

ABSTRACT

Name : Uktoriko
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Title : Development of a Machine Learning–Based Mass Land Valuation Model with Integrated Market Comparable Data.

Mass land valuation is a critical component of land administration and property taxation systems, yet conventional approaches based on simple statistical models face limitations in capturing non-linear relationships and market heterogeneity in urban land markets. Advances in machine learning provide a more flexible alternative; however, market comparable data are often not systematically integrated into predictive models.

This study aims to develop a machine learning–based mass land valuation model by integrating market comparable data. A case study was conducted in Dumai City using 236 land parcels with 76 variables, including property characteristics and three market comparables for each parcel. Comparable data were incorporated through feature engineering by constructing statistical features representing the average, dispersion, and range of comparable prices. The performance of Random Forest, Support Vector Regression, and Gradient Boosting models was evaluated with hyperparameter tuning. The results indicate that the Gradient Boosting model achieved the best performance, with a Mean Absolute Error of 46,838.86 Rupiah/m², Root Mean Squared Error of 172,338.83 Rupiah/m², R² of 0.99, Coefficient of Dispersion of 0.00%, and Price-Related Differential of 1.03, reflecting high accuracy and valuation consistency. An ablation test further demonstrated that removing market comparable features led to a noticeable decline in model performance, confirming the critical role of comparable data in mass land valuation. This study concludes that integrating market comparable data into machine learning models improves the accuracy, consistency, and transparency of mass land valuation and supports its potential application as a decision support system.

Keywords: Dumai City, Gradient Boosting, Machine learning, Market Comparable Data, Mass Land Valuation.