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# (Research Article)
# Classification of vessels based on their length using emitted sound by artificial neural network and hybrid particle swarm algorithm

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## Abstract

Sonar systems are of special importance in many ways, including military applications, shipping, fishing, etc. Therefore, the classification of sonar data is always of interest to experts in this field. In this article, two data preparation methods were used. In the first method, all the features extracted from the data and in the proposed method were averaged out of the time period used to extract the feature in the form of ten period. Different structures of artificial neural network and hybrid neural network were compared with particle swarm algorithm (PSO) to achieve the highest performance in classifying sounds emitted by floats based on float length. The results showed that in the case of using raw extracted features in the use of artificial neural network, the 2-2-2 structure in the hidden layer had the highest performance for training and testing conditions equal to 90.61 and 90% respectively. By using the hybrid neural network, the classification accuracy increased and reached 94.44% in the test conditions. In using the proposed method to prepare the extracted data, the simple structure of one layer with 6 neurons in the hidden layer provided the highest performance in the classification of the extracted features by 100% for training and testing.

**Keywords:** Sonar, Classification of vessels, Neural network, Particle swarm algorithm.

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