STATISTICAL FEATURE EXTRACTION BASED ON AN ANN APPROACH FOR ESTIMATING THE COMPRESSIVE STRENGTH OF CONCRETE

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Abstract: Applications of artificial intelligence in engineering disciplines have become widespread and have provided alternative solutions to engineering problems. Image processing technology (IPT) and artificial neural networks (ANNs) are types of artificial intelligence methods. However, IPT and ANN have been used together in extremely few studies. In this study, these two methods were used to determine the compressive strength of concrete, a complex material whose mechanical features are difficult to predict. Sixty cube-shaped specimens were manufactured, and images of specific features of the specimens were taken before they were tested to determine their compressive strengths. An ANN model was constituted as a result of the process of digitizing the images. In this way, the two different artificial intelligence methods were used together to carry out the analysis. The compressive strength values of the concrete obtained via analytical modeling were compared with the test results. The results of the comparison ($R^2 = 0.9837 - 0.9961$) indicate that the combination of these two artificial intelligence methods is highly capable of predicting the compressive strengths of the specimens. The model's predictive capability was also evaluated in terms of several statistical parameters using a set of statistical methods during the digitization of the images constituting the artificial neural network.

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