5. CONCLUSIONS

The presence of fuzzy information has complicated the predictive analysis of complex systems under multiple constraints. For engineering applications, it is very meaningful to develop a predictive analysis method facing multiple fuzzy constraints. This paper puts forward an improved multiconstrained fuzzy predictive analysis algorithm. The author explained the normalization, weighting, granularity setting and classic domain of the attributes of multiple constraints, introduced the calculation of the fuzzy distance and fuzzy closeness for the attributes of multiple constraints, and detailed the realization of our algorithm and model multi-constrained fuzzy predictive analysis. The effectiveness and feasibility of our algorithm and model were demonstrated through comparison with relevant data in the literature. The results show that the results of our approach agree with those of the literature. The proposed algorithm and model provide a new solution and support to multi-constrained fuzzy predictive analysis.

ACKNOWLEDGMENT

1. Key scientific research projects of institutions of higher learning in Henan Province in 2020 (NO.20A520034): Research and development of task scheduling optimization in distributed system for resource sharing and load balancing.

2. Key R & D and promotion special projects of Henan Province in 2020 (NO.202400450121): Research on the strategy of financial accounting system construction in Henan Province from the perspective of artificial intelligence.

3. Henan Province Teacher Education Curriculum Reform Project: Research on the curriculum reform of teachers' Informatization in primary and secondary schools under the mode of "Internet + education"(NO.2019-JSJYYB-118).

REFERENCES

- Zhang, L.M., Tang, W., Liu, Y.F., Lv, T. (2015). Multiobjective optimization and decision-making for DG planning considering benefits between distribution company and DGs owner. International Journal of Electrical Power & Energy Systems, 73: 465-474. http://dx.doi.org/ 10.1016/j.ijepes.2015.05.019
- Guo, Q., Zou, G.T. (2017). Prediction method for extension architecture programming based on decision tree classification. CAAI Transactions on Intelligent Systems, 12(1): 117-123. http://dx.doi.org/10.11992/tis.201610015
- [3] Majhi, B., Anish, C.M. (2015). Multiobjective optimization based adaptive models with fuzzy decision making for stock market forecasting. Neurocomputing, 502-511.

http://dx.doi.org/10.1016/j.neucom.2015.04.044

- [4] Ekel, P., Kokshenev, I., Parreiras, R., Pedrycz, W., Pereira Jr, J. (2016). Multiobjective and multiattribute decision making in a fuzzy environment and their power engineering applications. Information Sciences, 361-362: 100-119. http://dx.doi.org/10.1016/j.ins.2016.04.030
- [5] Lu, H. (2016). A grey forecasting model of the implicit correlation in complex system based on grey relation analysis method. Journal of Jiamusi University (Natural

Science Edition), 34(1): 110-113. http://dx.doi.org/10.3969/j.issn.1008-1402.2016.01.028

- [6] Javed, S.A., Mahmoudi, A., Khan, A.M., Javed, S., Liu, S. (2018). A critical review: Shape optimization of welded plate heat exchangers based on grey correlation theory. Applied Thermal Engineering, 144: 593-599. https://doi.org/10.1016/j.applthermaleng.2018.08.086
- [7] Bezuglov, A., Comert, G. (2016). Short-term freeway traffic parameter prediction: Application of grey system theory models. Expert Systems with Applications, 62: 284-292. http://dx.doi.org/10.1016/j.eswa.2016.06.032
- [8] Memon, M.S., Lee, Y.H., Mari, S.I. (2015). Group multicriteria supplier selection using combined grey systems theory and uncertainty theory. Expert Systems with Applications, 42: 7951-7959. http://dx.doi.org/10.1016/j.eswa.2015.06.018
- [9] Vukovic, D., Vyklyuk, Y., Chernova, N., Maiti, M. (2019). Neural network forecasting in prediction Sharpe ratio: Evidence from EU debt market. Physica A: Statistical Mechanics and its Applications, 123331. https://doi.org/10.1016/j.physa.2019.123331
- [10] Navas, R.K.B., Prakash, S., Sasipraba, T. (2019). Artificial Neural Network based computing model for wind speed prediction: A case study of Coimbatore, Tamil Nadu, India. Physica A: Statistical Mechanics and its Applications, 123383. https://doi.org/10.1016/j.physa.2019.123383
- [11] Akyol, K. (2020). Comparing of deep neural networks and extreme learning machines based on growing and pruning approach. Expert Systems with Applications, 140: 107-111. https://doi.org/10.1016/j.eswa.2019.112875
- Mao, Y., Wang, J., Lu, X., Mao, D., Gao, X. (2017). Research and application of uncertain genetic neural network in landslide hazard prediction. Computer Engineering, 43(2): 308-316. https://doi.org/10.3969/j.issn.1000-3428.2017.02.052
- [13] Wadkar, M., Di Troia, F., Stamp, M. (2020). Detecting malware evolution using support vector machines. Expert Systems with Applications, 2020: 143: 1-10. https://doi.org/10.1016/j.eswa.2019.113022
- [14] Hou, Q., Liu, L., Zhen, L., Jing, L. (2018). A novel projection nonparallel support vector machine for pattern classification. Engineering Applications of Artificial Intelligence, 75: 64-75. https://doi.org/10.1016/j.engappai.2018.08.003
- [15] Lukmanto, R.B., Nugroho, A., Akbar, H. (2019). Early detection of diabetes mellitus using feature selection and fuzzy support vector machine. Procedia Computer Science, 157: 46-54. https://doi.org/10.1016/j.procs.2019.08.140
- [16] Gangsar, P., Tiwari, R. (2019). A support vector machine based fault diagnostics of Induction motors for practical situation of multi-sensor limited data case. Measurement, 135: 694-711.
 https://doi.org/10.1016/j.measurement.2018.12.011

https://doi.org/10.1016/j.measurement.2018.12.011

- [17] Lee, C.K.H. (2018). A review of applications of genetic algorithms in operations management. Engineering Applications of Artificial Intelligenc, 76: 1-12. https://doi.org/10.1016/j.engappai.2018.08.011
- [18] Iyer, V.H., Mahesh, S., Malpani, R., Sapre, M., Kulkarni, A.J. (2019). Adaptive range genetic algorithm: A hybrid optimization approach and its application in the design and economic optimization of shell-and-tube heat

exchanger. Engineering Applications of Artificial Intelligence, 85: 444-461. https://doi.org/10.1016/j.engappai.2019.07.001

- [19] de Assis, L.S., Junior, J.R.D.P., Tarrataca, L., Haddad, D.B. (2019). Efficient Volterra systems identification using hierarchical genetic algorithms. Applied Soft Computing, 85: 1-12. https://doi.org/10.1016/i.asoc.2019.105745
- [20] Tseng, H.E., Chang, C.C., Lee, S.C., Huang, Y.M. (2018). A block-based genetic algorithm for disassembly sequence planning. Expert Systems with Applications, 96: 492-505. https://doi.org/10.1016/j.eswa.2017.11.004
- [21] Lu, H. (2016). A multilevel extension association forecasting analysis model under the influence of many factors and its application of complex systems. Chong Qin Ke Ji Xue Yuan Xue Bao (Natural Science Edition), 18(3): 107-111. http://dx.doi.org/10.3969/j.issn.1673-1980.2016.03.030
- [22] Chao, K.H. (2014). An extension theory-based maximum power tracker using a particle swarm optimization algorithm. Energy Conversion and Management, 86: 435-442.

http://dx.doi.org/10.1016/j.enconman.2014.05.018

[23] Chao, K.H., Ching, J.L. (2010). An intelligent maximum power point tracking method based on extension theory for PV systems. Expert Systems with Applications, 37(2): 1050-1055.

http://dx.doi.org/10.1016/j.eswa.2009.06.068

- [24] Silva, M.M., de Gusmão, A.P.H., Poleto, T., e Silva, L.C., Costa, A.P.C.S. (2014). A multidimensional approach to information security risk management using FMEA and fuzzy theory. International Journal of Information Management, 34(6): 733-740. http://dx.doi.org/10.1016/j.ijinfomgt.2014.07.005
- [25] Magdalena, L. (2019). Semantic interpretability in hierarchical fuzzy systems: Creating semantically decouplable hierarchies. Information Sciences, 496: 109-123. https://doi.org/10.1016/j.ins.2019.05.016
- [26] Sakthivel, R., Raajananthini, K., Kwon, O.M., Mohanapriya, S. (2019). Estimation and disturbance rejection performance for fractional order fuzzy systems. ISA Transactions, 92: 65-74. https://doi.org/10.1016/j.isatra.2019.02.005