عنوان مقاله:

Evaluation and Prediction of W/C Ratio vs. Compressive Concrete Strength Using A.I and M.L Based on Random Forest Algorithm Approach

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خلاصه مقاله:

Concrete, an artificial stone composed of cement, aggregate, water, and additives, is extensively utilized in contemporarycivil projects. A pivotal characteristic of concrete is its capacity to efficiently serve various purposes and structuralrequirements. Cement, water, aggregate, and additives are pivotal parameters wherein even minor alterations cansignificantly impact concrete strength. Among these parameters, the Water/Cement (W/C) ratio holds particular significancedue to its inverse correlation with strength. Traditionally, predicting concrete strength solely based on the water-to-cementratio has been challenging. However, with advancements in AI and machine learning techniques coupled with ample dataavailability, accurate strength prediction is achievable. This paper presents an analysis of a diverse dataset comprisingvarious concrete tests utilizing machine learning methodologies, followed by a comparative examination of the outcomes.Furthermore, this study scrutinizes a renowned dataset encompassing ۱۰۳۰ experiments, featuring diverse combinations ofcement, water, aggregate, etc., employing artificial intelligence and machine learning techniques. Model accuracy and resultfidelity are evaluated through rigorous sampling methodologies. Initially, the dataset is subjected to analysis utilizing thelinear regression algorithm, followed by validation employing the random forest algorithm. The random forest algorithm isemployed to predict the water-to-cement ratio and corresponding compressive strength for concrete with a density of ۳۰۰kg/m۳. Notably, the obtained results exhibit a high level of concordance with experimental and laboratory findings fromprior studies. Hence, the efficacy of the random forest algorithm in concrete strength prediction is established, offeringpromising prospects for future applications in this domain.

کلمات کلیدی:

Concrete, AI, Machine Learning, W/C Ratio, Prediction, Strength