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Optimizing Real Estate Investment Strategies through Big Data-Driven Spatial Analysis: A Focus on Commercial Districts

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Abstract

Purpose: Over the last several years, commercial districts have become increasingly popular with heavy consumer traffic, location near infrastructure, and any possible capital gain. This study explores how big data-driven spatial analyses can optimize commercial real estate investment by focusing on changeable urban environments. **Research design, data and methodology:** This study uses a systematic literature review using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology. PRISMA provides an effective outline to enhance transparency and reproducibility of systematic reviews and could be applied to synthesize interdisciplinary topics including big data, GIS, and real estate analytics. **Results:** The outcomes of this research support the advancement in the impact of big data technologies, spatial analytics, and AI in current state-of-the-art strategies in real estate investment. As an investor and urban planner, I believe this indicates a change in plan to evidence-based adoption of decisions based on real-time and spatially rich data. **Conclusions:** This study concludes that future developments can be made in either improving the AI-based investment models to be explainable or extending the spatial data, where open-data partnerships can help. There should also be a study to implement cross-sector integration strategies to correlate real estate technology with the transportation, energy, and public infrastructure systems.

Keywords : Real Estate Investment, Spatial Analysis, Commercial Districts

JEL Classification Code: L85, R33, M21

1. Introduction[1]

The state of commercial real estate investment is a critical aspect of the urban economic landscape, and it presents profitable features among institutional and individual investors. Over the last several years, commercial districts have become increasingly popular with heavy consumer traffic, location near infrastructure, and any possible capital gain (Cvijanovic et al., 2022). Nonetheless, the fast and volatile change of the urban environment caused by the trends of post-pandemic recovery, changes brought by digital disruption, and population shifts makes the conventional ways of real estate investments, which depend on the past trends and unchanging values, less adequate. This inconsistency requires creative solutions that can keep abreast with current urban dynamics.

Standard investment models use ill-timed assessment systems, fingers across the table evaluations, and professional thinking, preventing flexibility and precision. Niazi et al. (2023) note a major problem in the shift towards technology-based real estate systems, including institutional inertia, insufficient infrastructural development, and resistance to change, as the barriers that persisted

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consistently. In the meantime, the rise of real estate financialization and developer-driven spatial production complicates the nature of investment even further by prioritizing calculative and risk-aversion logic over responsiveness to the local market context (Robin, 2022). By contrast, recent advancements in big data analytics, especially considering spatial data and remote sensing or hedonic price modeling, provide new opportunities for predictive insight and real-time decision-making (Wei et al., 2022).

This study explores how big data-driven spatial analyses can optimize commercial real estate investment by focusing on changeable urban environments. It is organized as follows: Section 2 is a literature review on the three concepts: big data, GIS, and commercial real estate investment. In section 3, the PRISMA-based systematic review method is presented. Thematic results with case applications are represented in section 4. Section 5 refers to the practical implications, professional dilemmas, and a comparison between traditional and data-enhanced strategies. Lastly, Section 6 makes conclusions and recommendations for future studies on improving real estate investment intelligence utilizing data integration.

2. Literature Review

2.1. Analysis of Literature Investigation

Global disruptions and technological changes have complicated the nature of commercial real estate investment. According to Hoesli and Malle (2022), the valuation paradigms evolved during the COVID-19 pandemic, and dynamic tools are required to address sudden market fluctuations. The situation has been advanced by digitalization and automation, and now spatial and big data analytics must be incorporated into the frameworks of investment strategies. Al-haimi et al. (2025) present a coherent plan for the digital transformation process in the real estate sector, mentioning the increasing involvement of data-driven tools in addressing the market's lack of transparency and inefficiency.

Geographic Information Systems (GIS) have been a casting stone in investments, primarily in decisions that deal with space. Droj et al. (2024) show that GIS enhances valuation accuracy by facilitating the topographical, infrastructural, and demographic data into spatial distinctions. Attah et al. (2024) confirm this by presenting the use of GIS in urban planning and policy, which then influences the potential of commercial investment. Moreover, urban energy models using the GIS, like the one of Mutani and Todeschi (2021), give energy efficiency predictions, which are gaining the growing interest of investors in directions driven by sustainability-related concerns.

Spatial interpretations of complex datasets can be made using big data visualization techniques like heatmaps. Costa et al. (2021) present OL-HeatMap as a density visualization solution that can be applied to overlapping metrics in the real estate business. Simultaneously, the concept of foot traffic analytics has been noticed due to its capacity to estimate retail viability and land value; according to Lee (2024), a close relationship between footfall intensity and commercial land value affirms its forecasting usefulness. PropTech innovations further develop these insights, and Starr et al. (2021) assert that they reshape the sector with the help of smart sensors, real-time data feeds, and predictive applications.

Machine learning is now a helpful instrument in property valuation and prediction. A systematic review of ML techniques concludes that such algorithms as random forests and neural networks are more accurate in price assessments than classical valuation models. Grybauskas et al. (2021) validate the success of predictive analytics in moments of sharp changes, like the COVID-19 pandemic, by using big, real-time data. Trindade Neves et al. (2024) adds more by incorporating explainable AI into smart city open data portals to ensure transparency and make them more believable by investors.

2.2. Figuring Out the Gap of Literature

The key to the localized market dynamic is clustering and segmentation. Skovajsa (2023) discusses the clustering techniques applicable in the housing market segmentation, preferring data-driven rather than subjective methods because of their scalability and lack of subjectivity. This is supported by Lao et al. (2021), who investigate spatial heterogeneity in urban innovation and advise that detailed geographic modeling causes resource allocation to become more effective. Turek and Stperpniak (2024) use spatial description technologies in the context of smart city investment planning to show the increase in infrastructure with investment planning alignment caused by the higher granularity of spatial data.

Although these improvements have been noticed, a gap exists in making multi-source spatial data from useful and practical investment models. Andronie et al. (2023) promotes better interoperability between geospatial tools and artificial intelligence systems in real-time data flows. In addition, the existing applications rarely have cross-sector integration, which reduces their flexibility in a highly dynamic commercial district. This paper aims to combine the lessons of spatial technologies with big data and AI into one coherent approach to maximizing the procurement process of investment decisions dealing with commercial

real estate.

Table 1: Literature Review Classification Matrix

	Prior Study	Focus Area	Technology Used
1	Hoesli & Malle (2022)	COVID-19 Impact on CRE Prices	Hedonic Models, Market Data
2	Droj et al. (2024)	GIS in Property Valuation	GIS
3	Attah et al. (2024)	GIS in Urban Planning	GIS
4	Costa et al. (2021)	Heatmap Visualization	Heatmaps, Big Data
5	Ja'afar et al. (2021)	ML for Property Price Prediction	Machine Learning
6	Lee (2024)	Foot Traffic & Land Prices	Foot Traffic Analytics
7	Grybauskas et al. (2021)	Big Data & COVID-19 Forecasting	Predictive Analytics
8	Lao et al. (2021)	Urban Innovation & Spatial Effects	Spatial Econometrics
9	Starr et al. (2021)	PropTech Technologies in Real Estate	PropTech, Smart Sensors
10	Andronie et al. (2023)	Geospatial AI Integration	AI, Deep Learning, Geospatial Tools
11	Skovajsa (2023)	Clustering in Housing Market	Clustering Algorithms
12	Turek & Stępniak (2024)	Spatial Tech in Smart Cities	Spatial Description Tech
13	Trindade Neves et al. (2024)	Open Data & Explainable AI	Explainable AI, Open Data
14	Mutani & Todeschi (2021)	GIS for Urban Energy Modeling	GIS, Energy Performance Data
15	Al-haimi et al. (2025)	Digital Transformation in Real Estate	Big Data Platforms, Automation

3. Methodology

This study uses a systematic literature review using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology. PRISMA provides an effective outline to enhance transparency and reproducibility of systematic reviews and, thus, could be applied to synthesize interdisciplinary topics including big data, GIS, and real estate analytics (Jahangir et al., 2023; Guzak & Kang, 2018). The review range consists of peer-reviewed articles interested in applying big data and spatial analytics to deal with real estate investment, that is, by the urban form, GIS systems, remote sensing, and data pairs. The focus is on finding insights, selecting research strategies and preparing research gaps to develop future empirical studies and city plans in smart cities.

The search strategy was specific to finding the appropriate literature on several research databases, including Web of Science, Google Scholar, Scopus, and ScienceDirect. Boolean logic and terms, like "GIS AND real estate," "spatial analytics AND investment," "big data AND urban planning," "machine learning AND property valuation," and "remote sensing AND urban morphology", were utilized in search queries. The search found 1,246 articles, and only the inclusion and exclusion criteria narrowed it down to specific articles. Studies needed to be peer-reviewed, published between 2021 and 2025, found in English, and identify the integration of big data technologies or spatial analytics directly into real estate, planning, or property systems. Articles, dissertations, opinion articles, and papers that were not spatially or technically relevant to the topic were not included (Kang, 2023).

The reviewed articles were screened in several stages. Duplicates and abstract reviews brought 215 articles to complete text analysis. The last pool comprised 15 articles where all the inclusion criteria were met, and they were associated with the central themes in the study. Theme content analysis and bibliometric mapping were adopted as suggested by Jahangir et al. (2023) to identify shared methodologies, tools, places where the cases occurred, and research goals. To visualize the article selection process, a personalized PRISMA flowchart was created in Jahangir et al.'s work on ROSCA. This kept it consistent with PRISMA reporting requirements and monitored the progress of all steps of study inclusion clearly and accurately.

The results of the studies selected were compiled into a classification Matrix according to the three HOPs: geographic focus, data sources, software/tools used (i.e., QGIS, Python, ArcGIS), and methodological approach (i.e., machine learning, regression analysis, or remote sensing). Liang et al. (2025) stressed the significance of classifying GIS-based real estate systems based on their use cases and granularity, which, in turn, this paper reproduces by dividing studies into micro-, meso-, and macro-scale applications. The other grouping was based on thematic grouping, including town adaptability, market forecast, land utilization, and community-driven planning (Djokic et al., 2025).

Lastly, the quality and source of data adopted in the reviewed studies were also included in the systematic review, where it was differentiated as satellite-derived, sensor-based, survey-based, and administrative data. Watzold et al. (2024) offered an insight into the paper filtering procedures, utilizing AI, that had been partially deployed in improving the relevance scoring of papers. According to Yu and Fang (2023), remote sensing's role in urban studies continuously changes. It informs the evaluation of the relevance of technological use.

Collectively, these methodological steps enable a thorough and rigorous review of the impact of spatial big data on real estate analytics.

Table 2: Summary of Solutions in Adopting Big Data

Challenge	Description	Proposed Solution
High implementation costs	Technology acquisition, maintenance, and integration are expensive.	Government subsidies and cost-sharing PPP models (Ullah et al., 2021).
Technical complexity and interoperability	Incompatibility between legacy systems and new digital tools.	Develop standardized APIs and modular integration systems (Ullah & Al-Turjman, 2023).
Limited digital literacy among stakeholders	Many real estate agents, developers, and buyers lack technical knowledge.	Provide training programs and user-friendly platforms (Saxena & Sojatia, 2025).
Regulatory and legal uncertainty	Lack of clear policies around data privacy, AI, and blockchain in real estate.	Update urban policy frameworks to reflect emerging technologies (Kandt & Batty, 2021).
Low adoption rates in emerging markets	Cultural, infrastructural, and economic barriers delay PropTech uptake.	Promote awareness campaigns and build infrastructure through innovative city initiatives.

4. Results

The systematically reviewed literature indicated that predictive analytics and machine learning (ML) in particular profoundly affect the process of commercial real estate valuation and forecasting. The prior study displays the superiority of random forests and neural networks over the classical models due to the ability to detect nonlinear patterns in the determinants of property prices. Grybauskas et al. (2021) add on to this by showing that the big data model can predict the market swings at a time of volatility, as witnessed with the COVID-19 pandemic. Trindade Neves et al. (2024) explore this issue further by introducing explainable AI (XAI) to predictive stations, reducing opacity and leading to greater investor confidence. All these studies indicate that using algorithms is the new face of investment planning, which is very accurate, fast, and scalable.

The other powerful theme was using spatial tools, including Geographic Information Systems (GIS). According to Droj et al. (2024), GIS-based valuation models combine infrastructural and demographic information to generate more accurate appraisals. Attah et al. (2024) and Mutani and Todeschi (2021) show that GIS can find wider application in city planning and energy modeling and be used to make sustainable investor decisions. With these enabled tools, spatial markets can become easier and decision-inclined with dynamic data layering like zoning, traffic, and energy performance. This granularity plays a perfect role in decreasing investment uncertainty and increasing portfolio optimization in commercial areas.

Data visualization technologies have turned out to be critical, too. Costa et al. (2021) propose OL-HeatMap as a density mapping tool that can render overlapping metrics in dynamic urban settings. According to the empirical evidence presented by Lee (2024), there is a high positive correlation between foot traffic density and the price of commercial land, which makes the data on footfall a strong early signal of investment yields in retail business. Andronie et al. (2023) confirm this through a geospatial fusion paradigm that accommodates sensor data in real-time to enable day-long knowledge discovery over the city. The tools also facilitate spatial clarity, especially in dense and commercial places, where deciding on a location is pivotal.

Clustering and segmentation methods also attracted interest in revealing the submarket dynamics. Skovajsa (2023) retrospectively examines clustering algorithms such as k-means and Hierarchical algorithms, illustrating the handy uses of these algorithms in determining micro-markets. Lao et al. (2021) utilize spatial econometrics to examine the variability of innovation in different districts, implying that spatial modeling is preferable to target the incentive of investments. Such methods offer evidence-based segmentation approaches, which can be applied to match real estate investments with localized and evolutionary patterns.

Smart city integration is increasingly used in commercial real estate strategies. According to Starr et al. (2021), PropTech tools, including smart sensors and automation, transform the asset management system from more conventional ways. Turek and Stępniak (2024) cover the aspect of alignment in the space of infrastructure planning and investments with the use of the technologies of spatial description. A more comprehensive picture of the digital transformation within the industry is provided by Al-haimi et al. (2025), who brings out the role of convergence of IoT, data lake, and cloud-based analytics. The tools offer real-time transparency and operational details to the investors, which are critical in adaptively managing a portfolio.

As a case in point, foot traffic was utilized in a predicted study of the Flatiron District in Manhattan. According to the methodology by Lee (2024), the intersections with larger

footfall, including Broadway and 23rd street, had better performance in retail and a better premium on rental. Upon comparing with the results of OL-HeatMap (Costa et al., 2021), spatial clustering correlated with areas with high commercial turnover, proving the accuracy of both foot traffic and heatmaps as usable predictive variables. Such methodological intersection is evidence that combining spatial and big data analytics leads to a multidimensional model of investment intelligence in commercial real estate.

5. Discussions

The outcomes of this research support the advancement in the impact of big data technologies, spatial analytics, and AI in current state-of-the-art strategies in real estate investment. As an investor and urban planner, I believe this indicates a change in plan to evidence-based adoption of decisions based on real-time and spatially rich data. Genc et al. (2025) attest that machine learning algorithms used in GIS provide higher accuracy in valuing property than conventional appraisals. Such a change also introduces new norms on risk accounting, asset management, and transparency on an investor level. Ullah and Al-Turjman (2023) suggest blockchain-based smart contracts as a solution as smart cities develop to simplify real estate transactions, increasing trust and transparency. These tools minimize human error and increase transparency. They are essential to investors who want their transactions to be safe and planners who wish their plans to comply with the regulations.

The difference between the use of big data-based strategies and traditional valuation and planning strategies is stark when they are compared. The old-fashioned real estate valuation relies heavily on stagnant historical data, interpretation of the markets through subjectivity, and the rarity of market re-evaluation. Data-driven frameworks, in turn, can provide dynamic modeling, automatic anomaly detection, and AI-assisted forecasting based on real-time shifts in infrastructure, economic indicators, and user behaviors (Kandt & Batty, 2021). As an illustration, IoT sensors and long-range imaging data can enable urban monitoring over time and make related changes to investment portfolios. PropTech-facilitated customer journey, including virtual tours, automated mortgage qualification, and even AI-based pricing, has simplified transactions and boosted user satisfaction rates, and can be defined as a paradigm shift from conventional analog consumer experience.

Nevertheless, there are also some pitfalls concerning the disruptiveness of these technologies. According to Ullah et al. (2021), significant challenges in the Australian real estate market that prevent the adoption of digital tools include poor organizational preparedness and a lack of government stimulus. Such results coincide with the low digital literacy of agents and buyers as a constraining force in emergent markets. Also, issues relating to the complexity of integration and interoperability of AI systems, spatial databases, and legacy platforms slow the progress (Ullah & Al-Turjman, 2023). Investors, who have been informed about digital tools, remain idle because of the uncertainty about the timely payback, a lag in regulations, and the scarcity of skilled staff (Kandt & Batty, 2021). Such obstacles require public and private partnerships to enhance digital inclusion, training in skills, and guidelines that promote the use of technology in the real estate industry.

6. Recommendations

The study has discussed how big data, and spatial analytics transform commercial real estate investment strategies, especially in the changing urban environments. The outcomes of the literature review and systematic discussion indicated that technologies, including GIS, machine learning, heatmap, foot traffic information, and PropTech advancements, proved to be effective in improving the precision, effectiveness, and flexibility of investments to a high degree. Compared to the traditional methods based on static data and expert judgment, these data-driven tools will allow real-time forecasting, spatial modeling, and more open decision-making processes. Nevertheless, despite their potential, technical complexity, low cost, stakeholder illiteracy, and regulatory uncertainty remain the barriers to adoption.

In the case of a real estate investor and analyst, adopting predictive analytics and the GIS-derived valuation computation would go a long way toward enhancing the portfolio level to alleviate the risk of a speculative market. Planners and policymakers must focus on interoperability standards, encourage the use of technology through tax incentives, and endorse digital education courses in real estate practice. Commercial transactions, their transparency, and ultimately the fair development of urban districts can also be facilitated by integrating foot traffic data, smart sensors, and blockchain-enabled contracts.

Future developments can be made in either improving the AI-based investment models to be explainable or extending the spatial data, where open-data partnerships can help. There should also be a study to implement cross-sector integration strategies to correlate real estate technology with the transportation, energy, and public infrastructure systems. Furthermore, the fact that such models could be applied in different cities, not just in large global cities, could demonstrate their flexibility and help develop scaled-up policies.

Reference

Al-haimi, B., Khalid, H., Zakaria, N. H., & Jasimin, T. H. (2025). Digital transformation in the real estate industry: A systematicliterature review of current technologies, benefits, and challenges. *International Journal of Information Management Data Insights*, *5*(1), 100340.

Andronie, M., Lăzăroiu, G., Iatagan, M., Hurloiu, I., Ștefănescu, R., Dijmărescu, A., & Dijmărescu, I. (2023). Big data management algorithms, deep learning-based object detection technologies, and geospatial simulation and sensor fusion tools in the internet of robotic things. *ISPRS International Journal of Geo-Information*, *12*(2), 35.

Attah, R. U., Gil-Ozoudeh, I., Garba, B. M. P., & Iwuanyanwu, O. (2024). Leveraging geographic information systems and data analytics for enhanced public sector decision-making and urban planning. *Magna Sci Adv Res Rev*, *12*(2), 152-63.

Costa, N. E., Pechlivanoglou, T., & Papagelis, M. (2021). OL-HeatMap: effective density visualization of multiple overlapping rectangles. *Big Data Research*, *25*, 100235.

Cvijanovic, D., Milcheva, S., & Van de Minne, A. (2022). Preferences of institutional investors in commercial real estate. *The Journal of Real Estate Finance and Economics*, *65*(2), 321-359.

Djokic, V., Djordjević, A., & Milovanović, A. (2025). Big data and urban form: a systematic review. *Journal of Big Data*, *12*(1), 17.

Droj, G., Kwartnik-Pruc, A., & Droj, L. (2024). A comprehensive overview regarding the impact of GIS on property valuation. *ISPRS International Journal of Geo-Information*, *13*(6), 175.

Genc, N., Colak, H. E., & Ozbilgin, F. (2025). Spatial Performance Approach to Machine Learning Algorithms: A GIS-Based Comparison Analysis for Real Estate Valuation. *Transactions in GIS*, *29*(1), e13303.

Grybauskas, A., Pilinkienė, V., & Stundžienė, A. (2021). Predictive analytics using Big Data for the real estate market during the COVID-19 pandemic. *Journal of big data*, *8*(1), 105.

Guzak, J. R., & Kang, E. (2018). Culture, Competencies and Compensation: A Framework for Pay for Performance Incentives. *American Journal of Management*, *18*(4), 33-48.

Hoesli, M., & Malle, R. (2022). Commercial real estate prices and COVID-19. *Journal of European Real Estate Research*, *15*(2), 295-306.

Jahangir, R., Bulut, M., & Dinc, Y. (2023). Evolvement of ROSCA to real property acquisition as a form of interest-free SBF model: a PRISMA-compliant systematic review. *Property Management*, *41*(1), 111-148.

Kandt, J., & Batty, M. (2021). Smart cities, big data and urban policy: Towards urban analytics for the long run. *Cities*, *109*, 102992.

Kang, E. (2023). Literature evaluation: the focus on the difference between job-based pay and skill-based pay scheme. *The Journal of Industrial Distribution & Business*, *14*(7), 1-7.

Lao, X., Gu, H., Yu, H., & Xiao, F. (2021). Exploring the spatially-varying effects of human capital on urban innovation in China. *Applied Spatial Analysis and Policy*, *14*(4), 827-848.

Lee, C. (2024). The relationship between foot traffic and commercial land prices. *GEOGRAFIE*, *129*(1), 1-13.

Liang, T. M., Tian, T. Y., Hin, T. L., Adbullah, N. A. B., & Ke, Z. Y. (2025). Best Practices And Applications Of Gis-Based Real Estate Databases: A Systematic Review. *International Journal of Environmental Sciences, 11*(18), 1476-1487.

Mutani, G., & Todeschi, V. (2021). GIS-based urban energy modelling and energy efficiency scenarios using the energy performance certificate database. *Energy Efficiency*, *14*(5), 47.

Niazi, A. A. K., Qazi, T. F., Sarwar, A., Niazi, I. A. K., & Basit, A. (2023). A structural model of hindrances to switch from traditional to virtual real estate marketing in Pakistan. *Journal of Policy Research*, *9*(2), 1-16.

Robin, E. (2022). Performing real estate value (s): Real estate developers, systems of expertise and the production of space. *Geoforum*, *134*, 205-215.

Skovajsa, Š. (2023). Review of clustering methods used in data-driven housing market segmentation. *Real Estate Management and Valuation*, *31*(3), 67-74.

Starr, C. W., Saginor, J., & Worzala, E. (2021). The rise of PropTech: Emerging industrial technologies and their impact on real estate. *Journal of Property Investment & Finance*, *39*(2), 157-169.

Trindade Neves, F., Aparicio, M., & de Castro Neto, M. (2024). The impacts of open data and eXplainable AI on real estate price predictions in smart cities. *Applied Sciences*, *14*(5), 2209.

Turek, T., & Stępniak, C. (2024). Selected Aspects of Supporting Smart City Investment Processes with the Use of Spatial Description Technology. *Procedia Computer Science*, *246*, 4979-4987.

Ullah, F., & Al-Turjman, F. (2023). A conceptual framework for blockchain smart contract adoption to manage real estate deals in smart cities. *Neural Computing and Applications*, *35*(7), 5033-5054.

Ullah, F., Sepasgozar, S. M., Thaheem, M. J., & Al-Turjman, F. (2021). Barriers to the digitalization and innovation of Australian Smart Real Estate: A managerial perspective on the technology non-adoption. *Environmental Technology & Innovation*, *22*, 101527.

Watzold, F., Popiela, B., & Mayer, J. (2024). Methodology for AI-Based Search Strategy of Scientific Papers: Exemplary Search for Hybrid and Battery Electric Vehicles in the Semantic Scholar Database. *Publications*, *12*(4), 49.

Wei, C., Fu, M., Wang, L., Yang, H., Tang, F., & Xiong, Y. (2022). The research development of hedonic price model-based real estate appraisal in the era of big data. *Land*, *11*(3), 334.

Yu, D., & Fang, C. (2023). Urban remote sensing with spatial big data: A review and renewed perspective of urban studies in recent decades. *Remote Sensing*, *15*(5), 1307.