Deep learning-based fault detection in electrical transmission lines

Abstract

Fault detection is a critical stage in power systems, requiring swift and accurate identification. This paper introduces an Artificial Neural Network (ANN) tailored for fault identification, utilizing a deep learning approach. The proposed model marks a pioneering effort, employing ANN for fault identification using raw and sampled data from three-phase current and voltage signals collected through simulation from a 14-bus system across various fault and no-fault classes. Performance evaluation metrics such as accuracy, sensitivity, specificity, precision, and F1 score are employed to assess the model's efficacy. Results demonstrate that the ANN model achieves exceptional accuracy and efficiency in fault detection, showcasing its potential as a pivotal tool for enhancing the reliability and performance of electrical power systems. Notably, the suggested model attains a remarkable 99% accuracy across all tested fault scenarios, F1Score 0.99 for fault and non-fault detection with closely matched testing and training loss curves.

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