Performance, accuracy and equity in automated valuation models: applications of artificial intelligence in brazil under the perspective of the sdgs

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SUMMARY

This research explores the technical performance, statistical accuracy, and normative equity of Automated Valuation Models (AVMs) applied to the Brazilian real estate context, using Artificial Intelligence (AI), advanced statistical modeling, and a solid legal-regulatory framework. Based on the standards established by ABNT NBR 14.653, the International Valuation Standards (IVS), and the Brazilian Code of Civil Procedure (CPC/2015), the study proposes the construction and validation of models grounded in Multiple Linear Regression (MLR) and Artificial Neural Networks (ANNs), with a focus on urban properties and urbanizable land plots. Real structured data from the city of Itabuna, in the state of Bahia (Brazil), were used, comprising physical, locational, and market attributes, processed using techniques of standardization, homogeneity, and multicollinearity control. The empirical validation employed internationally recognized metrics: Coefficient of Determination (R^2), Mean Absolute Error (MAE), Root Mean Square Error (RMSE), F-Test, residual analysis, and QQ-Plot charts. The regression models showed R^2 values above 0.90 and MAE below 5%, with residuals normally distributed, thus technically robust and legally defensible. Neural networks demonstrated superior predictive performance in complex and nonlinear scenarios but with lower interpretability, which directly affects their admissibility and defensibility in court settings. The comparative analysis of both methods reveals that, for legal, fiscal, and institutional purposes, model transparency is as critical as predictive accuracy, demanding hybrid solutions that balance algorithmic performance and auditability. The proposal aligns directly with the United Nations Sustainable Development Goals (SDGs), particularly SDG 10 (reduced inequalities), SDG 11 (sustainable cities), and SDG 16 (effective institutions and justice), by addressing valuation modeling through a lens of spatial equity, algorithmic justice, and data governance. This study marks a methodological milestone for the responsible adoption of AI in Valuation Engineering, offering clear criteria for the acceptance and defense of automated models in judicial, public, and scientific domains in Brazil. It positions the valuation engineer as a technical

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curator of intelligent models and a promoter of socio-spatial equity in the valuation of urban and rural assets.