

# Toward an adaptive protection scheme in active distribution networks: Intelligent approach fault detector

## Abstract

Conventional protection schemes have proven insufficient for the protection of Active Distribution Networks (ADN). Novel protection schemes with an adaptive approach should be developed to guarantee the protection of ADN under all their operating conditions. This paper proposes an ADN adaptive protection methodology, which is based on an intelligent approach fault detector over locally available measurements. This approach uses Machine Learning (ML) based techniques to reduce the strong dependence of the adaptive protection schemes on the availability of communication systems and to determine if, over a fault condition, an Intelligent Electronic Device (IED) should operate considering the changes in operational conditions of an ADN. Additionally, the methodology takes into account different and remarkable recommendations for the use of ML techniques. The proposed methodology is validated on the modified IEEE 34-nodes test feeder. Additionally, it takes into consideration typical features of ADN and micro-grids like the load imbalance, reconfiguration, changes in impedance upstream from the micro-grid, and off-grid/on-grid operation modes. The results demonstrate the flexibility and simplicity of the methodology to determine the best accuracy performance among several ML models. Besides, they show the methodology's versatility to find the suitable ML model for IEDs located on different zones of an ADN. The ease of design's implementation, formulation of parameters, and promising test results indicate the potential for real-life applications.