

# Hybrid ANFIS-Rao algorithm for surface roughness modelling and optimization in electrical discharge machining

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## ABSTRACT

Advanced modeling and optimization techniques are imperative today to deal with complex machining processes like electric discharge machining (EDM). In the present research, Titanium alloy has been machined by considering different electrical input parameters to evaluate one of the important surface integrity (SI) parameter that is surface roughness  $R_a$ . Firstly, the response surface methodology (RSM) has been adopted for experimental design and for generating training data set. The artificial neural network (ANN) model has been developed and optimized for  $R_a$  with the same training data set. Finally, an adaptive neuro-fuzzy inference system (ANFIS) model has been developed for  $R_a$ . Optimization of the developed ANFIS model has been done by applying the latest optimization techniques Rao algorithm and the Jaya algorithm. Different statistical parameters such as the mean square error (MSE), the mean absolute error (MAE), the root mean square error (RMSE), the mean bias error (MBE) and the mean absolute percentage error (MAPE) elucidate that the ANFIS model is better than the ANN model. Both the optimization algorithms results in considerable improvement in the SI of the machined surface. Comparing the Rao algorithm and Jaya algorithm for optimization, it has been found that the Rao algorithm performs better than the Jaya algorithm.

## ARTICLE INFO

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