

A Review of the Application of Artificial Intelligence Technology in the Evaluation and Processing of Real Estate

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Abstract: In the case of the full development of China's real estate market until saturation, problems such as the increase in the number of houses and the difficulty in targeted treatment of houses have emerged. The rapid development of AI technology provides an answer to this problem. In order to fully explore the possible role and impact of artificial intelligence technology on current problems, this paper selects a number of papers related to artificial intelligence and real estate at home and abroad, and analyzes the substantive impact of artificial intelligence on different aspects. The final conclusion shows that artificial intelligence, as a rapidly developing and increasingly mature tool, plays an important role in the targeted valuation of different types of houses, life cycle and remaining life assessment, structural safety assessment, repair and renovation recommendations, etc.

Keywords: Real Estate; Artificial Intelligence; Development Trends

1. Introduction

China's housing market is characterized by a large base and a variety of housing types. In recent years, with the high-quality development of China's economy, the housing market has also fully developed, and the number and types of housing have increased significantly, reaching a saturation period of development.

In China, when the existing housing level has reached a saturation dynamic equilibrium, there are a large number of aging or idle houses. In this case, there is a great need and significance for the evaluation and determination of the current situation of housing. In order to meet this demand, practical technologies such as artificial intelligence, which have advanced in recent years, have become important tools to overcome the problems caused by the large number and variety of vacant houses, which are difficult to evaluate and dispose of.

The selected articles in this paper are from domestic journals such as *China Management Science* and foreign journals such as *Journal of Property Tax Assessment & Administration*, and summarize and analyze in detail the potential of current AI technology for the evaluation and renovation of old houses.

1.1 The Status Quo of China's Housing Real Estate

Since the reform and opening up, China's housing construction has made rapid progress. Correspondingly, the real estate market has grown rapidly over the past three decades or so[1]. More than 30 billion square meters of housing have been built in urban and rural areas across the country, the housing area of urban and rural residents has increased substantially, and the per capita residential floor area has increased by four times, reaching the living standard of moderately developed countries. According to the statistics of the Ministry of Land, in 2007, the actual floor area of houses in villages and towns across the country exceeded 32.34 billion square meters, of which 27.12 billion square meters were residential buildings, and at present, more than 28 billion square meters, and the actual construction area of urban houses exceeded 18 billion square meters [2].

According to data from the China Real Estate Research Institute, China's total real estate investment reached 14 trillion yuan by the end of 2023, and despite the overall slowdown, the total output value of the construction industry remained at an average annual growth level of about 5%, reflecting the steady expansion of the market. The four first-tier cities (Beijing, Shanghai, Guangzhou, and Shenzhen) account for about 30% of the country's total real estate investment, while the growth rate of key second-tier cities exceeds that of first-tier cities, reflecting changes in regionalized demand. In terms of market structure, the residential market is still dominant, accounting for about 70% of total investment, but the proportion of

commercial real estate is increasing. Especially in market segments such as logistics real estate and science and technology industrial parks, investment has grown rapidly. For example, in 2023, the scale of China's logistics real estate investment will increase by 20% year-on-year, becoming a new growth point for investment capital. These changes are closely related to the rapid development of the digital economy and the rise in demand for online shopping, reflecting the diversification trend of market structure [3].

1.2 Feasibility of Using AI in Real Estate Valuations to Discuss

Artificial intelligence, as a technological concept, is having a significant impact on an extremely wide range of industries and professional fields [4]. With the advancement and maturity of AI technology year by year, it has gradually begun to play an important role in the field of architecture, especially in complex design problems [5].

It can be seen that artificial intelligence has sufficient capabilities for the evaluation and research of building housing, and can also show high efficiency and accuracy in the face of a

large number of aging idle houses with high specificity.

As one of the important component models of artificial intelligence, artificial neural network models (ANNs) are widely used because of their powerful data processing capabilities and classical learning capabilities [11]. Nowadays, the real estate market often uses artificial neural network models to conduct batch and targeted analysis of the aging and idle real estate resources currently held.

2. Research Methods

In order to study the role of artificial intelligence in real estate appraisal processing, this paper selects one paper from each of five journals at home and abroad (see Table 1), and summarizes and discusses the specific role of artificial intelligence technology in real estate appraisal and provides reasonable suggestions from five aspects.

In addition, this paper selects and discusses the example of real estate websites using artificial intelligence technology to enhance their competitiveness, and illustrates the specific role of artificial intelligence in real estate appraisal from the side.

Table 1. Appraisal Procedure

Name of the journal	The title of the paper	Specific role
Chinese Management Science	Freshness assessment of buildings based on artificial neural networks[6]	An artificial neural network model is used to calculate the novelty of the building
sustainable development	Development status of smart cities and related suggestions[7]	Various electronic information devices in the city can realize remote connection and data sharing, and these data based on connection and sharing can be used to monitor the smart city in real time, and then systematically grasp the operation status of the smart city.
<i>Advances in environmental science and energy planning</i>	Artificial intelligence in property valuations. An application of artificial neural networks to housing appraisal[8]	Artificial intelligence technology is used to analyze housing samples and accurately value commercial houses such as apartments.
Int. Journal of Housing Science	use of artificial intelligence algorithm in housing projects efficiency decisions[9]	AI tools such as neural network models can be used as predictive tools for the efficiency of housing projects.
The International Journal of Life Cycle Assessment	The application of life cycle assessment in buildings: challenges, and directions for future research[10]	Leverage digital building resources to provide accurate and reliable environmental assessments to determine a building's life cycle and remaining lifespan.

3. The Specific Role of Artificial Intelligence in Housing Evaluation and Detection

3.1 Freshness Assessment of Buildings based on Artificial Neural Networks

3.1.1 Overview

Artificial neural networks are the use of physically achievable devices or existing computers to simulate some of the structure and functions of neural networks in biological texts, and in turn to be applied in engineering or other fields. In the evaluation of the newness of buildings, BP networks are usually used, which

have the advantages of simple structure and easy hardware implementation in the working state [6].

In this evaluation method, the influencing factors of housing are listed and quantified in detail, and then the reasonably quantified data is imported into the BP neural network for unified calculation. For example, the load-bearing components of a dwelling are listed as a separate factor for the newness of the building, which is quantified as a "9" when it is still intact and strong, and a "5" when it is slightly cracked.

After that, the quantized data of each house component was introduced into the BP model that completed the learning, and the overall newness of the building was obtained.

3.1.2 Analysis

This evaluation method puts forward the concepts of "quantifying building damage factors" and using artificial neural network models, which reflects the role of artificial neural network models in batch data analysis and processing, and plays a key role in batch analysis of idle and aging buildings and life analysis of building structures.

On this basis, the artificial neural network model combined with artificial intelligence analysis tools with high execution can further improve the targeted analysis ability for different types of houses. Greatly save the cost of manual assessment for aging and idle houses.

3.2 Artificial Intelligence Conducts Comprehensive Evaluation and Analysis of Housing in the Way of Building a Smart City

3.2.1 overview

Smart cities emphasize the collection and analysis of real-time data, using big data and artificial intelligence technologies to optimize city management and services and assist decision-making [7]. It relying on information technology to empower the efficient management of the Internet of Things, the real-time evaluation of buildings is more intelligent and refined In this process, AI can also use real-time data to accurately analyze a dwelling in an area to assess its market value and building longevity.

3.2.2 Analyse

Under the premise of smart city, the internal structure and internal properties of the house, such as internal volume, elevation, wall status, furniture status, etc., will be used as the basis for comprehensive evaluation such as artificial

intelligence, which will help provide investors with highly targeted, accurate and concise housing evaluation.

In addition, the different spatial attributes of each housing due to different environmental factors such as floor height, building density, and surrounding road overview are one of the important factors affecting housing evaluation, and its high particularity and high complexity lead to the inevitable consumption of a lot of manpower and material resources in the traditional artificial housing assessment at this stage. With the support of the smart city platform of data exchange, artificial intelligence can be used as an important tool for housing evaluation, which plays a significant role in housing evaluation in complex urban environments.

In addition to the underlying physical properties of the house, AI can also be used to predict the future appreciation potential and risk of the house in the home appraisal. For example, by analyzing historical data and market trends, AI models can predict the price trend of houses in the coming period, providing a reference for investors and home buyers. In addition, personalized evaluation reports can also be provided according to the needs of different users. For example, for investors, ROI analysis can be provided; for home buyers, a cost-effective analysis of the home can be provided.

3.3 Artificial Intelligence for Real Estate Valuation

Artificial Neural Networks (ANNs) have great potential in home valuation, providing a new and effective evaluation tool for real estate practitioners. The role of ANN in housing appraisal includes, but is not limited to, improving assessment accuracy, automatically capturing cause and effect, handling limited data (for small sample evaluations in the real estate market), avoiding the limitations of traditional models, providing extreme flexibility and adaptability, real-time market adjustments, etc. These characteristics make ANN have a wide range of applications in real estate appraisal [8].

3.4 Artificial Intelligence Algorithms are Applied to the Efficiency Decision-Making of Housing Projects

3.4.1 overview

In a case study of a housing project in Van

province, Turkey, the ANN model simplifies complex planning and design problems into several key factors such as social, economic, engineering, environmental, and safety, and uses these factors as input parameters, including population, environmental level, distance to hospitals, distance to schools, seismic levels in the project area, climate, topography, distance to highways, flood risk, distance to faults, and financial criteria [9]. The efficiency of a housing project is determined by the output parameters of the algorithm. By training and testing using data from different housing project areas, the ANN model is able to predict the efficiency of housing projects in a particular area. The results show that the ANN model has a high success rate in predicting the efficiency of housing projects, and its statistical index r^2 value reaches 0.8170, indicating that the model has a good fit and prediction ability. The advantage of this approach is that it can be used as a tool for predicting the efficiency of housing projects in the future, helping decision-makers to assess and predict the potential efficiency of housing projects at the project planning stage.

3.4.2 Analyse

In addition to the physical structural properties of housing construction, housing efficiency and other data determined by the surrounding geopolitical environment are also important indicators for evaluating housing. At this level, other indicators of housing, such as the efficiency of housing projects, can be predicted and evaluated through artificial intelligence models such as ANN.

Different from subdividing and quantifying the internal components of the building and then calculating them, the evaluation of the efficiency of the housing project of the housing construction is to quantify the various key factors around the building into parameters, and then use the artificial neural network algorithm to comprehensively calculate it. This method provides a new and effective tool for the planning and decision-making of housing projects by simplifying complex problems into several key factors and utilizing the ANN model for efficiency prediction. This approach not only improves the accuracy and efficiency of assessments, but also helps decision-makers better understand and predict the potential impact of housing projects.

3.5 Artificial Intelligence is used to Assess the

Current Life Cycle Process of a Real Estate Property

3.5.1 Overview

The role of AI technology in building assessment is mainly reflected in the following aspects: first, data-driven dynamic LCA, which can achieve more accurate environmental impact assessment by processing and analyzing large amounts of real-time data (such as energy consumption data during the building use stage); The second is to improve decision support capabilities, using machine learning algorithms to quickly assess the environmental impact of multiple design options and provide optimization suggestions; The third is to integrate multidisciplinary models, promote the integration of Building Information Modeling (BIM) and LCA, and automatically extract and match the material information in the BIM model and the environmental impact data in the LCA database through AI algorithms; Fourth, deal with uncertainty, and evaluate the potential impact of multiple uncertainties faced by construction projects on environmental impacts during their life cycle through uncertainty analysis and scenario simulation; The fifth is to promote the circular economy and support circular economy practices in the construction industry, such as optimizing the recycling and reuse of building materials [10].

3.5.2 Analyse

Construction projects such as housing have their life cycle, and the current life cycle of a building is an important indicator to assess the current state of the building. In building life cycle assessment (LCA), artificial intelligence can be used to process huge amounts of data and quickly analyze the status quo of different scenarios, greatly improving the efficiency of housing life cycle assessment, and is of significant help to batch assessment and processing of idle and aging houses.



Figure 1. Digital Real Estate Service Platform

4. Specific Cases

Zillow is a leading digital real estate marketplace that offers a full range of real estate services (see Figure 1), including buying, selling, leasing, financing, and renovating properties [12]. Zillow is known for its vast database of more than 110 million U.S. households and innovative technologies such as Zestimate, which provides estimated market value for U.S. households. Its core service function is targeted property valuation, which is welcomed by the market for its accuracy and flexibility.

Zillow developed and deployed Zestimate. Zestimate is an AI-driven property valuation model that uses machine learning algorithms to analyze a large number of data points, including physical attributes, location details, and historical transaction data, and continuously updates the model to improve accuracy [13].

5. Limitations

Although AI has the advantages of efficiency and accuracy in real estate appraisal, the limitations of data privacy, model bias, and computational cost cannot be ignored. These limitations can lead to inaccurate assessment results or limit their application in broader scenarios.

5.1 Data Privacy Issues

5.1.1 The dilemma of data collection and sharing
Real estate appraisal requires a large amount of data, including basic information about the house (such as area, house type, decoration degree), transaction records, surrounding facilities information, personal information of the owner, etc. However, this data involves personal privacy and trade secrets. For example, information such as a property owner's income level and the purpose of the purchase may be used for evaluation, but unauthorized collection and use would violate privacy.

Data sources are scattered, and the data standards and update frequency of different institutions (such as government departments, banks, and real estate agencies) are inconsistent, forming "information islands" that are difficult to integrate for model training.

5.1.2 Data storage and usage risks

Servers that store large amounts of sensitive data may be at risk of cyberattacks, leading to data breaches. Once leaked, it will not only harm the interests of the owner, but also may expose the appraisal agency to legal action.

In the process of data use, even if the data is anonymized, it may be re-identified through correlation analysis with other data sets, thus revealing privacy[14].

5.1.3 Impact on evaluation results

Due to privacy protection restrictions, comprehensive data cannot be obtained, which may lead to insufficient or biased model training samples, which in turn affects the accuracy and reliability of evaluation results.

5.2 Model Bias Problem

5.2.1 Geographical differences

There are regional differences in the real estate market, and data may be richer and more up-to-date in economically developed areas, while data in economically disadvantaged or rural areas is scarce. If the model is trained primarily on data from developed regions, it may create valuation bias for properties in other regions.

5.2.2 Historical legacies

There may be historical legacy issues in the data, such as abnormal fluctuations in housing prices in some areas in the past due to special policies, and if these data are directly used for model training without processing, it will lead to the model's misjudgment of the current market.

6. Conclusion

After analyzing a number of journal papers, this paper summarizes the different roles of artificial intelligence in housing evaluation in the current situation, including but not limited to the direct value evaluation of housing real estate, the life evaluation of physical structures of housing buildings, the efficiency evaluation of housing projects, and the life cycle of buildings. It can be concluded that artificial intelligence has a non-negligible role in the evaluation and judgment of current housing, especially the aging and idle housing that is increasing year by year, and giving reasonable real estate treatment suggestions.

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