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A Study of Global and Nepalese Perspectives

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The Role of Artificial Intelligence in Property Valuation: A Study of Global and Nepalese Perspectives

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Abstract

Property valuation plays a crucial role in real estate markets, impacting decisions related to mortgage lending, taxation, and urban planning. Traditional property valuation methods, including the sales comparison and cost approach, have long been criticized for their reliance on expert judgment, leading to subjective and inconsistent results. The emergence of Artificial Intelligence (AI) has introduced transformative technologies, particularly Automated Valuation Models (AVMs), which leverage machine learning to process large datasets and identify patterns that are often overlooked by traditional methods. This report aims to examine the role of AI in property valuation, focusing on its potential to improve accuracy, efficiency, and consistency globally, with a particular emphasis on its applicability in Nepal. The primary objective is to evaluate how AI-driven systems can address the challenges of property valuation, such as data limitations, market volatility, and regional inconsistencies, especially in rapidly urbanizing markets like Nepal. The study adopts a qualitative research approach, reviewing secondary data from global studies and AI-focused literature, while comparing AI-based valuation systems to traditional methods. The findings indicate that AI offers significant benefits, including more accurate property assessments, faster processing times, and the ability to integrate complex datasets. However, its implementation in Nepal is hindered by challenges such as incomplete digital land records, informal market transactions, and the lack of standardized data. The report discusses the potential of AI to enhance valuation practices in Nepal, particularly in improving transparency, reducing bias, and supporting decision-making in urban planning and finance. Despite its promise, the adoption of AI in Nepal requires addressing infrastructural and institutional challenges, including improving data quality, digitization efforts, and building technical expertise. In conclusion, while AI has the potential to revolutionize property valuation globally, its successful integration into

Nepal's real estate sector depends on overcoming data gaps, regulatory concerns, and enhancing institutional capacity to support its use.

***Keywords*:** Artificial Intelligence (AI), Property Valuation, Automated Valuation Models (AVMs), Real Estate Technology, Nepal

1. Introduction

1.1 Background and Literature Review

Property valuation is a fundamental component of real estate markets, influencing mortgage lending, investment decision-making, taxation, land administration, and urban planning. Traditionally, property valuation has relied on approaches such as the sales comparison method, income capitalization, and cost approach, all of which depend heavily on expert judgment and historical comparables. While these methods have been widely accepted, they are often criticized for subjectivity, inconsistency, and limited ability to process large and complex datasets (Pagourtzi et al., 2003). With increasing urbanization, market volatility, and data availability, conventional valuation techniques are increasingly challenged to deliver timely, accurate, and consistent property value estimates.

In recent years, Artificial Intelligence (AI) has emerged as a transformative technology in real estate appraisal. AI-driven valuation models, commonly referred to as Automated Valuation Models (AVMs), apply machine learning algorithms to analyze large volumes of structured and unstructured data, including property characteristics, transaction history, spatial attributes, and market trends. These models are capable of identifying nonlinear relationships and hidden patterns that are difficult to capture through traditional statistical techniques (McCluskey et al., 2013). Studies indicate that AI-based valuation systems significantly improve predictive accuracy, operational efficiency, and consistency, particularly in mass appraisal and mortgage risk assessment (Toprakli, 2024). As a result, AI is increasingly viewed as a complementary tool that enhances, rather than replaces, professional valuation practice.

The evolution of AI in property valuation parallels advancements in data science, computational power, and digital land information systems. Early valuation models relied on simple regression techniques; however, modern AI applications incorporate advanced

machine learning methods such as neural networks, ensemble learning, and explainable AI frameworks. These approaches allow valuation systems to adapt dynamically to market changes while reducing human bias (Toprakli, 2024). Nevertheless, concerns related to data quality, algorithmic transparency, and ethical use of AI remain central topics in the literature, highlighting the need for regulatory oversight and human supervision in appraisal processes.

In the context of Nepal, property valuation remains largely informal and fragmented, often influenced by negotiation, local practices, and inconsistent benchmarks. Despite rapid urban expansion in cities such as Kathmandu, Pokhara, and Bharatpur, standardized valuation frameworks and comprehensive transaction databases are limited. This creates challenges for financial institutions, land administration authorities, and urban planners in ensuring fair and transparent valuation. The adoption of AI-driven valuation systems in Nepal presents significant potential to improve consistency, reduce subjectivity, and support data-driven decision-making, particularly in banking, taxation, and land management. However, constraints such as limited digitized land records, incomplete market data, and lack of technical capacity pose barriers to immediate implementation. Understanding global developments in AI-based valuation is therefore essential for assessing its applicability and future integration within Nepal's evolving real estate sector.

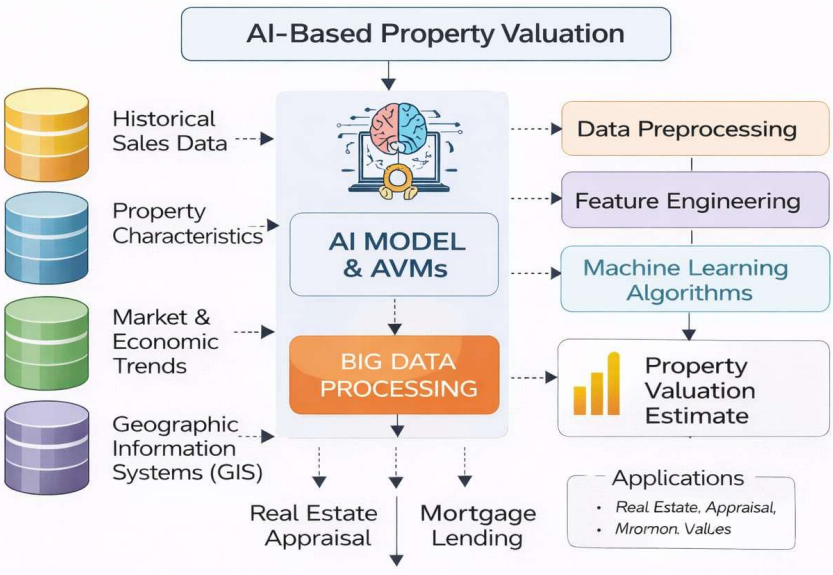

Figure 1: Conceptual framework of AI-based property valuation

1.2. Objectives

1.2.1 Primary objective:

- To examine the role of Artificial Intelligence in property valuation and evaluate its potential to improve the accuracy, efficiency, and consistency of real estate appraisal, with particular reference to the Nepalese context.

1.2.2 Secondary Objectives

- To review existing literature on AI-based property valuation and automated valuation models.
- To identify the advantages and limitations of AI-driven valuation systems compared to traditional appraisal methods.
- To assess the applicability of AI-driven valuation approaches within Nepal's current real estate market and data environment.

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2. Methods and Materials

This study employs a qualitative research approach based on a systematic review of secondary data to examine the application of Artificial Intelligence in property valuation. Relevant literature was collected from peer-reviewed journals, conference papers, and authoritative publications focusing on AI-driven valuation models, automated valuation systems, and real estate appraisal.

The primary reference for this study is the article *"AI-driven valuation: a new era for real estate appraisal"* published in the *Journal of European Real Estate Research*. Additional sources were obtained from academic databases such as Emerald Insight, ScienceDirect, MDPI, and Google Scholar. The selected literature was analyzed to identify key AI techniques used in property valuation and to compare AI-based approaches with traditional valuation methods in terms of accuracy, efficiency, and transparency.

Furthermore, the findings from global studies were interpreted in the context of Nepal's real estate market, considering existing valuation practices, data availability, and institutional constraints to assess the applicability of AI-driven valuation systems in emerging market conditions.

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3. Results and Findings

The study demonstrates that artificial intelligence (AI) has a significant impact on property valuation, both internationally and in the Nepalese context. Key findings are summarized below:

1. Accuracy and Standardization

- Globally, AI-driven valuation models are capable of analyzing large datasets containing property attributes, locational factors, historical transaction prices, and market trends. They identify complex patterns often overlooked in traditional appraisal methods, leading to more objective and consistent outcomes.
- In Nepal, these models can help reduce variability caused by subjective judgments and regional inconsistencies, contributing to more standardized valuations across the country.

2. Efficiency

- Internationally, AI-based automated valuation models (AVMs) are widely used in mortgage lending, taxation, and real estate portfolio management, reducing the time and cost of property appraisals.
- In Nepal, where manual valuations are often time-consuming and differ between regions, AI can streamline procedures and improve operational efficiency for both public agencies and private valuation firms.

3. Limitations

- Worldwide, AI systems depend on the availability of high-quality, structured data. Limited or unrepresentative datasets can reduce accuracy and lead to algorithmic bias.
- In Nepal, challenges include incomplete digitization of land records, informal market transactions, and regional inconsistencies in property documentation. These factors limit predictive accuracy and the reliability of AI models.
- Additionally, the complexity of some machine-learning algorithms raises concerns about transparency and interpretability, which are critical for professional and regulatory acceptance.

4. Emerging Opportunities

- Globally, integration of AI with geographic information systems (GIS), digital mapping, and big data analytics is enhancing property valuation practices.
- In Nepal, ongoing digitization initiatives, growing GIS adoption, and expanding access to digital financial services create a supportive environment for implementing AI-driven valuation tools. Such technologies could enhance evidence-based decision-making, improve fairness in property taxation, and strengthen credit risk assessment in the real estate sector.

AI-driven property valuation is proving effective worldwide, improving accuracy, efficiency, and standardization. In Nepal, its adoption shows strong potential, but successful implementation depends on reliable data, professional oversight, and institutional readiness.

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4. Discussion

The results of this study indicate that artificial intelligence (AI) has the potential to transform property valuation practices worldwide, including in Nepal. Internationally, AI-driven valuation models are increasingly used in countries with advanced real estate markets to improve accuracy, efficiency, and consistency. These models analyze large datasets, including property attributes, locational factors, historical transaction prices, and market dynamics, allowing them to detect complex patterns that traditional appraisal methods often miss. By reducing reliance on human judgment, AI contributes to standardized, objective valuation outcomes, which has been shown to enhance fairness and efficiency in property taxation, mortgage lending, and portfolio management.

In the Nepalese context, AI adoption shows similar promise but faces unique challenges. Traditional valuation practices in Nepal are often time-consuming and inconsistent across regions, and informal transactions can influence appraisal outcomes. AI-driven models have the potential to address these issues by providing rapid, data-driven valuation estimates and reducing subjectivity. However, the effectiveness of these systems depends on the availability of reliable and standardized property data. Incomplete digitization of land records, informal market transactions, and regional inconsistencies in documentation can limit predictive accuracy. Additionally, some advanced machine-learning algorithms are complex and opaque, raising concerns regarding transparency and interpretability, which are essential for professional acceptance and regulatory compliance.

Despite these challenges, ongoing technological and institutional developments in Nepal provide opportunities for AI integration. Initiatives in land administration digitization, wider adoption of geographic information systems (GIS), and the expansion of digital financial services create a supportive environment for AI-driven valuation tools. If properly implemented, AI can facilitate evidence-based decision-making in urban planning, enhance fairness in property taxation, and improve credit risk assessment in real estate finance.

A SWOT analysis provides a structured summary of AI-driven property valuation in the Nepalese context, highlighting its strengths, weaknesses, opportunities, and threats:

	Strengths(S)	**Weaknesses (W)**
SWOT Analysis	**S1** Improved accuracy and consistency through data-driven valuation models **S2** Faster valuation process compared to traditional methods **S3** Reduced subjectivity and human bias in property appraisal **S4** Ability to integrate GIS and spatial analytics	**W1** Incomplete and non-standardized land and transaction data **W2** High dependence on data quality and availability **W3** Limited transparency and interpretability of complex AI models **W4** Shortage of skilled professionals in AI and advanced valuation techniques
Opportunities (O) **O1** Ongoing digitization of land administration systems **O2** Increasing use of GIS and geospatial technologies **O3** Rapid urbanization and growth of real estate markets **O4** Expansion of digital financial services and mortgage markets	**SO** **SO1:** Integrate AI models with digitized land records and GIS platforms to improve valuation accuracy and spatial analysis (S1, S4 + O1, O2). **SO2:** Deploy AI-driven valuation tools to support urban planning and large-scale real estate development projects (S2, S3 + O3). **SO3:** Use standardized AI valuations to strengthen mortgage lending and credit risk assessment in the financial sector (S1, S2 + O4).	**WO** **WO1:** Improve data quality and availability through land record digitization and standardized data collection frameworks (W1, W2 + O1). **WO2:** Build institutional capacity by promoting AI and GIS training programs aligned with urban and real estate sector growth (W4 + O2, O3). **WO3:** Combine AI valuation outputs with expert oversight to enhance transparency and professional acceptance (W3 + O4).
Threats (T) **T1** Regulatory uncertainty regarding AI use in valuation **T2** Resistance from traditional valuation professionals **T3** Data privacy and cyber security concerns **T4** Risk of algorithmic bias due to poor-quality or incomplete data	**ST** **ST1:** Use objective, data-driven valuation outputs to support regulatory compliance and policy formulation (S1, S3 + T1). **ST2:** Demonstrate efficiency and consistency benefits of AI to encourage adoption among traditional valuers (S2 + T2). **ST3:** Apply robust data governance and secure digital infrastructure to protect valuation datasets (S4 + T3).	**WT** **WT1:** Develop clear regulatory guidelines and ethical frameworks for AI-based valuation to address transparency and bias concerns (W3 + T1, T4). **WT2:** Implement hybrid valuation approaches combining AI models with professional judgment during early adoption stages (W1, W3 + T2).

Overall, the discussion highlights that while AI-driven property valuation is not yet fully mature in the Nepalese context, its potential benefits are substantial. The findings suggest that AI can significantly improve valuation accuracy, efficiency, and consistency when supported by reliable data, institutional readiness, and professional oversight. The SWOT analysis further demonstrates that Nepal is at a transitional stage, where emerging opportunities such as land record digitization and GIS adoption can be strategically leveraged to overcome existing weaknesses and threats. Therefore, AI should be viewed as a complementary tool rather than a replacement for traditional valuation practices, supporting more transparent, evidence-based, and equitable property valuation systems. These insights provide a foundation for concluding remarks and recommendations for future implementation.

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5. Conclusion

This study examined the role of artificial intelligence (AI) in property valuation and its relevance to the Nepalese context. The findings indicate that AI-driven valuation models can improve accuracy, efficiency, and consistency compared to traditional appraisal methods. In Nepal, AI has the potential to reduce subjectivity and regional inconsistencies, although challenges related to data availability, digitization, and technical capacity remain. Therefore, AI should be adopted as a complementary tool supported by professional oversight and regulatory frameworks. With continued improvements in land record digitization and GIS adoption, AI-based valuation systems can contribute to more transparent and evidence-based property valuation in Nepal.

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6. Recommendations and Future Scope

Based on the findings of this study, several recommendations can be made for the effective adoption of AI-driven property valuation in Nepal. Priority should be given to the digitization and standardization of land records and property transaction data to improve model accuracy and reliability. Capacity-building programs focusing on AI, GIS, and data analytics should be promoted for valuation professionals and relevant

institutions. Clear regulatory guidelines and ethical frameworks are also necessary to ensure transparency, accountability, and data security in AI-based valuation systems.

For future research, empirical studies using real property transaction data from Nepal are recommended to test and validate AI-based valuation models. Further investigation into explainable AI techniques and hybrid valuation approaches combining AI with professional judgment would also enhance practical applicability and professional acceptance.

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