

# **AI-Based Microgrid Protection Scheme Using Low-Cost Embedded hardware**

**Kashinath Dattatray Date<sup>1</sup>, Omkar Mahantesh Vacche<sup>2</sup>, Arjun Sanjay Rathod<sup>3</sup>, Prof. V. D. Gund<sup>4</sup>**

<sup>1,2,3</sup> UG Students, Department of Electronics and Telecommunication

<sup>4</sup> Asst. Professor, Department of Electronics and Telecommunication

Brahmdevdada Mane Institute of Technology, Solapur, Maharashtra, India

Kdate133@gmail.com

**Abstract:** *The AI-Based Microgrid Protection Scheme presents an innovative solution to address the critical challenges of fault detection and protection in modern microgrid systems using cost-effective embedded hardware. This system integrates artificial intelligence algorithms with low-cost microcontrollers like Raspberry Pi and Arduino to create an intelligent protection scheme capable of real-time fault detection, classification, and isolation. The core objective is to enhance microgrid reliability, reduce downtime, and provide affordable protection solutions for renewable energy systems. The system employs machine learning algorithms including Support Vector Machine (SVM) and Artificial Neural Networks (ANN) to analyze electrical parameters such as voltage, current, frequency, and power quality. By utilizing sensors for continuous monitoring and embedded processors for intelligent decision-making, the protection scheme can differentiate between normal operational variations and actual fault conditions. The system offers 99.75% accuracy in fault detection and classification while maintaining cost-effectiveness through the use of readily available embedded hardware. Beyond technical performance, this solution provides valuable applications in distributed energy systems, smart grids, and renewable energy integration, making advanced protection technologies accessible to smaller microgrid installations that cannot afford expensive commercial protection systems*

**Keywords:** Microgrid Protection, Embedded Systems, Artificial Intelligence, Fault Detection, Machine Learning, Raspberry Pi, Arduino, Smart Grid

