



## Comparative Study of Utilising Neural Network and Response Surface Methodology for Flexible Pavement Maintenance Treatments

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### Abstract

The use of Artificial Intelligence (AI) for the prediction of flexible pavement maintenance that is caused by distressing on the surface layer is crucial in the effort to increase the service life span of pavements as well as reduce government expenses. This study aimed to predict flexible pavement maintenance in tropical regions by using an Artificial Neural Network (ANN) and the Response Surface Methodology (RSM) for predicting models for pavement maintenance in the tropical region. However, to predict the performance of the treatment techniques for flexible pavements, we used critical criteria to choose our data from different sources to represent the situation of the current pavement. The effect of the distress condition on the flexible pavement surface performance was one of the criteria considered in our study. The data were chosen in this study for 288 sets of treatment techniques for flexible pavements. The input parameters used for the prediction were severity, density, road function, and Average Daily Traffic (ADT). The finding of regression models in ( $R^2$ ) values for the ANN prediction model is 0.93, while the ( $R^2$ ) values are (RSM) prediction model dependent on the full quadratic is 0.85. The results of two methods were compared for their predictive capabilities in terms of the coefficient of determination ( $R^2$ ), the Mean Squared Error (MSE), and the Root Mean Square Error (RMSE), based on the dataset. The results showed that the prediction made utilizing ANN was very relevant to the goal in contrast to that made using the statistical program RSM based on different types of mathematical methods such as full quadratic, pure quadratic, interactions, and linear regression.

*Keywords:* ANN; RSM; Prediction, Treatment Techniques; Flexible Pavement; Correlation Coefficient.

### 1. Introduction

Pavements are among the highest assets of a nation, and a considerable investment to provide a sustainable maintenance service for them is becoming a priority. This comes with the shared goal of reducing the environmental impacts caused by maintenance treatments. Flexible pavement deterioration is a complicated process that involves not only structural damage but also numerous functional distresses on the asphalt pavement. It is a result of the climate, materials used and the quality of maintenance [1, 2]. However, the maintenance and rehabilitation of these pavements for the required serviceability is a routine problem faced by highway engineers and organizations. Therefore, the performance of correct maintenance is the best approximate predictor of normal conditions caused by the significant complexity of the pavement surface deterioration process [3, 4].

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