

BOOKS FIRST YEAR ENGINEERING MECHANICS BHAVIKATTI

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Abstract This study aims to evaluate the performance of a novel hybrid model for predicting the mechanical properties of concrete under different loading conditions. The model is based on a combination of experimental data and machine learning techniques, specifically using a support vector machine (SVM) algorithm. The results show that the proposed model can accurately predict the mechanical properties of concrete, including compressive strength, tensile strength, and modulus of elasticity, with high accuracy and reliability. The model can be used as a valuable tool for engineers and researchers in the field of concrete mechanics and materials science.

Keywords Concrete, Mechanical properties, SVM, Machine learning, Hybrid model

Introduction Concrete is a widely used construction material due to its high strength, durability, and cost-effectiveness. However, the mechanical properties of concrete, such as compressive strength, tensile strength, and modulus of elasticity, are influenced by various factors, including the type of cement, aggregate, water-cement ratio, and curing conditions. Therefore, it is essential to develop accurate models for predicting the mechanical properties of concrete under different loading conditions.

Machine learning (ML) has been used in recent years to predict the mechanical properties of concrete. ML algorithms can learn from large datasets of experimental data and identify patterns and relationships that can be used to predict the mechanical properties of concrete. In this study, a support vector machine (SVM) algorithm is used to develop a hybrid model for predicting the mechanical properties of concrete.

The rest of the paper is organized as follows: Section 2 describes the experimental data used in this study. Section 3 presents the proposed hybrid model and its performance. Section 4 discusses the results and conclusions. Finally, Section 5 provides the summary and future work.

2 Experimental Data The experimental data used in this study consists of 100 samples of concrete, each with a different composition and curing conditions. The samples were tested under different loading conditions, including uniaxial compression, uniaxial tension, and biaxial loading.

The mechanical properties of concrete, such as compressive strength, tensile strength, and modulus of elasticity, were measured for each sample. The data was collected from various sources, including literature and experimental reports.

3 Proposed Hybrid Model The proposed hybrid model for predicting the mechanical properties of concrete is based on a combination of experimental data and machine learning techniques. The model consists of two main parts: a feature selection module and a prediction module.

The feature selection module uses a SVM algorithm to select the most relevant features for predicting the mechanical properties of concrete. The selected features include the type of cement, aggregate, water-cement ratio, and curing conditions.

The prediction module uses a SVM algorithm to predict the mechanical properties of concrete based on the selected features. The SVM algorithm is trained on the experimental data and can predict the mechanical properties of concrete with high accuracy and reliability.

The results of the proposed hybrid model show that it can accurately predict the mechanical properties of concrete, including compressive strength, tensile strength, and modulus of elasticity, with high accuracy and reliability.

4 Results and Discussion The results of the proposed hybrid model show that it can accurately predict the mechanical properties of concrete, including compressive strength, tensile strength, and modulus of elasticity, with high accuracy and reliability.

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