

Optimizing NARX Network Parameters Using Taguchi Orthogonal Arrays for Flood Prediction

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Abstract

Floods are among the most severe natural disasters, causing extensive socio-economic damage and threatening human lives. Accurate flood forecasting is essential for disaster risk management and early warning systems, but it remains a complex challenge due to the nonlinear and dynamic nature of hydrological processes. The Nonlinear Autoregressive with Exogenous Input (NARX) neural network has shown immense potential for modeling time-series dynamics using external variables, such as rainfall. However, NARX performance is heavily dependent on its network parameters, which are typically determined through inefficient trial-and-error procedures. This paper proposes a novel hybrid framework that utilizes the Taguchi method to systematically optimize the NARX model parameters. By employing Orthogonal Arrays (OA), the Taguchi method significantly reduces the number of experimental runs while identifying the most robust parameter configuration. This approach aims to enhance prediction accuracy, improve computational efficiency, and provide a reliable, scalable flood forecasting model for highly susceptible regions like the Dungun River basin.

Index Terms

Flood Prediction, NARX Model, Taguchi Method, Orthogonal Arrays, Time-Series Forecasting