

IoT in Smart Agriculture: Optimization of Crop Production

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Abstract

The integration of IoT in agriculture offers transformative solutions for crop production optimization. This paper examines IoT-enabled frameworks for monitoring environmental conditions, predicting crop growth, and improving resource allocation. By utilizing real-time data, the proposed system enhances efficiency, reduces waste, and increases productivity. Results demonstrate that IoT technologies are essential for advancing smart agriculture practices.

(Keywords:)

IoT, Smart Agriculture, Crop Production, Real-Time Monitoring, Resource Optimization

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REFERENCES

- [1] El-Kenawy, E. S. M., Ibrahim, A., Mirjalili, S., Eid, M. M., & Hussein, S. E. (2020). Novel feature selection and voting classifier algorithms for COVID-19 classification in CT images. *IEEE access*, 8, 179317-179335.
- [2] 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.
- [3] 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.
- [4] 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.
- [5] El-Kenawy, E. S. M., Mirjalili, S., Ibrahim, A., Alrahmawy, M., El-Said, M., Zaki, R. M., & Eid, M. M. (2021). Advanced meta-heuristics, convolutional neural networks, and feature selectors for efficient COVID-19 X-ray chest image classification. *Ieee Access*, 9, 36019-36037.
- [6] Abdelhamid, A. A., El-Kenawy, E. S. M., Khodadadi, N., Mirjalili, S., Khafaga, D. S., Alharbi, A. H., ... & Saber, M. (2022). Classification of monkeypox images based on transfer learning and the Al-Biruni Earth Radius Optimization algorithm. *Mathematics*, 10(19), 3614.
- [7] Ibrahim, A., Mirjalili, S., El-Said, M., Ghoneim, S. S., Al-Harhi, M. M., Ibrahim, T. F., & El-Kenawy, E. S. M. (2021). Wind speed ensemble forecasting based on deep learning using adaptive dynamic optimization algorithm. *IEEE Access*, 9, 125787-125804.
- [8] El-Kenawy, E. S. M., Mirjalili, S., Alassery, F., Zhang, Y. D., Eid, M. M., El-Mashad, S. Y., ... & Abdelhamid, A. A. (2022). Novel meta-heuristic algorithm for feature selection, unconstrained functions and engineering problems. *IEEE Access*, 10, 40536-40555.
- [9] Abdelhamid, A. A., El-Kenawy, E. S. M., Alotaibi, B., Amer, G. M., Abdulkader, M. Y., Ibrahim, A., & Eid, M. M. (2022). Robust speech emotion recognition using CNN+ LSTM based on stochastic fractal search optimization algorithm. *Ieee Access*, 10, 49265-49284.
- [10] 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.
- [11] Eid, M. M., El-kenawy, E. S. M., & Ibrahim, A. (2021, March). A binary sine cosine-modified whale optimization algorithm for feature selection. In *2021 National Computing Colleges Conference (NCCC)* (pp. 1-6). IEEE.
- [12] El-Kenawy, E. S. M., Mirjalili, S., Abdelhamid, A. A., Ibrahim, A., Khodadadi, N., & Eid, M. M. (2022). Meta-heuristic optimization and keystroke dynamics for authentication of smartphone users. *Mathematics*, 10(16), 2912.
- [13] Abdelhamid, A. A., Towfek, S. K., Khodadadi, N., Alhussan, A. A., Khafaga, D. S., Eid, M. M., & Ibrahim, A. (2023). Waterwheel plant algorithm: a novel metaheuristic optimization method. *Processes*, 11(5), 1502.
- [14] Alhussan, A. A., Abdelhamid, A. A., El-Kenawy, E. S. M., Ibrahim, A., Eid, M. M., Khafaga, D. S., & Ahmed, A. E. (2023). A binary waterwheel plant optimization algorithm for feature selection. *IEEE Access*, 11, 94227-94251.
- [15] 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.
- [16] El-Kenawy, E. S. M., Abdelhamid, A. A., Ibrahim, A., Mirjalili, S., Khodadadi, N., Alduailij, M. A., ... & Khafaga, D. S. (2023). Al-Biruni Earth Radius (BER) Metaheuristic Search Optimization Algorithm. *Comput. Syst. Sci. Eng.*, 45(2), 1917-1934.
- [17] Alharbi, A. H., Towfek, S. K., Abdelhamid, A. A., Ibrahim, A., Eid, M. M., & Khafaga, D. S. & Saber, M.(2023). Diagnosis of Monkeypox Disease Using Transfer Learning and Binary Advanced Dipper Throated Optimization Algorithm. *Biomimetics*, 8(3), 313.
- [18] El-Kenawy, E. S. M., Mirjalili, S., Khodadadi, N., Abdelhamid, A. A., Eid, M. M., El-Said, M., & Ibrahim, A. (2023). Feature selection in wind speed forecasting systems based on meta-heuristic optimization. *Plos one*, 18(2), e0278491.
- [19] 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.
- [20] Eid, M. M., El-Kenawy, E. S. M., Khodadadi, N., Mirjalili, S., Khodadadi, E., Abotaleb, M., ... & Khafaga, D. S. (2022). Meta-heuristic optimization of LSTM-based deep network for boosting the prediction of monkeypox cases. *Mathematics*, 10(20), 3845.
- [21] Khodadadi, N., Khodadadi, E., Al-Tashii, 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.
- [22] Salamai, A. A., El-kenawy, E. S. M., & Abdelhameed, I. (2021). Dynamic voting classifier for risk identification in supply chain 4.0. *Computers, Materials & Continua*, 69(3).
- [23] Djaafari, A., Ibrahim, A., Bailek, N., Bouchouicha, K., Hassan, M. A., Kuriqi, A., ... & El-Kenawy, E. S. M. (2022). Hourly predictions of direct normal irradiation using an innovative hybrid LSTM model for concentrating solar power projects in hyper-arid regions. *Energy Reports*, 8, 15548-15562.