Qeios

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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1. What is the key novelty of TransCapAI compared with existing series capacitor placement methods based on PSO, GA, DE, GWO, and other metaheuristic techniques? The authors should clearly quantify the improvement over existing approaches.
2. Why was Particle Swarm Optimization (PSO) selected for this problem? Have the authors compared its performance with other optimization algorithms to demonstrate that PSO is particularly suitable?
3. What machine-learning algorithm was used for the surrogate model, and why was it selected? The paper should justify the choice and compare it with alternative surrogate models where appropriate.
4. How was overfitting of the surrogate models avoided? The authors should provide information about cross-validation, hyperparameter tuning, and the independent test dataset.
5. The paper reports a 42.50% reduction in active power losses. This appears substantial. Please provide the base-case loss, optimized loss, and corresponding numerical values before and after compensation so that this improvement can be independently verified.
6. The authors report a 4.56% improvement in the minimum Voltage Stability Index. Please clearly define the VSI used, its mathematical formulation, and explain why this particular index was selected.

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7. What are the constraints imposed on capacitor compensation levels? Please specify the minimum/maximum compensation limits and explain whether these limits reflect realistic practical operating conditions.
8. Please discuss the practical feasibility of the proposed capacitor placement by considering realistic compensation limits, line thermal constraints, voltage limits, generator reactive-power limits, contingency conditions, and installation costs.

Declarations

Potential competing interests: No potential competing interests to declare.