Predicting the Compressive Strength of Concretes Made with Unwashed Gravel from Eastern Nigeria Using Artificial Neural Networks

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Abstract

Cases of collapsed buildings and structures are prevalent in Nigeria. In most of these cases the cause of the collapse could be traced to the strength of the construction materials, mainly concrete. Secondly, experimental determination of the strength of concrete materials used in buildings and structures is quite expensive and time consuming. This research seeks to develop a computational model based on artificial neural networks for the determination of the compressive strength of concrete materials made from a prevalent coarse aggregate component from Nigeria. The study involved building a multilayer perceptron neural network model which was trained using experimental data obtained from compressive strength test of concrete made from unwashed gravel. Compressive strength predictions were compared with alternative model based on regression analysis. Results show that for the unwashed gravel based concrete the regression model prediction has a sum of squares error of 9.808 and a mean absolute percentage (relative) error of 1.167, while the neural network model prediction has a sum of squares error of 0.025 and a mean absolute percentage (relative) error of 0.015. Generally, the models predicted well, but the neural network model predicted better than the regression model. This study has ably demonstrated a cheap, simple, very quick and accurate alternative to experimental method of concrete strength determination. It is simpler and quicker than analytical methods based on regression analysis.

Keywords: Artificial Neural Network, Concrete, Unwashed gravel, Regression, Modelling.

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