# DEVELOPMENT OF AN INTELLECTUAL SYSTEM FOR PREDICTING PRICES IN THE HOUSING MARKET BASED ON DATA FROM DIGITAL PLATFORMS

**Elmurotov Rustam Ergash o‘g‘li**
Tashkent State University of Economics (Samarkand branch), Senior doctoral student
*https://doi.org/10.5281/zenodo.21299283*

***Annotation.*** *The conceptual and methodological foundations of an intelligent system aimed at predicting housing prices based on data from digital platforms are studied. The research substantiates the scientific and practical significance of price forecasting using hedonic approaches, spatial factors, machine learning algorithms, and interpretive artificial intelligence tools.*

***Keywords:*** *digital platforms, housing prices, prediction, intelligent system, machine learning, hedonic model, geolocation, interpretable artificial intelligence.*

***Аннотация****. В работе исследуются концептуальные и методологические основы интеллектуальной системы, предназначенной для прогнозирования цен на жилье на основе данных с цифровых платформ. Исследование сосредоточено на методах производства, пространственного анализа, машинного обучения и научных исследований.*

***Ключевые слова:*** *Цифровые платформы, цены на жилье, прогнозирование, интеллектуальные системы, машинное обучение, гедонистическая модель, геолокация, интерпретируемый искусственный интеллект.*

***Anotatsiya.*** *Raqamli platformalar ma’lumotlari asosida uy-joy narxlarini bashoratlashga yo‘naltirilgan intellektual tizimning konseptual-metodologik asoslari tadqiq etiladi. Tadqiqotda gedonik yondashuv, fazoviy omillar, mashinaviy o‘rganish algoritmlari va izohlanuvchan sun’iy intellekt vositalari orqali narx prognozining ilmiy-amaliy ahamiyati asoslanadi.*

***Kalit so‘zlar:*** *Raqamli platformalar, uy-joy narxlari, bashoratlash, intellektual tizim, mashinaviy o‘rganish, gedonik model, geolokatsiya, izohlanuvchan sun’iy intellekt.*

## INTRODUCTION

The housing market is a strategically important sector of the national economy, where prices are determined by a combination of structural, spatial, and socio-economic factors. The rapid expansion of digital platforms has created new opportunities for collecting large-scale housing data, including listing prices, property characteristics, geolocation, and descriptive information. These data enable more timely market monitoring and improve the application of machine learning techniques for housing price prediction.

The aim of this study is to develop the conceptual and methodological foundations of an intelligent system for predicting housing prices based on digital platform data. To achieve this objective, the study reviews existing scientific approaches, identifies the role of platform-based data and spatial attributes, and proposes a conceptual framework integrating data collection, processing, prediction models, and interpretable outputs. The proposed approach is expected to support more reliable and transparent housing price forecasting in the context of Uzbekistan.

**Literature Review**

The hedonic model provides the principal theoretical foundation for explaining housing prices by relating property value to its structural and locational attributes [10].

However, traditional regression models have limited ability to capture complex nonlinear relationships among housing characteristics. Recent studies demonstrate that machine learning algorithms improve prediction accuracy while emphasizing the need to balance predictive performance with model interpretability [8].

Overall, the literature indicates that integrating hedonic theory with machine learning methods provides a stronger foundation for developing intelligent housing price prediction systems based on digital platform data.

Overall, the literature demonstrates that hedonic models provide the theoretical basis for attribute selection, while regression and ensemble methods improve prediction performance. Digital platform and spatial data enhance market representation, and explainable artificial intelligence increases the transparency and reliability of prediction results. These complementary approaches together form the conceptual foundation of an intelligent housing price prediction system based on digital platform data.

The literature indicates that intelligent housing price prediction systems should integrate hedonic theory, machine learning models, digital platform data, spatial information, and explainable artificial intelligence into a unified analytical framework. Platform data provide timely market signals through online listings, web scraping, and textual information, thereby improving regional market monitoring and reducing the lag of official statistics [3].

Previous studies also confirm that spatial characteristics, including transport accessibility, infrastructure, and neighborhood conditions, significantly improve prediction accuracy and should be incorporated into intelligent forecasting models [4]. In Uzbekistan, however, existing studies mainly emphasize real estate valuation, cadastral systems, and institutional regulations, while the integration of digital platform data, geospatial information, and interpretable artificial intelligence remains insufficiently developed [1]. This gap highlights the need for an integrated intelligent system tailored to the national housing market.

The reviewed literature indicates that existing studies provide complementary perspectives on housing price prediction. Hedonic and machine learning approaches establish the theoretical and methodological basis, while platform data and spatial models improve prediction accuracy through timely market and location information. In Uzbekistan, however, research mainly focuses on valuation practices and institutional issues, whereas the integration of digital platform data, geospatial information, and explainable artificial intelligence remains limited. This gap justifies the development of an integrated intelligent housing price prediction system tailored to the national context.

The literature indicates that international studies mainly emphasize predictive models and information technologies, whereas local studies focus on real estate valuation and the institutional framework of the cadastre. This difference highlights the need to integrate platform data, geospatial information, and explainable models into a unified intelligent system for the housing market of Uzbekistan.

This generalization directly links the literature review to the methodology. The following diagram shows the scientific logic, from theoretical framework to data integration, model selection, evaluation, and interpretive results.

**Research Methodology.**

The study focuses on housing listings obtained from digital platforms and the application of artificial intelligence methods for price prediction. The dataset includes listing prices, property attributes, geolocation, cadastral information, and infrastructure indicators. Although platform data provide rich and timely information, they require validation because of duplicate listings, incomplete attributes, and differences between listing and transaction prices [6].

The proposed methodology integrates structural, spatial, and temporal features into the prediction process. Previous studies confirm that location, accessibility, and neighborhood characteristics significantly improve model performance [9]. After data preprocessing and feature engineering, regression, Random Forest, Gradient Boosting, XGBoost, LightGBM, and neural network models are evaluated using MAE, RMSE, MAPE, and $R^2$ metrics [8]. The intelligent system consists of data collection, preprocessing, model training, and interpretable prediction layers, providing transparent and reliable housing price estimates for the Uzbekistan market [1].

**Discussion and Key Findings**

The analysis indicates that digital platform data enable timely monitoring of housing market dynamics and provide richer information than official statistics, particularly at the micro-area level [3;6]. In addition to structural property attributes, spatial characteristics such as accessibility, infrastructure, and neighborhood conditions substantially improve prediction accuracy and should be incorporated into intelligent forecasting models [9].

The findings also suggest that model selection should balance predictive accuracy with interpretability. Ensemble and deep learning methods enhance forecasting performance, whereas explainable artificial intelligence increases the transparency and practical applicability of prediction results [5;7]. In the context of Uzbekistan, the effectiveness of an intelligent housing price prediction system depends not only on algorithm selection but also on the integration of digital platform data with cadastral, statistical, and institutional information systems [1].

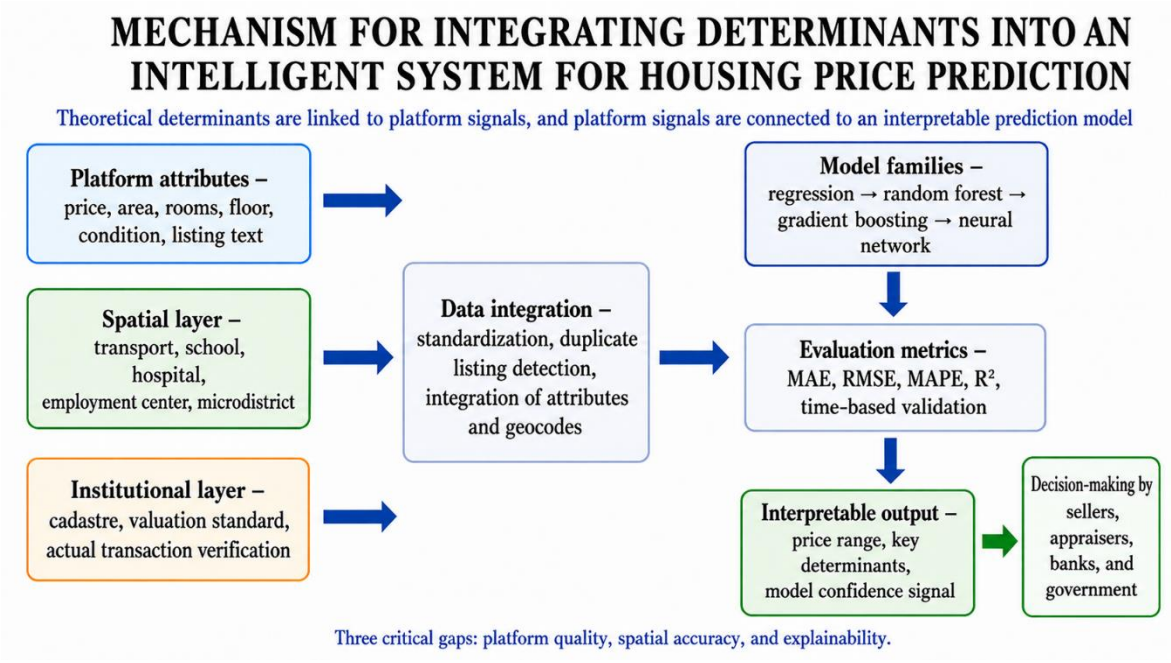

**Figure 1.1. Mechanism for integrating determinants into an intelligent system for predicting housing prices**

Figure 1.1 illustrates the proposed intelligent housing price prediction framework, integrating platform data, spatial information, and institutional sources into a unified decision-support system. The framework combines data integration, model evaluation, and interpretable prediction to support buyers, sellers, appraisers, financial institutions, and policymakers.

Since listing prices may differ from actual transaction values, the system requires continuous validation using verified market data and periodic model retraining to ensure prediction accuracy under changing market conditions.

**Conclusion and Recommendations**

The results of the study show that digital platforms are a source of high-frequency, attribute-rich, and spatially fine-grained data that can be used to analyze the housing market and predict prices. Machine learning models, especially tree-based ensemble algorithms, capture complex nonlinear relationships better than traditional regression. However, model accuracy alone is not enough. Data cleaning, improving the quality of geolocation, standardizing platform attributes, choosing the right error criteria, and interpreting the results determine the reliability of an intelligent system [7].

In the conditions of Uzbekistan, it is advisable to form a standardized database of housing advertisements, enter platform attributes in a mandatory format, and link geolocation and infrastructure data to the model. In the future, such a system could become a scientific and practical platform that would be tested with real transactions, explained through interpretation methods such as SHAP, and integrated with valuation practice.

**REFERENCES**

1. Abdikarimova, D. R., & Bekimbetova, G. M. (2017). Ko‘chmas mulkni baholash. Toshkent: Niso Poligraf. Unilibrary.uz
2. Baur, K., Rosenfelder, M., & Lutz, B. (2023). Automated real estate valuation with machine learning models using property descriptions. Expert Systems with Applications, 213, 119147. DOI: 10.1016/j.eswa.2022.119147. ScienceDirect
3. Bricongne, J.-C., Meunier, B., & Pouget, S. (2023). Web-scraping housing prices in real-time: The Covid-19 crisis in the UK. Journal of Housing Economics, 59, 101906. DOI: 10.1016/j.jhe.2022.101906. ScienceDirect
4. Gao, Q., Shi, V., Pettit, C., & Han, H. (2022). Property valuation using machine learning algorithms on statistical areas in Greater Sydney, Australia. Land Use Policy, 123, 106409. DOI: 10.1016/j.landusepol.2022.106409. ScienceDirect
5. Ho, W. K. O., Tang, B.-S., & Wong, S. W. (2021). Predicting property prices with machine learning algorithms. Journal of Property Research, 38(1), 48–70. DOI: 10.1080/09599916.2020.1832558. Taylor & Francis Online
6. Hu, L., He, S., Han, Z., Xiao, H., Su, S., Weng, M., & Cai, Z. (2019). Monitoring housing rental prices based on social media: An integrated approach of machine-learning algorithms and hedonic modeling to inform equitable housing policies. Land Use Policy, 82, 657–673. DOI: 10.1016/j.landusepol.2018.12.030. ScienceDirect

7. Iban, M. C. (2022). An explainable model for the mass appraisal of residences: The application of tree-based machine learning algorithms and interpretation of value determinants. Habitat International, 128, 102660. DOI: 10.1016/j.habitatint.2022.102660. ScienceDirect
8. Park, B., & Bae, J. K. (2015). Using machine learning algorithms for housing price prediction: The case of Fairfax County, Virginia housing data. Expert Systems with Applications, 42(6), 2928–2934. DOI: 10.1016/j.eswa.2014.11.040. ScienceDirect
9. Rey-Blanco, D., Zofío, J. L., & González-Arias, J. (2024). Improving hedonic housing price models by integrating optimal accessibility indices into regression and random forest analyses. Expert Systems with Applications, 235, 121059. DOI: 10.1016/j.eswa.2023.121059. ScienceDirect
10. Rosen, S. (1974). Hedonic prices and implicit markets: Product differentiation in pure competition. Journal of Political Economy, 82(1), 34–55. DOI: 10.1086/260169. JSTOR