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Probabilistic Inference Approach for Predicting Concrete Compressive Strength - A Bayesian Network Algorithm

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Abstract **–** This study highlights innovative and novel techniques that employ Artificial Intelligence (AI) technology in evaluating and predicting concrete compressive strength. Past literature utilized different AI algorithms to predict the nonlinear behaviour of concrete, of which the most commonly used is the Artificial Neural Network (ANN). Limited past studies used the probabilistic inference approach by using Bayesian Networks (BN) to envisage the structural health integrity and mechanical performance of concrete. This research investigates the potential applicability of BN in predicting the compressive strength of self-compacting concrete made with various supplementary cementitious materials and basalt fibers. Two learning algorithms, namely Naïve Bayes and Markov Blanket, were employed along with various discretization methods to maximize network performance and minimize integral absolute error. Research findings showed that Naïve Bayes classifier, coupled with K-means discretization tool with 4 segments of 'days' variable and 3 segments of the remaining variables, gave the highest correlation between experimental and predicted values. The accuracy of the predicted BN results was slightly superior to that obtained from the ANN model.

Keywords**:** Probabilistic Inference, Bayesian Network, Artificial Neural Network, Compressive Strength, Sustainable Concrete.