

## Current approaches of artificial intelligence in breakwaters – A review

Suman Kundapura\* and Arkal Vittal Hegde<sup>a</sup>

*Department of Applied Mechanics and Hydraulics, NITK, Surathkal, India*

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**Abstract.** A breakwater has always been an ideal option to prevent shoreline erosion due to wave action as well as to maintain the tranquility in the lagoon area. The effects of the impinging wave on the structure could be analyzed and evaluated by several physical and numerical methods. An alternate approach to the numerical methods in the prediction of performance of a breakwater is Artificial Intelligence (AI) tools. In the recent decade many researchers have implemented several Artificial Intelligence (AI) tools in the prediction of performance, stability number and scour of breakwaters. This paper is a comprehensive review which serves as a guide to the current state of the art knowledge in application of soft computing techniques in breakwaters. This study aims to provide a detailed review of different soft computing techniques used in the prediction of performance of different breakwaters considering various combinations of input and response variables.

**Keywords:** breakwaters; artificial neural networks; ANFIS; support vector machines; genetic algorithm; particle swarm optimization

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### 1. Introduction

Coast is the interface between the land and the sea, which is subjected to a dynamic environment. Global scenario of coastal urbanization and the subsequent increase in the port volumes calls for a sustainable coastal management. Breakwater is one of the several structures available for coastal protection. The effect of breakwater installation in the field needs a comprehensive study on the performance characteristics of breakwaters. The simulation models could also be used in the laboratory to assess the same involving different parameters which affects the shape, strength, alignment and base stability. The coastal processes being complex and non-linear by nature may not be numerically modeled with accuracy. The Computational Intelligence (CI) techniques could be made use to overcome these shortcomings. Artificial Intelligence has emerged as one of the most revolutionary area. This paper gives an overview of applications of Artificial Intelligence in prediction and forecasting of different wave parameters associated with breakwaters. Application of Artificial Intelligence in the absence of adequate experimental data sets is superlative as the data sets could be efficiently interpolated. The

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\*Corresponding author, Research Scholar, E-mail: [sumankundapura@yahoo.com](mailto:sumankundapura@yahoo.com)

<sup>a</sup> Professor, Email: [arkalvittal@gmail.com](mailto:arkalvittal@gmail.com)

























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