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Renewable Energy Efficiency Optimization Through Neural Networks and Quantum Algorithms in Smart Cities

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Abstract:

The increasing demand for sustainable and efficient energy systems in smart cities has necessitated the integration of advanced computational techniques for renewable energy optimization. This research explores the combined application of neural networks and quantum algorithms to enhance the efficiency and stability of renewable energy sources, such as solar and wind, within urban infrastructures. Neural networks are employed for dynamic prediction and adaptive control of energy consumption and generation patterns, while quantum algorithms are leveraged to solve complex optimization problems related to grid stability, load forecasting, and resource allocation. The hybrid model aims to improve decision-making speed and accuracy in real-time energy management systems. Experimental evaluations demonstrate superior performance over conventional models in terms of accuracy, scalability, and computational cost, indicating a significant step toward intelligent, sustainable urban energy ecosystems.

Keywords:

renewable energy, neural networks, quantum algorithms, smart cities, energy optimization, sustainable systems

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REFERENCES

[1] El-Kenawy, E. S. M., Eid, M. M., Saber, M., & Ibrahim, A. (2020). MbGWO-SFS: Modified binary grey wolf optimizer based on stochastic fractal search for feature selection. IEEE Access, 8, 107635-107649.

[2] El-Kenawy, E. S., & Eid, M. (2020). Hybrid gray wolf and particle swarm optimization for feature selection. Int. J. Innov. Comput. Inf. Control, 16(3), 831-844.

[3] El-Kenawy, E. S. M., Khodadadi, N., Mirjalili, S., Abdelhamid, A. A., Eid, M. M., & Ibrahim, A. (2024). Greylag goose optimization: nature-inspired optimization algorithm. Expert Systems with Applications, 238, 122147.

[4] Abdollahzadeh, B., Khodadadi, N., Barshandeh, S., Trojovský, P., Gharehchopogh, F. S., El-kenawy, E. S. M., ... & Mirjalili, S. (2024). Puma optimizer (PO): a novel metaheuristic optimization algorithm and its application in machine learning. Cluster Computing, 27(4), 5235-5283.

[5] Khodadadi, N., Khodadadi, E., Al-Tashi, Q., El-Kenawy, E. S. M., Abualigah, L., Abdulkadir, S. J., ... & Mirjalili, S. (2023). BAOA: binary arithmetic optimization algorithm with K-nearest neighbor classifier for feature selection. IEEE Access, 11, 94094-94115.

[6] Khodadadi, N., Abualigah, L., El-Kenawy, E. S. M., Snasel, V., & Mirjalili, S. (2022). An archive-based multi-objective arithmetic optimization algorithm for solving industrial engineering problems. IEEE Access, 10, 106673-106698.

[7] El-Kenawy, E. S. M. T., & SM, E. (2019). A machine learning model for hemoglobin estimation and anemia classification. International Journal of Computer Science and Information Security (IJCSIS), 17(2), 100-108.

[8] El-kenawy, E. S. M. T. (2018). Solar radiation machine learning production depend on training neural networks with ant colony optimization algorithms. International Journal of Advanced Research in Computer and Communication Engineering (IJARCCE), 7(5), 1-4.

[9] Hassib, E. M., El-Desouky, A. I., Labib, L. M., & El-Kenawy, E. S. M. (2020). WOA+ BRNN: An imbalanced big data classification framework using Whale optimization and deep neural network. soft computing, 24(8), 5573-5592.

[10] Kaveh, A., Talatahari, S., & Khodadadi, N. (2019). The hybrid invasive weed optimization-shuffled frog-leaping algorithm applied to optimal design of frame structures. Periodica Polytechnica Civil Engineering, 63(3), 882-897.

[11] Khodadadi, N., Abualigah, L., & Mirjalili, S. (2022). Multi-objective stochastic paint optimizer (MOSPO). Neural Computing and Applications, 34(20), 18035-18058.

[12] Kaveh, A., Talatahari, S., & Khodadadi, N. (2022). Stochastic paint optimizer: theory and application in civil engineering. Engineering with Computers, 1-32.

[13] Khodadadi, N., & Mirjalili, S. (2022). Truss optimization with natural frequency constraints using generalized normal distribution optimization. Applied Intelligence, 52(9), 10384-10397.

[14] Khodadadi, N., Soleimanian Gharehchopogh, F., & Mirjalili, S. (2022). MOAVOA: a new multi-objective artificial vultures optimization algorithm. Neural Computing and Applications, 34(23), 20791-20829.

[15] Khodadadi, N., Abualigah, L., Al-Tashi, Q., & Mirjalili, S. (2023). Multi-objective chaos game optimization. Neural Computing and Applications, 35(20), 14973-15004.