growing demands of urbanization (Zhou et al., 2023). In recent years, driverless public transit, as an emerging transit mode, has garnered increasing attention from both academia and industry. Despite this growing interest, the existing literature lacks a comprehensive and integrative assessment of the research landscape in this field. Specifically, there is a notable absence of prior bibliometric reviews that systematically map the knowledge structure, evolution, and collaborative networks within this domain. To fill this gap, the present study adopts a bibliometric approach comprising time series analysis of publication volume, keyword co-occurrence analysis, international collaboration network analysis, and citation analysis, with the aim of systematically characterizing the literature and identifying developmental trends in driverless public transit research.

RESEARCH OBJECTIVES

1. To identify key research themes and trends concerning the impact of driverless technology on public transit.
2. To examine research trends in driverless public transit across key dimensions, specifically focusing on scheduling optimization, user acceptance and adoption, public demands and preferences, and technical frameworks.
3. To develop the future research agenda for driverless public transit.

Research Methodology

1. Method

This study employs bibliometric analysis using VOSviewer to systematically examine the research status and trends in driverless public transit. Bibliometric analysis is an objective, quantitative, and visual method that reveals a field's development, research hotspots, key scholars, and institutions through indicators such as institutional collaboration, literature co-citation, and keyword co-occurrence (Donthu et al., 2021; Wang et al., 2018). VOSviewer, developed by Van Eck and Waltman (2017) at Leiden University, has been widely applied in knowledge network analysis, policy research, and corporate decision-making. Using VOSviewer, this study constructs keyword maps, national collaboration maps, and journal co-citation maps to analyze the current research status and developmental directions of driverless public transit. Figure 1 illustrates the overall research design and analytical procedure. Network-based analyses, including keyword co-occurrence and collaboration networks, were conducted using VOSviewer. The association strength normalization method was applied to represent the relative strength of relationships between nodes.

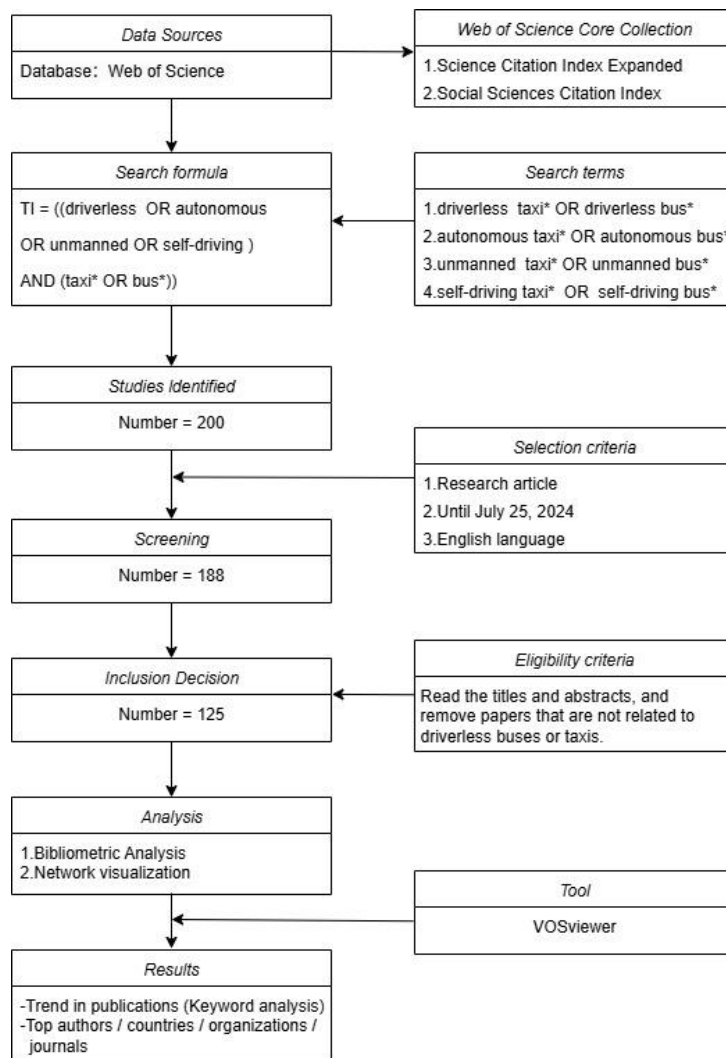


Figure 1 Research design and procedure

2. Literature Sources and Search Strategies

The data for this study was sourced from relevant literature in the Web of Science (WOS) core dataset, Science Citation Index Expanded (SCI Expanded), and Social Sciences Citation Index (SSCI) databases. The search start time is unlimited, and the deadline is July 25, 2024. A title-based retrieval strategy was adopted to ensure high thematic relevance by capturing studies in which driverless public transit constituted the primary research focus. This approach reduces the inclusion of marginally related literature and enhances the precision and methodological rigor of the bibliometric analysis. The retrieval formula is $TI = (driverless OR autonomous OR unmanned OR "self driving") AND (taxi* OR bus*)$. Using this strategy, 200 articles were retrieved from the core set database of WOS. After literature screening and elimination, a total of 125 articles were retained for analysis.

The specific searching and screening process are as follows:

2.1 In the Web of Science Core Collection, including SCI-Expanded and the SSCI, search using the following search modalities:

TI = ((driverless OR autonomous OR unmanned OR self-driving) AND (taxi* OR bus*))

A preliminary search yielded 200 articles.

2.2 After excluding non-thesis literature, 189 papers remained.

2.3 After excluding non-English papers, 188 papers remained.

2.4 By reading the title and abstract of the paper and eliminating the papers unrelated to driverless public transit, 125 papers were finally obtained.

Research Findings

Traditional bibliometric analysis mainly relies on a single indicator, such as publication counts or citation frequencies, to assess academic impact. However, a single metric is often insufficient to capture the complexity of scholarly development. Therefore, this study adopts a comparative bibliometric approach that integrates multiple indicators, including citations, bibliographic coupling, and keyword co-occurrence, to construct a multidimensional analytical perspective and more deeply reveal the evolution of the knowledge structure within the field. By analyzing country collaboration networks and keyword co-occurrence networks, the structural characteristics and dynamic patterns of the research field across countries and research topics can be identified. Furthermore, comparative analysis across the time dimension helps to illustrate the developmental trajectory and potential future trends of the field. In this study, VOSviewer is employed for visual analysis, and the results are presented through network maps to more intuitively highlight research hotspots, frontier areas, and core driving forces.

1. Analysis of literature publication trends

As shown in Figure 2, from 2013 to 2024, the number of research publications in the field of driverless public transit showed a significant upward trend. The process can be roughly divided into three stages: the initial stage of germination, the slow growth stage and the rapid development stage.

1.1 Initial germination period (2013-2016)

From 2013 to 2016, the volume of publication in the field of driverless public transit is very small, with an average annual publication of only 0.75. The proportion of research literature at this stage is only 2.4%, indicating that unmanned technology is still in the preliminary exploration stage. Related studies and applications are few, and the whole field is in its infancy.

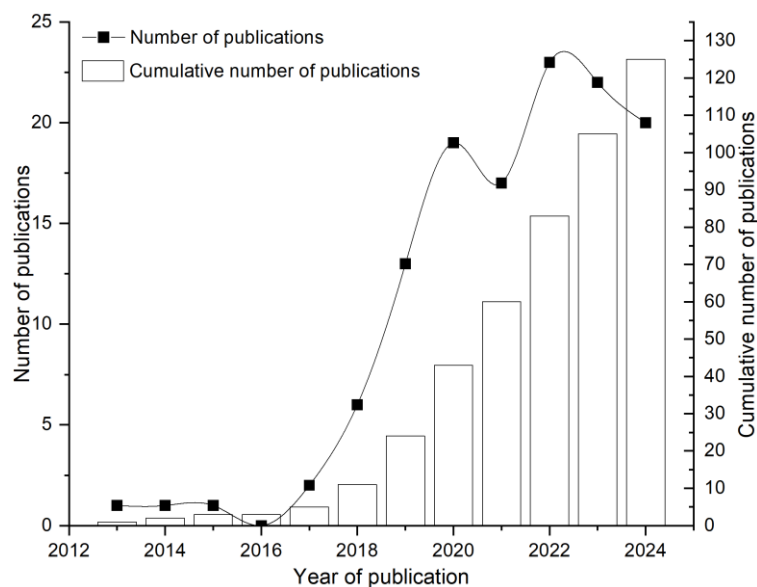


Figure 2 Trend of Annual Publication Volume

1.2 Slow growth period (2017-2019)

From 2017 to 2019, the number of literatures has significantly increased, with an average annual publication of 7 articles, accounting for 16.8% of the total articles. Among them, there was a significant increase in the number of articles published in 2018 and 2019, with approximately 6 articles published in 2018 and further increased to 13 articles in 2019. This indicates that autonomous driving technology has begun to receive widespread attention, and related research and development activities have significantly increased. At this point, autonomous driving technology is gradually becoming more well known and has drawn the interest of other academics.

1.3 High speed development period (2020-2024)

From 2020 to 2024, the average annual number of publications is about 22, with a literature proportion of up to 80.8%. Especially in the first seven months of 2024, the number of articles published has reached 20, indicating that autonomous driving technology has received unprecedented attention in this stage. The explosive growth in the number of articles reflects the rapid development and widespread application of autonomous driving technology. At this stage, 2022, 2023, and 2024 are the peak periods of research in the field of autonomous driving, with an annual publication volume exceeding 20 articles. This trend indicates that the research and application of autonomous driving technology have reached a new high point in recent years, and the research results in related fields are showing a rapid growth trend.

2. Analysis of the keywords

Keyword co-occurrence analysis reveals the characteristics and evolving trends of a research field by identifying associations among keywords. It helps identify thematic clusters

that represent the core themes or conceptual foundations of the field. In this study, keywords extracted from the selected articles were imported into the Network Visualization module of VOSviewer for clustering analysis.

Several measures were adopted to enhance the credibility and precision of the results. First, a minimum keyword occurrence threshold of three was applied to reduce noise from low-frequency terms while retaining representative research topics, in line with common bibliometric practices. Second, meaningless or irrelevant terms, such as filler words and common stop words unrelated to driverless public transit, were removed to improve clarity. As a result, 57 representative keywords were retained for analysis. The keyword clustering results are presented in Figure 3, where node size indicates keyword frequency and link thickness represents the strength of co-occurrence relationships. Keywords sharing the same color constitute a cluster, yielding four distinct clusters in total.

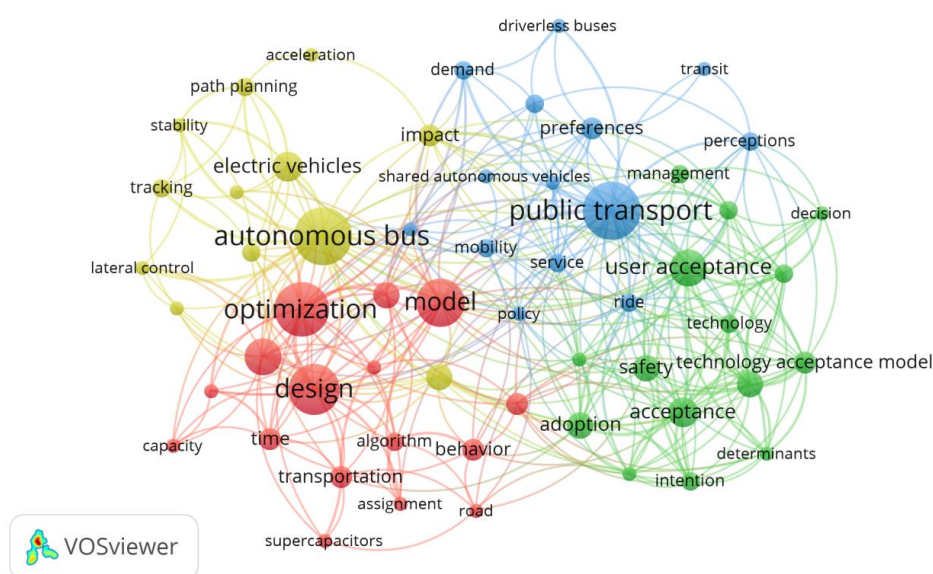


Figure 3 Network diagram of the co-occurrence of keywords

The first cluster (red) focuses on the dispatch optimization of driverless taxis and buses using intelligent algorithms, with keywords such as “optimization,” “design,” “model,” “system,” “simulation,” “autonomous taxi,” “time,” “transportation,” “algorithm,” “assignment,” and “capacity,” emphasizing improvements in traffic efficiency and service performance through optimized dispatch systems. The second cluster (green) centers on user acceptance of driverless technology in public transit, including terms such as “user acceptance,” “adoption,” “safety,” “trust,” “technology acceptance model,” “intent,” and “perceived risk,” and examines how psychological and perceptual factors influence technology

adoption. The third cluster (blue) addresses public demands and preferences for driverless public transit, with keywords such as “public transport,” “preferences,” “choice,” “demand,” “mobility,” “perceptions,” “cost,” and “driverless buses,” focusing on market demand, user choice behavior, and development trends. The fourth cluster (yellow) concentrates on technical assessment related to the framework and operational mechanisms of driverless bus systems, represented by keywords including “autonomous bus,” “path planning,” “electric vehicles,” “tracking,” and “routing,” and explores key enabling technologies such as path planning, stability control, and performance evaluation of driverless buses.

To illustrate the temporal evolution of research topics, a keyword time overlay visualization was constructed (Figure 4), depicting the distribution of keywords across clusters over time. Keywords are color-coded according to the average year of first appearance, ranging from blue (earlier years) to green and yellow (more recent years), thereby highlighting shifting research hotspots. As shown in Figure 4, terms such as “transportation,” “demand,” and “driverless buses” emerged as prominent topics around 2019, indicating growing attention to the application of driverless technology in public transit. This trend reflects the increasing recognition of its potential impacts on transportation safety, efficiency, and sustainability. Moreover, research on users’ acceptance of driverless public transit has expanded markedly since 2020, suggesting a growing academic focus on social dimensions, particularly public attitudes and adoption behavior. Overall, these trends indicate a transition of driverless technology research from a predominantly technical development stage toward practical application and social integration.

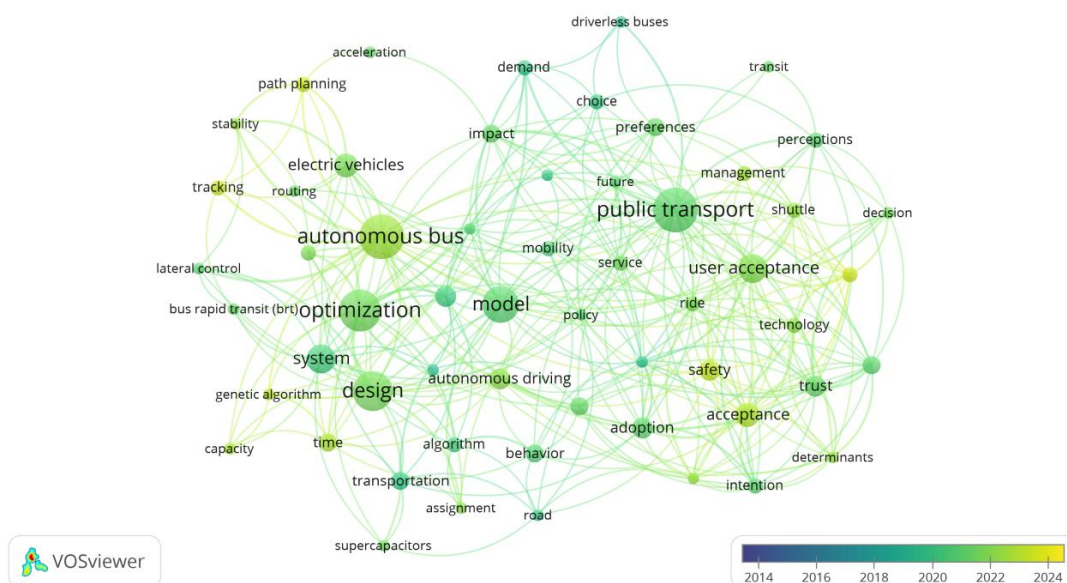


Figure 4 Overlay diagram of the co-occurrence of keyword

3. Analysis of the countries

Table 1 presents the top 10 most productive countries. Moreover, a national collaboration network was constructed in VOSviewer using countries as nodes. Among the 34 countries with publications in this field, only those with more than two articles were included in the visualization, as shown in Figure 5.

From a country-level perspective, China, the United States, Germany, and Singapore are the most productive contributors to the literature. Among them, China and the United States account for approximately 64% of total publications, underscoring their dominant roles in driverless public transit research. As illustrated in the collaboration network, China and the United States exhibit the strongest bilateral cooperation. China also maintains close research ties with the United Kingdom, Australia, and Japan, while the United States collaborates extensively with Japan, Germany, and Sweden. Germany further demonstrates active cooperation with countries such as Japan, Spain, and the Netherlands, reflecting its strong engagement in autonomous driving research. Overall, international collaboration patterns display clear regional characteristics, closely linked to geographic proximity, strategic priorities, and resource allocation. Strengthening cross-regional collaboration in the future may facilitate global knowledge integration and accelerate technological advancement in intelligent and safe transportation systems.

Table 1 The top 10 most productive countries

Rank	Country	Publications
1	China	53
2	The United States	30
3	Germany	12
4	South Korea	10
5	Japan	8
6	Singapore	8
7	Spain	6
8	Sweden	6
9	England	4
10	Netherlands	4

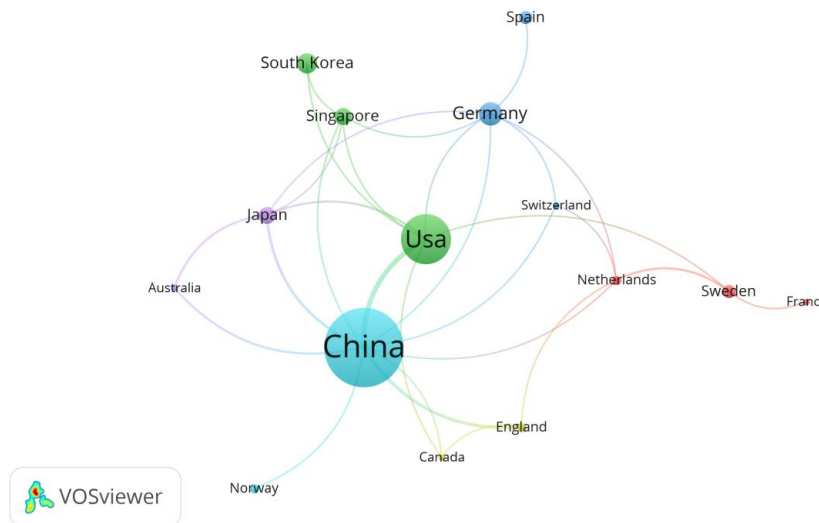


Figure 5 Network diagram of the co-occurrence of countries

4. Analysis of the journal co-citation

Citation analysis serves as a key indicator for identifying influential research and scholarly contributions within a field. Table 2 summarizes the most highly cited studies and leading scholars in driverless public transit research, reflecting its core themes and developmental trajectories. For instance, Greenblatt et al. (2015) examined the potential of autonomous taxis to reduce carbon emissions and energy consumption, while Lokhandwala and Cai (2018) focused on traffic flow optimization through shared autonomous taxi systems. In terms of safety and user perspectives, studies have addressed the reliability of autonomous driving systems and passenger acceptance, with Dong et al. (2019) analyzing user adoption patterns and attitudes toward emerging technologies. Collectively, these influential works provide a comprehensive view of the technological, operational, and behavioral dimensions shaping the evolution of driverless public transit.

Table 2 The top 10 articles by citation count

Authors	Title	Journal	Citation counts
Greenblatt et al. (2015)	Autonomous taxis could greatly reduce greenhouse-gas emissions of US light-duty vehicles	Nature Climate Change	263
Lokhandwala and Cai (2018)	Dynamic ride sharing using traditional taxis and shared autonomous taxis: A case study of NYC	Transportation Research Part C-Emerging Technologies	138
Salonen (2018)	Passenger's subjective traffic safety, in-vehicle security and emergency management in the driverless shuttle bus in Finland	Transport Policy	100
Dong et al. (2019)	Transit user perceptions of driverless buses	Transportation	84
Bae et al. (2019)	Toward a Comfortable Driving Experience for a Self-Driving Shuttle Bus	Electronics	80
Cao and Ceder (2019)	Autonomous shuttle bus service timetable and vehicle scheduling, using skip-stop tactic	Transportation Research Part C-Emerging Technologies	78
Herrenkind et al. (2019)	Investigating end-user acceptance of autonomous electric buses to accelerate diffusion	Transportation Research Part D-Transport and Environment	71
Dai et al. (2020)	Joint optimization of scheduling and capacity for mixed traffic with autonomous and human-driven buses: A dynamic programming approach	Transportation Research Part C-Emerging Technologies	65
Abe (2019)	Introducing autonomous buses and taxis: Quantifying the potential benefits in Japanese transportation systems	Transportation Research Part A-Policy and Practice	63
Mao et al. (2020)	Dispatch of autonomous vehicles for taxi services: A deep reinforcement learning approach	Transportation Research Part C-Emerging Technologies	60

DISCUSSION OF THEMATIC CLUSTERS

As a key component of intelligent transportation systems, driverless public transit has attracted growing scholarly attention. Driven by advances in artificial intelligence, automation, and sensor technologies, it is increasingly recognized as a promising solution for urban transportation. Within the context of global mobility transformation, these technological developments have positioned driverless public transit as an integral element of AI-driven mobility solutions, Mobility-as-a-Service (MaaS), and Smart City frameworks, all of

which emphasize data-driven operations, service integration, and sustainable urban mobility. Current research in this field primarily focuses on the following areas.

1. Scheduling and optimization of driverless public transit

Core technologies include autonomous driving algorithms, environment perception systems, vehicle sensors, and vehicle-to-vehicle and vehicle-to-road communication (Li et al., 2023). Significant progress has been made in low-speed unmanned vehicles, such as driverless buses and minibuses (Dai et al., 2020). Research emphasizes optimizing dispatch systems with intelligent algorithms to enhance operational efficiency and service quality (Li et al., 2023). Simulation studies explore efficient scheduling and the behavior of driverless taxis or buses in urban traffic (Hasan et al., 2022). From the perspective of AI-driven mobility, these optimization studies support real-time, data-enabled transport operations and adaptive decision-making in complex urban systems. Additionally, some studies investigate new energy technologies to improve endurance and energy efficiency (Oarg et al., 2024). Overall, this cluster highlights the use of intelligent algorithms to enhance the performance of driverless public transit in complex urban environments, aligning with Smart City objectives of improving traffic efficiency and resource allocation through intelligent infrastructure.

2. User acceptance and technology adoption

This cluster examines user acceptance and adoption of driverless public transit, with an emphasis on individuals' psychological and decision-making processes when encountering emerging technologies. Existing studies commonly apply the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) to analyze key determinants, including trust, safety perception, and perceived risk (Schandl et al., 2024). In addition, research has considered the roles of gender, cultural context, and policy measures in shaping adoption decisions (Rosell & Allen, 2020). Within MaaS frameworks, user acceptance of driverless public transit is particularly critical, as seamless integration across multiple transport modes depends on users' trust in automated and digitally mediated mobility services. Overall, these studies aim to understand and promote user acceptance of driverless public transit, which constitutes a prerequisite for large-scale deployment in smart and integrated mobility ecosystems.

3. Public demands and preferences

This cluster examines user demands and preferences for driverless public transit, including driverless buses and shared autonomous vehicles. Existing studies assess the potential of autonomous driving technologies by analyzing travel demand, user preferences, and mode choice behavior, with particular attention to factors such as convenience, comfort, and cost (Klinkhardt et al., 2024). These demand-oriented studies are closely aligned with MaaS concepts, which emphasize user-centric, flexible, and service-oriented mobility solutions. Public acceptance is influenced by culture, region, and technological maturity, as well as

economic benefits. Legal and regulatory issues, including the protection of passengers' and pedestrians' rights, are also critical for promoting adoption. Understanding public demand is essential for integrating driverless public transit into Smart City strategies that seek to balance efficiency, accessibility, and social inclusiveness.

4. Technical framework and operation mechanism

It concentrates on the technologies and operational mechanisms of driverless public transit, with a particular emphasis on core systems and stability control. Existing studies examine the application of autonomous driving technologies in public transportation, focusing on the safety, stability, and operational efficiency of driverless buses and taxis (Shi et al., 2022; Hu et al., 2024). Key research topics include path tracking, path planning, and model-free adaptive iterative learning control algorithms (Liu et al., 2024). In addition, research highlights the performance of electric driverless buses, especially in terms of environmental benefits, driving endurance, and energy efficiency (Shi et al., 2022), thereby providing important technical support and theoretical guidance for the development of intelligent transportation infrastructure. These technical frameworks provide the foundational infrastructure for intelligent, connected, and sustainable urban mobility systems, enabling the integration of driverless public transit with urban data platforms and digital governance mechanisms.

Overall, the thematic clustering indicates the coexistence of theory-driven and practice-oriented research streams. In particular, user acceptance research is grounded in established technology adoption frameworks, while the other clusters predominantly reflect engineering and operational perspectives focused on system optimization, technological development, and implementation.

CONCLUSION, FUTURE DIRECTIONS AND LIMITATIONS

1. Conclusion

Through bibliometric analysis, this study identifies the principal research themes and developmental trends in driverless public transit. As autonomous driving technology transitions from theoretical exploration to practical deployment, several notable patterns have emerged. First, dispatch optimization has attracted growing attention, with studies demonstrating that intelligent algorithms and simulation-based approaches can enhance operational feasibility in complex urban environments by modeling traffic flow and vehicle demand. Second, user acceptance has been recognized as a critical determinant of implementation outcomes, exhibiting substantial variation across cities due to differences in public policy, social context, and technological maturity. Finally, existing research places strong emphasis on technical implementation, including path planning, control algorithms, and system stability, which are fundamental to ensuring the safety and reliability of driverless public transit systems. These findings also offer important policy implications for developing countries, where rapid

urbanization, limited infrastructure, and fiscal constraints make driverless public transit a potentially cost-effective solution for improving accessibility and service efficiency.

2. Future directions and limitations

Significant progress has been made in driverless public transit, yet several key areas warrant further research. Based on current literature, five potential directions are proposed:

2.1 Cross-cultural and regional perspectives

Future research should investigate how cultural, economic, policy, and social contexts influence the acceptance and adoption of driverless buses and taxis, thereby informing region-specific deployment strategies.

2.2 Technology-policy-user interaction

Research should further examine the interplay among technological development, government regulation, social norms, and user perceptions, and develop an integrated conceptual framework to support the large-scale adoption of driverless public transit.

2.3 Real-world implementation and performance

Empirical evaluations of practical applications, including traffic flow, operational efficiency, and safety performance, are essential for informing policymakers, optimizing system design, and identifying barriers to adoption.

2.4 Social sustainability and equity

The long-term impacts on urban transportation systems, environmental sustainability, employment, and social equity should be systematically assessed, and corresponding policy measures should be proposed to ensure fairness and inclusiveness.

2.5 Legal, ethical, and regulatory frameworks

It is crucial to address legal liability, ethical challenges, and data privacy concerns, and to establish robust regulatory frameworks that enhance public trust and guide the responsible development of driverless public transit.

Despite offering insights into research trends through bibliometric analysis, this study has several limitations. First, reliance on public academic databases may lead to the omission of undercited studies or non-academic sources. Moreover, the exclusive use of the Web of Science database may result in the underrepresentation of relevant research published in non-English journals or regional outlets. Future studies could expand the literature scope by incorporating industry reports and policy documents. In addition, while keyword co-occurrence analysis effectively highlights major research themes, it may not fully capture the complexity of the field. Integrating complementary approaches, such as topic modeling or sentiment analysis, would provide a more comprehensive understanding.

REFERENCES

- Abe, R. (2019). Introducing autonomous buses and taxis: Quantifying the potential benefits in Japanese transportation systems. **Transportation Research Part A: Policy and Practice**, **126**, 94–113. <https://doi.org/10.1016/j.tra.2019.06.003>
- Bae, I., Moon, J., & Seo, J. (2019). Toward a comfortable driving experience for a self-driving shuttle bus. **Electronics**, **8**(9), Article 943. <https://doi.org/10.3390/electronics8090943>
- Cao, Z., & Ceder, A. A. (2019). Autonomous shuttle bus service timetabling and vehicle scheduling using skip-stop tactic. **Transportation Research Part C: Emerging Technologies**, **102**, 370–395. <https://doi.org/10.1016/j.trc.2019.03.018>
- Cheng, Y. H., & Lai, Y. C. (2024). Exploring autonomous bus users' intention: Evidence from positive and negative effects. **Transport Policy**, **146**, 91–101. <https://doi.org/10.1016/j.tranpol.2023.11.004>
- Dai, Z., Liu, X. C., Chen, X., & Ma, X. (2020). Joint optimization of scheduling and capacity for mixed traffic with autonomous and human-driven buses: A dynamic programming approach. **Transportation Research Part C: Emerging Technologies**, **114**, 598–619. <https://doi.org/10.1016/j.trc.2020.03.001>
- Dong, X., DiScenna, M., & Guerra, E. (2019). Transit user perceptions of driverless buses. **Transportation**, **46**(1), 35–50. <https://doi.org/10.1007/s11116-017-9786-y>
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. **Journal of Business Research**, **133**, 285–296. <https://doi.org/10.1016/j.jbusres.2021.04.070>
- Greenblatt, J. B., & Saxena, S. (2015). Autonomous taxis could greatly reduce greenhouse-gas emissions of US light-duty vehicles. **Nature Climate Change**, **5**(9), 860–863. <https://doi.org/10.1038/nclimate2685>
- Hasan, U., Whyte, A., & AlJassmi, H. (2022). A microsimulation modelling approach to quantify environmental footprint of autonomous buses. **Sustainability**, **14**(23), 1–31. <https://doi.org/10.3390/su142315657>
- Herrenkind, B., Brendel, A. B., Nastjuk, I., Greve, M., & Kolbe, L. M. (2019). Investigating end-user acceptance of autonomous electric buses to accelerate diffusion. **Transportation Research Part D: Transport and Environment**, **74**, 255–276. <https://doi.org/10.1016/j.trd.2019.08.003>
- Hu, Q., Hu, S., Shen, S., Ouyang, Y., & Chen, X. M. (2024). Optimizing routing and scheduling of shared autonomous electric taxis considering capacity constrained parking facilities. **Sustainable Cities and Society**, **111**, Article 105557. <https://doi.org/10.1016/j.scs.2024.105557>

- Jo, A., Kwon, W., & Yi, K. (2024). Motion planning for urban autonomous bus considering localization uncertainty using offset-free MPC. **IEEE Access**, **12**, 11743–11760. <https://doi.org/10.1109/ACCESS.2024.3355205>
- Klinkhardt, C., Kandler, K., Kostorz, N., Heilig, M., Kagerbauer, M., & Vortisch, P. (2024). Integrating autonomous busses as door-to-door and first-/last-mile service into public transport: Findings from a stated choice experiment. **Transportation Research Record**, **2678**(2), 605–619. <https://doi.org/10.1177/03611981231175900>
- Li, H., Li, S., & Zhang, X. (2023). Coordination optimization of real-time signal priority of self-driving buses at arterial intersections considering private vehicles. **Applied Sciences**, **13**(19), 1–15. <https://doi.org/10.3390/app131910803>
- Liu, S., Huang, W., Ji, H., & Wang, L. (2024). Robust model-free adaptive iterative learning control for an autonomous bus trajectory tracking system. **Science Progress**, **107**(2), 1–37. <https://doi.org/10.1177/00368504241249617>
- Lokhandwala, M., & Cai, H. (2018). Dynamic ride sharing using traditional taxis and shared autonomous taxis: A case study of NYC. **Transportation Research Part C: Emerging Technologies**, **97**, 45–60. <https://doi.org/10.1016/j.trc.2018.10.007>
- Mao, C., Liu, Y., & Shen, Z. J. M. (2020). Dispatch of autonomous vehicles for taxi services: A deep reinforcement learning approach. **Transportation Research Part C: Emerging Technologies**, **115**, Article 102626. <https://doi.org/10.1016/j.trc.2020.102626>
- Oliveira, R., Lima, P., Cirillo, M., & Wahlberg, B. (2021). Autonomous bus driving: A novel motion-planning approach. **IEEE Vehicular Technology Magazine**, **16**(3), 29–37. <https://doi.org/10.1109/MVT.2021.3086438>
- Rosell, J., & Allen, J. (2020). Test-riding the driverless bus: Determinants of satisfaction and reuse intention in eight test-track locations. **Transportation Research Part A: Policy and Practice**, **140**, 166–189. <https://doi.org/10.1016/j.tra.2020.08.013>
- Salonen, A. O. (2018). Passenger's subjective traffic safety, in-vehicle security and emergency management in the driverless shuttle bus in Finland. **Transport Policy**, **61**, 106–110. <https://doi.org/10.1016/j.tranpol.2017.10.011>
- Schandl, F., Lerner, E., & Hudecek, M. F. (2024). If it concerns me: An experimental investigation of the influence of psychological distance on the acceptance of autonomous shuttle buses. **Collabra: Psychology**, **10**(1), Article 118770. <https://doi.org/10.1525/collabra.118770>
- Shi, M., He, H., Li, J., Han, M., & Zhou, N. (2022). Path planning and following control of autonomous bus under time-varying parameters against parametric uncertainties and external disturbances. **IEEE Transactions on Vehicular Technology**, **71**(7), 7057–7070. <https://doi.org/10.1109/TVT.2022.3170440>

- Van Eck, N. J., & Waltman, L. (2017). Citation-based clustering of publications using CitNetExplorer and VOSviewer. **Scientometrics**, **111**, 1053–1070. <https://doi.org/10.1007/s11192-017-2300-7>
- Wang, L., Xue, X., Zhao, Z., & Wang, Z. (2018). The impacts of transportation infrastructure on sustainable development: Emerging trends and challenges. **International Journal of Environmental Research and Public Health**, **15**(6), 1–15. <https://doi.org/10.3390/ijerph15061172>
- Xie, H., David, A., Mamun, M. R. A., Prybutok, V. R., & Sidorova, A. (2022). The formation of initial trust by potential passengers of self-driving taxis. **Journal of Decision Systems**, **32**(2), 326–355. <https://doi.org/10.1080/12460125.2021.2023258>
- Zhou, X., Wu, L., Zhang, Y., Chen, Z. S., & Jiang, S. (2023). A robust deep reinforcement learning approach to driverless taxi dispatching under uncertain demand. **Information Sciences**, **646**, 1–16. <https://doi.org/10.1016/j.ins.2023.119401>