



## Advancements in Optimization for Automotive Manufacturing: Hybrid Approaches and Machine Learning

N. Nainggolan<sup>a,\*</sup>  0000-0002-1825-5576, E. Maghsoudlou<sup>b</sup>  0000-0001-9591-1218,

B. M. AlWadi<sup>c</sup>  0000-0003-1677-1275, F. Atamurotov<sup>d,e,f</sup>  0000-0001-8857-4970,

M. E. Kovsov<sup>g,h,i</sup>  0000-0002-1067-0935, W. Putra<sup>j</sup>  0009-0006-6697-7393

<sup>a</sup> Mathematics Department, Sam Ratulangi University, Manado, Indonesia;

<sup>b</sup> Southern Illinois University Carbondale, School of Computing, Department of Computer Science, Carbondale, IL United States;

<sup>c</sup> Al Zaytoonah University of Jordan, Amman, Jordan;

<sup>d</sup> New Uzbekistan University, Tashkent, Uzbekistan;

<sup>e</sup> Central Asian University, Tashkent, Uzbekistan;

<sup>f</sup> University of Tashkent for Applied Sciences, Tashkent, Uzbekistan;

<sup>g</sup> Plekhanov Russian University of Economics, Department of State and Municipal Finance, Moscow, Russia;

<sup>h</sup> Financial University under the Government of the Russian Federation, Department of Public Finance, Moscow, Russia;

<sup>i</sup> HSE University, Legal Management Institute HSLA, Moscow, Russian Federation;

<sup>j</sup> Universitas Tanjungpura, Pontianak, Indonesia

## References

- [1] T. Bidarra, R. Godina, J. C. Matias, and S. G. Azevedo, “SMED methodology implementation in an automotive industry using a case study method,” International Journal of Industrial Engineering and Management, vol. 9, no. 1, p. 1-16, 2018, doi: 10.24867/IJIEM-2018-1-101.
- [2] R. S. Mor, D. Kumar, S. Yadav, and S. K. Jaiswal, “Achieving cost efficiency through increased inventory leanness: Evidence from manufacturing industry,” Production Engineering Archives, vol. 27, no. 1, pp. 42-49, 2021, doi: 10.30657/pea.2021.27.6.
- [3] F. Sabbagh, “The impact of renewable energies on sustainable development,” Journal of Engineering, Management and Information Technology, vol. 1, no. 3, pp. 137-140, 2023, doi: 10.61552/JEMIT.2023.03.004.
- [4] C. Ramírez-Márquez, and J. M. Ponce-Ortega, “Process systems engineering tools for the water-energy-food nexus: challenges and opportunities,” Current Opinion in Chemical Engineering, vol. 42, p. 100980, 2023, doi: 10.1016/j.coche.2023.100980.
- [5] Q. Liu, J. Fan, J. X. Zhang, and Y. Jin, “Guest Editorial: Advanced Intelligent Manufacturing System: Theory, Algorithms, and Industrial Applications,” IEEE Transactions on Industrial Informatics, vol. 19, no. 6, pp. 7720-7723, 2023, doi: 10.1109/TII.2023.38272276.
- [6] M. Zaidi and S. M. Hasan, “Supply Chain Risk Prioritization Using AHP and Framework Development: A Perspective of the Automotive Industry”, International Journal of Industrial Engineering and Management, vol. 13, no. 4, pp. 283-293, 2022, doi: 10.24867/IJIEM-2022-4-319.
- [7] A. Thelen et al., “A comprehensive review of digital twin—part 1: modeling and twinning enabling technologies,” Structural and Multidisciplinary Optimization, vol. 65, no. 12, p. 354, 2022, doi: 10.1007/s00158-022-03425-4.
- [8] R. Bridgelall, Optimization Problems in Transportation and Logistics: A Practical Guide. MDPI books, 2024, doi: 10.48550/arXiv.2211.07345.
- [9] Y. Zhang, Y. Liang, B. Jia, and P. Wang, “Scheduling and Process Optimization for Blockchain-Enabled Cloud Manufacturing Using Dynamic Selection Evolutionary Algorithm,” IEEE Transactions on Industrial Informatics, vol. 19, no. 2, pp. 1903-1911, 2022, doi: 10.1109/TII.2022.3188835.

- [10] V. Sousa, J. A. Bogas, S. Real, I. Meireles, and A. Carriço, “Recycled cement production energy consumption optimization,” Sustainable Chemistry and Pharmacy, vol. 32, p.101010, 2023, doi: 10.1016/j.scp.2023.101010.
- [11] N. Nedjah and L. S. Junior, “Review of methodologies and tasks in swarm robotics towards standardization,” Swarm and Evolutionary Computation, vol. 50, p. 100565, 2019, doi: 10.1016/j.swevo.2019.100565.
- [12] E. Setyati, and I. Juniwati, “Ant Colony Optimization Ant Colony Optimization untuk menyelesaikan perutean distribusi Snack dengan Vehicle Routing Problem,” Jurnal Teknologi Informasi dan Terapan, vol. 9, no. 2, pp. 111-117, 2022.
- [13] J. Cheng, Y. Lin, and X. He, “Mixed-integer linear programming for enterprise's inventory pledge financing decision,” In 2022 IEEE International Conference on Networking, Sensing and Control (ICNSC), pp. 1-6, IEEE, Shanghai, China, 2022, doi: 10.1109/ICNSC55942.2022.10004127.
- [14] F. Ding, W. Zhang, S. Cao, S. Hao, L. Chen, X. Xie, W.-P. Li, and M. Jiang, “Optimization of water quality index models using machine learning approaches,” Water Research, vol. 243, p. 120337, 2023, doi: 10.1016/j.watres.2023.120337.
- [15] T. M. Thekkil, and N. Prabakaran, “A Multi-Objective Optimization for Remote Monitoring Cost Minimization in Wireless Sensor Networks,” Wireless Personal Communications, vol. 121, no. 1, pp. 1049-1065, 2021, doi: 10.1007/s11277-021-08671-1.
- [16] R. Hartner and V. Mezhuyev, “Time Series Based Forecasting Methods in Production Systems: A Systematic Literature Review”, International Journal of Industrial Engineering and Management, vol. 13, no. 2, pp. 119-134, 2022, doi: 10.24867/IJIEM-2022-2-306.
- [17] E. Haghgoshayie, Z. Ghorbani, and E. Hasapoor, “Home care environments are not adequately catered for by existing infection prevention guidelines,” Evidence-based nursing, vol. 25, no. 1, p. 30, 2022, doi: 10.1136/ebnurs-2020-103369.
- [18] S. Kim, and K. Chung, “Optimization of Capacity Allocation Models with Effort Dependent Demand in Global Supply Chain,” Sustainability, vol. 14, no. 3, p. 1375, 2022, doi: 10.3390/su14031375.
- [19] H. Singh, C. Li, P. Cheng, X. Wang, G. Hao, and Q. Liu, “Real-Time Optimization and Decarbonization of Oil and Gas Production Value Chain Enabled by Industry 4.0 Technologies: A Critical Review,” SPE Production & Operations, vol. 38, no. 3, pp. 433-451, 2023, doi: 10.2118/214301-PA.
- [20] A. P. Tyapukhin, “Value chain management versus supply chain management,” International Journal of Management Concepts and Philosophy, vol. 16, no. 4, pp. 335-353, 2023, doi: 10.1504/IJMCP.2023.133790.
- [21] K. A. Dimitrova, “Virtual and augmented reality in education - opportunities, principles, current aspects,” Edu & Tech Journal, vol. 18, no. 1, pp. 22-25, 2022, doi: 10.26883/2010.221.4177.
- [22] Oxford Analytica, “Nigeria faces security sector reform challenge. Emerald Expert Briefings,” (oxan-db), Nigeria, 2023, doi: 10.1108/OXAN-DB277909.
- [23] S. Ahmadi, “Optimizing Data Warehousing Performance through Machine Learning Algorithms in the Cloud,” International Journal of Science and Research (IJSR), vol. 12, no. 12, pp. 1859-1867, 2023, doi: 10.21275/SR231224074241.
- [24] A. H. Bajgiran and J. Jang, “A study of subsidizing a biofuel supply chain to incentivize the production of advanced biofuel: an equilibrium problem with equilibrium constraints approach,” International Journal of Energy Research, vol. 45, no. 11, pp. 16932-16946, 2021, doi: 10.1002/er.6914.