Machine Learning For Strength Estimation Of In Service Damaged Concrete By Ae Data

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To sustain service of the structures exposed to various environmental effects and loads is a challenge due to inability of identifying their damage status accurately. At this point integrating artificial intelligence with acoustic emission (AE) data obtained from fracture processes of concrete is a proper approach. Since AE data are effective for determining the severity, type and location of damage in a material under stress, utilizing artificial intelligence in AE analysis will increase the accuracy of damage detection. By instructing different AE parameters on artificial intelligence, mechanical properties of concrete structures can be evaluated. In this study, the relationship between stress level of the concrete under compression and AE parameters was investigated. For this purpose, concrete core samples, which were severely damaged by frost were tested under uniaxial compressive tests and monitored with AE. Statistics of different AE parameters such as AE hits, AE energy, RMS, duration, rise time, centroid frequency, and peak frequency were calculated for every 20×10-6 of strain increment and strength estimation skills of the random forests were evaluated. Consequently, the importance of the AE features of random forests was determined and the most important features were identified. Results suggest that centroid frequency and rise time parameters can be used to clarify the compressive fracture behavior of concrete.