

Peer Review

Review of: "TransCapAI: An Optimization Framework for Series Capacitor Allocation to Improve Efficiency and Voltage Stability in Transmission Systems using Machine Learning Techniques"

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The manuscript presents an interesting and timely framework, termed TransCapAI, which combines machine-learning-based surrogate modeling with Particle Swarm Optimization (PSO) for series capacitor allocation in a transmission system. The study uses the IEEE 57-bus system and evaluates the proposed approach primarily in terms of active power loss and Voltage Stability Index (VSI). The concerns regarding the article are presented below.

The integration of ML surrogate modeling and PSO is relevant to computationally intensive optimization problems. The manuscript explains that PSO uses a weighted objective consisting of loss reduction and VSI improvement, with weights of 60% and 40%. However, the complete mathematical formulation is not sufficiently presented.

The paper does not provide sufficient information about how many simulation samples were generated and how the combinations were selected.

The physical interpretation could be improved. Instead of only listing compensation percentages, the authors could discuss:

- Why particular corridors receive high compensation
- The relationship between compensation and line loading
- The relationship between compensation and voltage sensitivity

- Whether the selected lines correspond to high-loss corridors
- Whether the selected lines are associated with weak buses

The article should provide the computational efficiency analysis. Also, there seem to be inconsistencies in the parameter settings.

Declarations

Potential competing interests: No potential competing interests to declare.