## Office Building Rental Forecasting Based on Machine Learning Regression Model

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## ABSTRACT

Valuers face various challenges in determining property prices and rental values due to their heavy dependence on market data. The use of existing databases in property valuation assignments presents intrinsic challenges where the valuer might derive incorrect assumptions in analysing value-issued comparable data. Plus, it is worth noting that when predicting property values and rentals, appraisers and investors cannot rely on historical market data from real estate transactions. With the increasing spectrum of Industrial Revolution 4.0, the introduction of the Machine Learning Model to solve unforeseen issues are timely. To meet this requirement, certain computing techniques optimised the advancements in data science technologies are unavoidably the best options. Thus, this research aims to develop a Rental Forecasting Model of office building rentals. To fulfil the aim, this research proposed three (3) objectives, first by identifying the factors affecting office building rental prices based on the statistics from previous empirical analysis through the Systematic Literature Review. The second objective prioritizes the statistical relation between the acquired factors and office rental prices. Commence with the descriptive analysis performed with the datasets collected from the Valuation and Services Department on office building rental transactions from 2015 to 2021 (6 years) focusing on the Bandar Kuala Lumpur area. In addition, to analyse the relationship between the factors affecting office rentals, empirical experiments were performed through the Shapiro-Wilk and Spearman Correlation analysis. Next, this research will develop Machine Learning Regression Model for office building rentals forecasting. Four (4) algorithms have been tested namely the Random Forest, Decision Tree, Support Vector Machine and Linear Regression. The model was developed through the employment of optimal configuration from the Auto Model and tested using two (2) different approaches namely the Split data and CrossValidation. An in-depth analysis was performed by experimenting these approaches based on the regression performances of R2 and Root Mean Square Error. The finding of this research has provided new insight on 21 factors that could affect office building rental from the macroeconomic, physical, locational, certification and lease details aspect. On the other hand, the results of four (4) algorithms that have been tested show that the Random Forest outperforms other algorithms by acquiring a significant value of R2 and Root Mean Square Error as one of the processes to justify on the reliability of the prediction. Predictions results were used to forecast the office building rental. The results from forecasting the office building rental based on the regression model show that rental rates in Bandar Kuala Lumpur will continuously increase for the next three (3) years. With the application of machine learning aligned with Industrial Revolution 4.0, this research would be advantageous to valuers in experimenting with a new approach that can effectively evaluate office rental values in a more efficient way.