UNIVERSITI TEKNOLOGI MARA

PREDICTION MODELS OF HERITAGE BUILDING BASED ON MACHINE LEARNING

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MSc

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Cultural heritage is a series of previous historical records which exist in all countries and regions and is usually preserved from a generation to another generation. In general, cultural heritage can be divided into two categories such as tangible and intangible heritage, where in tangible itself, there are two groups which are moveable and unmoveable. Physical items that can be moved are known as moveable while immoveable properties are structures, monuments and archaeological sites. This study involves a tangible property which is a prewar shophouse located inside George Town, Penang Island. Heritage property is a part of an economic indicator, thus this is important in leading towards better decision making in determining and producing an accurate heritage property price in order to understand and respect the fair values of the heritage properties besides recognising the needs of heritage properties and it helps to respond to requirements for more responsibility for the sustained use of the resources. An effective value is generated by using an appropriate approach in price prediction. However, there is no absolute evidence on the proper predict approach in valuing heritage properties. To attain the proper prediction approach, researcher has setup three objectives to make it more consistent to observe. For the first objective is to identify the factors affecting the price of heritage properties. Then through the produced result researcher use the collected factors of heritage to achieve objective two which is to measure the significant factors that affecting the heritage properties price. After that, the produce significant factors of heritage are used to achieve objective three which to test the best algorithms of machine learning in predict the heritage properties price, this objective need a statistical technique to achieve the price prediction. Currently, the development of digital technologies is increasing and expending in various sectors in industries. From previous literatures, the most computational technique that has been studied is machine learning technique in real estate industry. However, the use of Machine Learning technique as a prediction model for heritage property prediction is still limited and one of the reasons is small datasets because they are not publicly available. To overcome these limitations, this research has proposed five machine learning algorithms namely Linear Regression, Lasso, Ridge, Random Forest and Decision Tree. This algorithms were selected based on previous literature review in price prediction. These algorithms were developed by using prewar shophouses dataset from 2004 until 2018 based on factors of heritage properties. The results show that Random Forest was the best model by referring to the metrics of R-square and root mean square errors. Besides, the significant factors affecting the property heritage prices are land area, main floor area, year of transaction, storey, position, floor material and authenticity. Thus, through the implementation of machine learning, the researcher can analyse the proper and acceptable algorithms that can be used in heritage property price prediction which also are recommended for other researchers. The implication of this empirical research, it would beneficial to industry practice such as Valuers, planning authority, expertise and related field by providing new information of the current heritage property market, factors of heritage and heritage authenticity environment in protecting the heritage structural, besides offer a new alternative in predicting price of heritage property.

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