GeoAI Applications in Smart Cities: A Systematic Review on Transportation, Building Models, and Navigation

Hacer Kübra Sevinç [1], Şüheda Semih Açmalı[1], İsmail Rakıp Karaş[2], Yasin Ortakçı[2],Emrullah Demiral [3], Nehad Ramaha[2]

[1]Vocational School of Information Technologies, Karabuk University, Karabuk, Turkiye
kubrasevinc@karabuk.edu.tr , semihacmali@karabuk.edu.tr
[2] Dept. of Computer Engineering, Karabuk University, Karabuk, Turkiye
yasinortakci@karabuk.edu.tr, ismail.karas@karabuk.edu.tr, nehadramaha@karabuk.edu.tr
[3] Dept. of Software Engineering, Karabuk University, Karabuk, Turkiye – emrullahdemiral@karabuk.edu.tr

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Abstract

The concept of smart cities aims to create more efficient, sustainable and liveable urban environments by integrating information and communication technologies. In recent years, the integration of artificial intelligence (AI) with geospatial data, known as geospatial artificial intelligence (GeoAI), has emerged as a pivotal catalyst for smart city initiatives. GeoAI has become as a transformative force in the context of smart cities, revolutionising the analysis, design and management of urban environments. By integrating AI and geographic information systems (GIS), it processes and analyses spatial data, informing decisions in various domains such as urban planning, public health, transportation management, and environmental monitoring. This study presents a systematic review of GEOAI applications in the smart cities concept between 2019 and 2024, focusing on the following topics: (1) smart transportation systems, (2) 3D building models and indoor navigation, (3) open data platforms and urban analytics, and (4) web-based interactive data visualisation.

1. Introduction

GeoAI leverages machine learning and geospatial data to optimise transport networks, facilitate real-time monitoring, and improve decision-making processes in urban areas. One of the critical benefits of GeoAI in transportation systems is its ability to accurately forecast traffic. Recent studies underscore the utility of deep learning models that utilize heterogeneous spatiotemporal data for anticipatory traffic management. For instance, Shi et al. (2024) describe how employing transformer-based graph learning techniques can significantly improve traffic forecasting capabilities, which are vital for urban transportation planning and congestion management. These systems analyse patterns in traffic data to predict future conditions, thereby enabling proactive traffic control measures and resource allocation.

The aim of smart cities is to create efficient, sustainable and liveable urban environments by integrating information and communication technologies (ICT), the Internet of Things (IoT), big data and artificial intelligence (AI). In recent years, the convergence of AI with geospatial data — known as geospatial artificial intelligence (GeoAI) — has emerged as a transformative driver of this vision. By combining AI techniques with geographic information systems (GIS), GeoAI enables advanced spatial analysis, predictive modelling and decision support across diverse domains, including transport management, urban planning, public health and environmental monitoring.

While early smart city initiatives focused on infrastructure and operational efficiency, there has been a shift towards citizen-centric approaches that prioritise inclusivity, participatory governance and environmental sustainability. GeoAI plays a critical role in this transformation by integrating heterogeneous spatial datasets, enabling real-time urban intelligence, and fostering active community engagement.

Despite rapid progress, the literature remains fragmented. Most existing studies focus on single domains, such as transportation forecasting, 3D building modelling or open-data-driven analytics, without providing a synthesis that connects technical innovations to governance frameworks and citizen-oriented outcomes. Furthermore, there is a lack of standardised methodologies, cross-domain integration and open data practices that would facilitate reproducibility and interdisciplinary collaboration.

This study addresses existing gaps by conducting a systematic review of GeoAI applications in smart cities during the period from 2019 to 2024. The review concentrates on four interconnected domains: intelligent transportation systems, three-dimensional building models and indoor navigation, open-data platforms and urban analytics, and web-based interactive visualization. By synthesizing findings across these areas, the paper provides a unified perspective that connects technical advancements with citizen-centric smart city strategies. Furthermore, the review delivers actionable insights for researchers, practitioners, and policymakers aiming to leverage GeoAI to foster urban development that is more sustainable, inclusive, and resilient.

2. Background

2.1 Smart Cities and ICT Infrastructure

A smart city is defined as a highly integrated urban environment where multiple technologies working together to improve services, infrastructure, and the overall quality of life. This definition emphasizes the integration of ICT, IoT, Big Data, and AI as pivotal components. ICT is fundamental to the

functioning of a smart city by providing the necessary communication networks that facilitate the flow of information. It encompasses internet connectivity, telecommunications, and broadcasting systems, enabling different sectors within the city to communicate efficiently (Nikitas et al., 2020; Park et al., 2018). Big Data is another crucial component of smart cities, providing the analytical base needed to process the vast amounts of data generated by IoT devices. The ability to analyze this data allows cities to optimize services such as waste management, public transportation, and emergency response systems, which in turn enhances sustainability and improves citizen engagement (Liu et al., 2022). Effective management of big data leads to insights that drive strategic decisions, improve resource allocation, and increase overall urban resilience (Hassan et al., 2021; Whaiduzzaman et al., 2022). AI technology plays a transformative role in smart cities, leveraging data from IoT and big data sources to create intelligent systems that further enhance urban life. AI can be used for predictive analytics, automated decision-making, and process optimization across various domains like traffic management, energy distribution, and public health (Kuzior, 2024; Yiğitcanlar et al., 2020). For instance, AI applications in smart transportation systems can analyze traffic data in real-time to improve flow and reduce congestion (Liu et al., 2022; Ibrahim et al., 2020). As AI becomes more embedded in urban management, it fosters innovative solutions that can adjust dynamically to changing city conditions.

The evolution of smart city concepts reflects a transition from predominantly infrastructure-centric approaches to increasingly citizen-centric paradigms. This transformation is fuelled by the realisation that sustainable urban development requires not only technological progress, but also active citizen participation and community-centred solutions.

2.1.1. Infrastructure-Centric Smart Cities: In the early stages of smart city development, the focus was on improving urban efficiency and service delivery by enhancing physical infrastructure through the integration of advanced ICT. Scholars like Batty et al. have highlighted that smart cities emerged as a response to the need for better functioning and management of urban areas using technological innovations Batty et al. (2012). During this period, the concept was often tightly linked to the enhancement of hard infrastructure, such as transportation systems and energy grids, which were seen as critical to urban resilience and operational efficiency (Baporikar, 2016; Pira, 2021). Furthermore, some definitions characterized smart cities largely in terms of their underlying technological frameworks, which contributed to improved infrastructure, they often failed to consider the social implications or the realities of urban life faced by residents (Wamba & Queiroz, 2019).

2.1.2. Shift to Citizen-Centric Approaches: However, as the discourse surrounding smart cities evolved, there was a growing recognition of the necessity to actively involve citizens in the creation and implementation of smart city initiatives. This shift towards citizen-centric methodologies is evident in recent literature, which posits that for a city to be truly "smart," it must embrace not only technological solutions but also prioritize the needs and voices of its citizens (Gandhi et al., 2021; Gils & Bailey, 2021). This broadens the definition to include community engagement, inclusivity, and environmental sustainability as fundamental components of smart city governance. The emphasis on citizen participation is a response to the limitations of earlier models, which were criticized for being top-down and for neglecting local contexts. Contemporary approaches advocate for bottom-up strategies

where municipalities focus on co-designing urban spaces and services collaboratively with residents (Al-Saidi & Zaidan, 2024). These citizen-centric strategies align with the concept of biophilic smart cities, where natural elements and community well-being are interwoven with technological integration to foster urban resilience Tarek & Ouf (2021) and enhance the quality of life (Kitika & Suwatcharapinun, 2024).

Furthermore, citizen-centric smart cities promote systems that empower individuals, encouraging them to participate in decision-making processes regarding urban planning and governance. This transition reflects a broader trend towards sociotechnical approaches that recognize the synergies between technology and the social fabric of urban environments.

2.1.3. Role of GeoAI in Enhancing Citizen-Centric Practices: The integration of geographic information systems with AI, termed GeoAI, has been demonstrated to play a transformative role in enhancing citizen-centric approaches within smart cities. Jovanović-Milenković and Petrović (2023) outline that GeoAI is essential for managing extensive datasets, improving transparency, and fostering equitable outcomes in urban planning. By combining big data analytics with spatial analysis, GeoAI enables decision-makers to derive insights that consider diverse community needs, ultimately leading to more informed, inclusive governance. GeoAI facilitates real-time data processing, which is critical for understanding urban dynamics. This capacity enables urban areas to respond expeditiously to the requirements of their populations and to modify their services accordingly (Qiu, 2023; Saleh et al., 2025). The ability of GeoAI to identify environmental hazards or assess accessibility issues within urban centers empowers citizens to engage directly with local governments to address these challenges (VoPham et al., 2018). As geographic information becomes more accessible, citizens can leverage tools like mobile applications to report issues, propose solutions, and participate in collaborative urban governance.

Research indicates that the integration of GeoAI applications has the potential to enhance community-driven initiatives, such as participatory mapping projects that visualize urban issues and foster dialogue among residents and decision-makers (KUMAŞ & Aslan, 2025; Carstensen & Skov-Petersen, 2023). This not only amplifies citizen voices but also builds social capital by encouraging collaboration and trust within communities. The evolution of smart city approaches from infrastructure-centric to citizen-centric, highlighting the role of GeoAI in integrating heterogeneous spatial data with AI to deliver context-aware solutions (Figure 1).
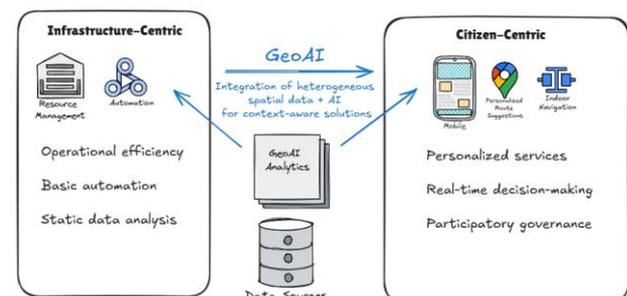

Figure 1. GeoAI's role in the shift from infrastructure-centric to citizen-centric smart city approaches.

2.2 Geospatial Artificial Intelligence (GeoAI)

GeoAI refers to the integration of AI techniques with geospatial data and GIS. The field of GeoAI is situated at the intersection

of AI and location intelligence (Figure 2). The methodology involves utilizing machine learning, deep learning, and other AI methodologies to analyze and interpret large volumes of geospatial data derived from various sources, including satellite imagery, sensor data, and volunteered geographic information (Li & Zipf, 2022; Bordogna & Fugazza, 2022; Li & Hsu, 2022). GeoAI facilitates advanced spatial analysis and improves decision-making processes related to urban planning, environmental monitoring, public health, disaster management, and resource allocation by deriving insights from complex spatial datasets (Boulos et al., 2019; Li, 2020). This concept effectively combines advancements in AI with the spatial dimension of geographic data, offering new solutions for addressing a wide range of societal and environmental issues (Hu et al., 2019).
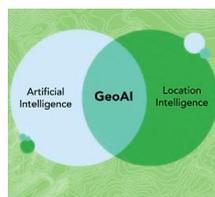

Figure 2. What is GeoAI (Esri, 2023)

2.2.1. Common AI Methods in GeoAI: Several artificial intelligence (AI) methods are commonly employed in GeoAI applications, each adapted for specific geospatial tasks. Machine learning (ML) techniques, such as decision trees, random forests, and support vector machines, are widely used for classification and regression tasks in geospatial domains, including land use classification and environmental modeling (Li & Hsu, 2022; Boulos et al., 2019). Deep learning (DL), particularly convolutional neural networks (CNNs), has become prominent in image analysis tasks, such as satellite image classification and object detection. CNNs have demonstrated effectiveness in extracting spatial features from high-resolution imagery, supporting applications like urban landscape classification and vegetation mapping (Li & Hsu, 2022; Gao et al., 2020). Geospatial data mining applies AI techniques to uncover patterns and relationships within geospatial datasets, thereby facilitating tasks such as urban form analysis and spatial interaction modeling (Song et al., 2024). Spatial statistics, when integrated with AI, enhance the analysis of spatially correlated data through methods such as spatial autocorrelation analysis and geostatistical modeling, enriching geospatial analyses (Bordogna & Fugazza, 2022; Masinde et al., 2024). Furthermore, natural language processing (NLP) is employed to analyze unstructured textual data containing geospatial information, such as social media posts and reports, enabling applications like sentiment analysis related to urban experiences (Paolanti et al., 2024; Boulos et al., 2019).

2.2.2. Data Sources for GeoAI: The effectiveness of GeoAI strongly depends on the availability of diverse and robust data sources that support a wide range of geospatial analyses. Remote sensing data, including satellite imagery and aerial photographs, serve as essential inputs for monitoring land use changes, urban expansion, and environmental conditions, providing high-resolution visual information suitable for GeoAI techniques (Bordogna & Fugazza, 2022; Boulos et al., 2019). Geolocation data obtained from GPS devices, mobile applications, and digital maps is critical for modeling human

mobility patterns, traffic dynamics, and urban navigation (Hu et al., 2019; Vanolo, 2013). Volunteered Geographic Information (VGI), derived from crowdsourced platforms such as OpenStreetMap where individuals contribute local geographic knowledge, plays an important role in enhancing the quality and granularity of geospatial datasets, thereby supporting the training of GeoAI models (Li & Zipf, 2022; Paolanti et al., 2024). Sensor data collected from Internet of Things (IoT) devices provides real-time information on environmental parameters, traffic flow, and urban infrastructure performance, enabling the integration of dynamic data into GeoAI systems for responsive and adaptive city management (Boulos et al., 2019; Masinde et al., 2024). In addition, socioeconomic data, including demographic and community-level indicators, further enriches GeoAI analyses by facilitating insights into accessibility, social disparities, and community needs within urban planning frameworks (Li & Hsu, 2022; Paolanti et al., 2024). GeoAI integrates sophisticated AI methodologies with geospatial data to uncover new opportunities for understanding and addressing urban and environmental challenges. Its evolution represents a critical advancement in geographic sciences, enhancing the capacity to process, analyze, and make informed decisions regarding spatial phenomena.

2.3 Previous Reviews

A comprehensive analysis of 12 recent review studies in the field of GeoAI reveals a research landscape characterised by thematic diversity but notable fragmentation. The details of these studies, including their scope, methodological approaches, and identified research gaps, are summarised in Table 1. The literature on the subject can be broadly categorized into three main strands: technical and methodological advancements, domain-specific applications, and ethical–governance considerations. Technical and methodological advancements are reflected in works such as Zeng et al. (2024), who conducted a systematic review on self-supervised learning for point cloud data, emphasizing its potential for large-scale 3D urban modelling. Li and Hsu (2022) reviewed large-scale image analysis methods for remote sensing and machine vision, while Pierdicca and Paolanti (2022) focused on AI approaches for complex geomatics data, identifying the need for algorithms specifically adapted to geospatial contexts.

Domain-specific applications form another significant body of work. Ouchlif et al. (2024) reviewed GeoAI applications for post-earthquake land prospection, noting effectiveness in damage assessment but gaps in broader applicability and long-term evaluation. Saleh et al. (2025) examined human geography and spatial networks, identifying the need for interdisciplinary integration. Aidaoui et al. (2024) applied bibliometric and systematic review methods to analyse GeoAI in urban planning and environmental monitoring, revealing methodological gaps in addressing socio-economic disparities. Sector-focused reviews also include Amponsah et al. (2023) and Kamel Boulos et al. (2019), which highlight applications in health, disease spread analysis, and public health surveillance, while stressing limited cross-sector integration. Ethical and governance considerations are addressed in Marasinghe et al. (2024), which integrates responsible AI principles into the urban geospatial context but identifies a lack of operational frameworks for practical implementation. Okonkwo et al. (2025) highlight the challenges of applying GeoAI in Nigerian urban contexts, pointing to high adoption costs and limited geospatial data availability. Gao (2021) emphasizes the need for

interdisciplinary collaboration and standardized methodologies in GeoAI applications. Across these studies, common research gaps emerge: (1) insufficient integration between transportation, 3D building/indoor navigation, and open-data-driven analytics; (2) limited standardized methodologies and evaluation frameworks; and (3) underdeveloped reproducibility and open-data practices. While the reviewed literature demonstrates GeoAI's adaptability to various domains, it also underscores the need for integrative reviews—such as the present work—that connect technical innovation with domain-specific applications and governance considerations to advance citizen-centric smart city development.

3. Methodology

This study adopts a **systematic review methodology** to synthesize and critically evaluate the body of literature on GeoAI applications within smart cities, with a particular focus on transportation systems, 3D building modelling, and indoor navigation, and open-data-driven urban analytics. The review process was structured to ensure transparency, reproducibility, and comprehensive coverage of relevant studies.

4. GeoAI in Smart Transportation Systems

GeoAI is a relatively new term that combines AI and location intelligence. Consequently, academic searches using the query "GeoAI" AND ("Transportation" OR "Route Optimization") have yielded insufficient results. This indicates that the field presents promising directions for future research. Therefore, in this study, the discussion will focus on works identified through searches using the terms "AI", "Big Data", and "Smart City" in combination with "Transportation" or "Route Optimization"(Table 2). One of the critical benefits of GeoAI in transportation systems is its capacity for accurate traffic forecasting. Recent studies have highlighted the efficacy of deep learning models that utilize heterogeneous spatiotemporal data for anticipatory traffic management. For example, Shi et al. describe how employing transformer-based graph learning techniques can significantly improve traffic forecasting capabilities, which are vital for urban transportation planning and congestion management (Shi et al., 2024). These systems analyse patterns in traffic data to predict future conditions, thereby enabling proactive traffic control measures and resource allocation.

Jana et al. (2024) developed a Dynamic Traffic Prediction Network (DTPN) that integrates convolutional and recurrent layers to capture spatiotemporal traffic dynamics. This model achieved over 99% precision and F1-score in city-wide congestion prediction. (Jana, 2024) In a similar vein, Ismaeel et al. (2023) proposed a hybrid CNN–RNN model for the classification of urban traffic patterns, which achieved an approximately 95% precision rate in identifying traffic states (Ismaeel, ve diğerleri, 2023). These models are capable of learning complex patterns from sensor networks and historical data, thereby enabling more accurate forecasts of traffic volume and bottlenecks.

5. AI in 3D Building Models and Indoor Navigation

The development of smart cities extends indoors through the implementation of intelligent building management systems and indoor navigation systems. The integration of Building Information Modeling (BIM) with AI is precipitating a paradigm shift in the manner in which building data is represented and utilized. BIM provides rich 3D digital models of buildings, integrating geometry with semantic information.

These models can be exploited by GeoAI algorithms for various purposes. A significant application of this technology is in the domain of indoor navigation and spatial reasoning.

6. Open Data Platforms and Urban GeoAI Analytics

The advent of open data initiatives has become pivotal in facilitating the development and implementation of GeoAI applications for urban analytics. Numerous municipal administrations and communities have disseminated open geospatial datasets, including traffic counts, public transportation data, land use maps, and crowdsourced geographic information, which function as a source of data for AI models. The increasing availability of open data for smarter cities (e.g., through open data portals) has been identified as a catalyst for innovation. Urban analytics with GeoAI frequently entail the integration of heterogeneous data sources to extract insights on city dynamics. For instance, as demonstrated by the integration of geospatial data (e.g., road networks, satellite imagery) with social data (e.g., social media check-ins, demographics) in GeoAI-powered urban computing models, it is possible to infer patterns of human activity. (Mai, 2025) Another notable element pertains to the utilization of open-source tools and the concept of reproducibility in the domain of urban analytics. A significant number of recent studies have made their GeoAI code and data available on platforms such as GitHub, thereby promoting collaboration and fostering trust among researchers.

7. Web-Based Interactive Data Visualization for GeoAI

Beyond dashboards, other interactive GeoAI visualization advances include web map applications that allow users to adjust parameters and observe AI model outcomes in real time (e.g., modifying an ML model's inputs to observe the alterations in predicted traffic congestion or energy usage across a city map). In this context, certain municipalities have initiated the implementation of open GeoAI portals, facilitating the visualization of various data-driven insights, including predicted flood zones, crime risk maps, and transit ridership forecasts. These portals employ AI algorithms to analyse historical data, thereby offering insights into potential future scenarios.

8. Conclusion

This systematic review underlines the transformative role of GeoAI in advancing smart city initiatives across four key domains: intelligent transportation systems, 3D building models and indoor navigation, open-data-driven urban analytics, and web-based interactive visualization. Findings reveal that GeoAI's integration of heterogeneous spatial data with advanced AI techniques enhances predictive accuracy, operational efficiency, and citizen-centric governance. However, the literature still lacks holistic integration across domains, standardized evaluation frameworks, and robust open-data practices. Addressing these gaps through interdisciplinary collaboration, methodological standardization, and active citizen participation will be essential for leveraging GeoAI towards more sustainable, inclusive, and resilient urban futures.

Title	Authors	Year	Method / Focus	Summary of Review
Towards Responsible Urban Geospatial AI: Insights From the White and Grey Literatures	Raveena Marasinghe, Tan Yiğitcanlar, Severine Mayere, Tracy L. Washington, Mark Limb	2024	The article utilizes a multi-method approach focusing on the integration of responsible AI in urban geospatial applications.	There is a gap in the literature regarding the application of responsible AI principles specifically within the geospatial domain which could impede effective integration of AI in urban geospatial applications.
Reviewing the Potential of GeoAI for Post-Earthquake Land Prospection	Ouchlif Ayoub, Hicham Hajji, Hamid Khalifi, Kenza Aitelkadi	2024	The article uses a systematic review method focusing on the potential applications of GeoAI in post-earthquake land prospection.	The effectiveness of GeoAI in post-earthquake land prospection but gaps remain in broader applications and long-term impacts of GeoAI implementations in diverse contexts.
GeoAI for Large-Scale Image Analysis and Machine Vision: Recent Progress of Artificial Intelligence in Geography	Wenwen Li, Chia-Yu Hsu	2022	The method used is a systematic review of GeoAI research focusing on various types of image and structured data for image analysis and machine vision applications.	The advancements in large-scale image analysis and machine vision but identify gaps in knowledge related to the integration of diverse data types and the need for further exploration of applications and methodologies.
Applications of Geospatial AI in Human Geography and Spatial Networks: A Literature Review	Hanaa Saleh, Judith Ratu Tandi Arrang, Luís Cardoso	2025	The article employs a literature review method focusing on the applications of GeoAI in human geography and spatial networks.	The applications of GeoAI in human geography and spatial networks yet gaps remain in comprehensive methodologies and interdisciplinary integration.
Mapping Tomorrow's Cities: GeoAI Strategies for Sustainable Urban Planning and Land Use Optimization	Amina Aidaoui, Assoule Dechaïcha, Djamel Alkama, Ikram Menai, Hana Salah-Salah	2024	The article employs a bibliometric analysis and systematic review to focus on integrating GeoAI technologies and LULC Analytics for urban planning and environmental monitoring.	The integration of GeoAI in urban planning and land use change monitoring reveals significant gaps in methodologies addressing socio-economic disparities and environmental sustainability.
Transforming the Urban Environmental Aesthetics of the Nigerian City through the Introduction of Advanced GeoAI Technologies: Issues and Challenges	Ugochukwu Udonna Okonkwo, Ezekiel Tosin Babatunde, P Onuche, Ellie L. Francis, P. Osazuwa, Olumide Ogungbemi	2025	The article employs a systematic literature review method and focuses on the challenges affecting urban environmental quality in Nigeria's cities.	The challenges in urban environmental quality in Nigeria including limited geospatial data and high adoption costs while gaps in the literature include the need for multidisciplinary approaches and innovative contributions integrating sustainable urban planning with GeoAI technologies.
Geospatial Artificial Intelligence (GeoAI)	Song Gao	2021	The method focuses on developing intelligent computer programs that mimic human perception and spatial reasoning within geographic contexts.	The integration of AI with geospatial analysis and emphasize the need for interdisciplinary collaboration but gaps exist in standardized methodologies and comprehensive evaluations of GeoAI applications across diverse geographical contexts.
Geospatial Artificial Intelligence (GeoAI) in the Integrated Hydrological and Fluvial Systems Modeling: Review of Current Applications and Trends	Carlos Gonzales-Inca, Mikel Calle, Danny Croghan, Ali Torabi Haghighi, Hannu Marttila, Jari Silander, Petteri Alho	2022	The article focuses on reviewing current GeoAI and machine learning applications in hydrological and hydraulic modeling.	The applications in hydrological modeling optimization and water quality highlighting a gap in method comparability due to rapid advancements and diverse techniques.
Utilization of GeoAI Applications in the Health Sector: A Review	Anastasia Amponsah, Philia Christi Latue, Heinrich Rakuasa	2023	The article uses a descriptive qualitative approach and focuses on the utilization of GeoAI applications in the health sector.	The application in health focusing on analyzing disease spread and risk factors but there are gaps in addressing its integration across various sectors and its impact on policy-making.
GeoAI: a review of artificial intelligence approaches for the interpretation of complex geomatics data	Roberto Pierdicca, Marina Paolanti	2022	The article employs a review method focusing on the application of artificial intelligence in geomatics data interpretation.	The integration of AI approaches in geomatics and stress the need for AI methods tailored specifically for geomatics data revealing gaps in the application and innovation of AI in this field.
An overview of GeoAI applications in health and healthcare	Maged N. Kamel Boulos, Guochao Peng, Trang VoPham	2019	The article employs an overview method focusing on GeoAI applications in health and healthcare.	GeoAI integrates AI with GIS and has significant applications in health and healthcare but gaps in the literature include underexplored methodologies and limited interdisciplinary collaboration.
GeoAI in the US Geological Survey for topographic mapping	E. Lynn Usery, Samantha T. Arundel, Ethan Shavers, Lawrence V. Stanislawski, Philip T. Thiem, Dalia E. Varanka	2021	The article focuses on the application of GeoAI for topographic mapping and employs methods related to feature extraction and multiscale processing.	The article provides insights into GeoAI applications for topographic mapping and feature extraction highlighting advancements in spatial data processing but does not address gaps in the literature.

Table 1. An analysis of 12 recent review studies in the field of Geospatial Artificial Intelligence (GeoAI)

Title	Year	DOI	Scope of the Research	Method / Focus	GeoAI Related
Mobility planning for urban employee to workplace: an analysis of bus routes network and stop locations	2023	10.1088/1755-1315/1151/1/012003	The study analyzes bus route networks and stop locations to enhance urban employee mobility planning.	- The method involves analyzing bus routes and stop locations to optimize urban employee commutes to the workplace.	It examines mobility planning and route optimization in urban transportation systems.
The Use of Artificial Intelligence to Optimize the Routing of Vehicles and Reduce Traffic Congestion in Urban Areas	2023	10.4108/ew.4613	AI enhances urban mobility by optimizing vehicle routing to alleviate traffic congestion.	- The method involves utilizing AI techniques for optimizing vehicle routing to reduce urban traffic congestion and enhance transportation efficiency.	It discusses optimizing vehicle routing in urban areas using AI directly linking to GeoAI applications in urban mobility.
AI-powered Strategies for Optimizing Waste Management in Smart Cities in Beijing	2024	10.53469/wjimt.2024.07(05).02	AI-driven route optimization in smart cities reduces waste collection trips by 25% and waste overflow incidents by 30%.	- Integration of AI and IoT technologies for waste management optimization in Beijing.	It discusses the use of AI for optimizing operational efficiency in urban environments specifically in relation to waste management systems.
Smart Fire Safety Management System (SFSMS) Connected with Energy Management for Sustainable Service in Smart Building Infrastructures	2023	10.3390/buildings13123018	The study presents an AI-based smart fire safety management system aimed at enhancing urban integrated management strategies.	- Developed an AI-based smart fire safety system utilizing a city-based fire safety architecture for efficient urban integrated management.	It discusses an AI-based system for urban management which aligns with GeoAI's focus on geographical data integration for urban planning and safety.
Cloud Solutions for Smart Parking and Traffic Control in Smart Cities	2023	10.4018/978-1-6684-9999-3.ch008	Urban mobility benefits from AI and big data through real-time data exchange congestion reduction and optimized infrastructure planning.	- Utilizes AI and machine learning algorithms for predictive analytics and adaptive traffic control.	The article discusses how AI and machine learning improve urban mobility and optimize transportation infrastructure in smart cities which aligns with GeoAI applications.
Traffic Flow Optimization Using AI	2024	10.4018/979-8-3693-8054-3.ch008	AI techniques can significantly enhance traffic flow optimization in smart cities by dynamically adjusting traffic signals and optimizing routing.	- The method involves using AI techniques such as machine learning algorithms and neural networks for real-time traffic flow optimization and dynamic traffic signal adjustments.	The article discusses the use of AI techniques for optimizing traffic flow in urban environments which aligns with GeoAI applications in transportation and urban mobility.
AI-Driven Smart Cities: Improving Urban Infrastructure and Services	2025	10.48175/ijarsct-23304	AI is transforming urban mobility and transportation efficiency in smart cities through optimized route management and resource allocation.	- Case studies analysis of AI applications in urban mobility and infrastructure across various cities.	It discusses how AI enhances urban infrastructure and services which is integral to GeoAI applications in smart cities.
AI Enabled Intelligent Traffic Management and Adaptive Transportation Systems for Congestion Reduction and Efficiency	2025	10.71443/9789349552241-06	AI enhances urban mobility by optimizing route planning and improving traffic flow through intelligent traffic management systems.	- Integration of multimodal transport systems using AI-driven solutions such as predictive analytics and intelligent traffic management.	It discusses AI's role in optimizing urban transportation systems and enhancing route planning.
AI-Based Traffic Congestion Prediction for Smart Cities Using Artificial Neural Network	2025	10.52783/jisem.v10i35s.5934	AI-driven frameworks improve congestion prediction and support route optimization for urban mobility in smart cities.	- Developed and evaluated Artificial Neural Network models using historical and real-time traffic data to predict congestion in smart cities.	It is related because it utilizes AI and data integration to optimize traffic management and enhance urban mobility in smart cities.
Urban Mobility Analysis Using Geospatial Analysis	2024	10.55041/ijsrem28008	Machine learning algorithms optimize transit routes and predict mobility trends aiding urban planners and transportation authorities.	- Utilizes machine learning algorithms for predicting mobility trends and evaluating intervention impacts.	The article is related to GeoAI as it utilizes machine learning and geospatial analysis to optimize transportation and predict mobility trends in urban settings.

Table 2. Smart Transportation System studies in the field of Geospatial Artificial Intelligence (GeoAI)

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