

Development of AI-Based Sorting Algorithm for Capacitor Voltage Balancing in Modular Multilevel Converter-Based High Voltage DC Power Supply

Abstract

1. Introduction:

Modular Multilevel Converters (MMCs) are widely used in high-voltage DC (HVDC) power supplies for nuclear fusion experiments due to their scalability, modularity, and ability to generate high-quality waveforms. One of the critical challenges in MMC operation is capacitor voltage balancing, which ensures stable operation and prolongs the lifetime of capacitors. Traditional balancing methods based on deterministic and rule-based approaches often struggle with dynamic changes in load and operating conditions. This project proposes the development of an artificial intelligence (AI)-based sorting algorithm to enhance capacitor voltage balancing, ensuring optimal performance and reliability of the MMC-based HVDC power supply.

2. Objectives:

- To develop an AI-based sorting algorithm for capacitor voltage balancing in MMC topology.
- To enhance the efficiency and stability of HVDC power supplies for nuclear fusion applications.
- To compare AI-based methods with conventional sorting algorithms in terms of balancing performance, computation time, and robustness.

Academic Project Requirements:

1) Required No. of student(s) for academic project: 1

2) Name of course with branch/discipline: M.E./M.Tech Electrical

3) Academic Project duration:

(a) Total academic project duration: 36 Weeks

(b) Student's presence at IPR for academic project work: 3 Full working Days per week

Email to: saurabh@ipr.res.in[Guide's e-mail address] and
project_ee@ipr.res.in [Academic Project Coordinator's e-mail address]

Phone Number: 079 -2174 [Guide's phone number]