

# Data-driven control based on marine predators algorithm for optimal tuning of the wind plant

*Mohd Zaidi Mohd Tumari<sup>a</sup>, Mohd Ashraf Ahmad<sup>b</sup>, Mohd Helmi Suid<sup>b</sup>, Mohd Riduwan Ghazali<sup>b</sup>*

<sup>a</sup> Universiti Teknikal Malaysia Melaka Hang Tuah Jaya, Faculty of Electrical & Electronics Engineering Technology, Melaka, Malaysia

<sup>b</sup> Universiti Malaysia Pahang Pekan, Faculty of Electrical & Electronics Engineering Technology, Pahang, Malaysia

## **ABSTRACT**

The main challenge in controlling the wind plant nowadays is a highly arduous effort in discovering the best controller parameters of the turbines due to the wake interaction effect. The aim of this paper is to develop the datadriven control based on marine predators algorithm (MPA) for fine-tuning the controller parameters of a single row of ten turbines in improving the wind plant power production according to the reference power. The real wind plant model from Denmark named Horns Rev is considered in this study. Effectiveness of the proposed method was particularly assessed according to the convergence curve and statistical analysis of the fitness function, and Wilcoxon's rank test. Comparative results alongside other existing metaheuristic-based algorithms further confirmed excellence of the proposed method through its superior performance against the slime mould algorithm (SMA), multi-verse optimizer (MVO), sine-cosine algorithm (SCA), grey wolf optimizer (GWO), and safe experimentation dynamics (SED) algorithm.

## **KEYWORDS**

Marine predators algorithm; Metaheuristic optimization; Renewable energy; Wind farm; Wind plant

**ACKNOWLEDGEMENTS**

The highest gratitude is especially extended to the Ministry of Higher Education for the financial assistance provided under Fundamental Research Grant Scheme (FRGS) No. FRGS/1/2021/TK0/UMP/02/5 (University reference RDU210106). Heartfelt appreciation is further directed to University Malaysia Pahang for the monetary and resource assurances under its internal grants from the postgraduate research scheme (PGRS) (PGRS220309).