



Universiteit
Leiden

The Netherlands

Model-assisted optimal control framework for industrial system coupling problems

Wei, X.

Citation

Wei, X. (2026, July 7). *Model-assisted optimal control framework for industrial system coupling problems*. Retrieved from <https://hdl.handle.net/1887/4307775>

Version: Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/4307775>

Note: To cite this publication please use the final published version (if applicable).

Bibliography

- Xu, X., Lu, Y., Vogel-Heuser, B., & Wang, L. (2021). Industry 4.0 and Industry 5.0—Inception, conception and perception. *Journal of manufacturing systems*, *61*, 530-535.
- Wang, X., Song, J., Duan, H., & Wang, X. E. (2021). Coupling between energy efficiency and industrial structure: An urban agglomeration case. *Energy*, *234*, 121304.
- Xing, X., & Ding, M. (2024). Thermodynamics and stochastic thermodynamics of strongly coupled systems. *Physical Review E*, *109*(3), 034105.
- Kieckhefen, P., Pietsch, S., Dosta, M., & Heinrich, S. (2020). Possibilities and limits of computational fluid dynamics–discrete element method simulations in process engineering: A review of recent advancements and future trends. *Annual review of chemical and biomolecular engineering*, *11*(1), 397-422.
- Shahriar, A., Montoya, H., Majlesi, A., Avila, D., & Montoya, A. (2024). Coupling Independent Solid Mechanics-Based Systems in a System-of-Systems Modeling Framework. *ALAA Journal*, *62*(9), 3510-3525.
- Garcia, G. R., Michau, G., Einstein, H. H., & Fink, O. (2021). Decision support system for an intelligent operator of utility tunnel boring machines. *Automation in Construction*, *131*, 103880.
- Mahmoodzadeh, A., Mohammadi, M., Ibrahim, H. H., Abdulhamid, S. N., Ali, H. F. H., Hasan, A. M., ... & Mahmud, H. (2021). Machine learning forecasting models of disc cutters life of tunnel boring machine. *Automation in Construction*, *128*, 103779.
- Xu, C., Liu, X., Wang, E., & Wang, S. (2021). Prediction of tunnel boring machine operating parameters using various machine learning algorithms. *Tunnelling and Underground*

- Space Technology*, 109, 103699.
- Guo, D., Li, J., Jiang, S. H., Li, X., & Chen, Z. (2022). Intelligent assistant driving method for tunnel boring machine based on big data. *Acta Geotechnica*, 17(4), 1019-1030.
- Liu, J., Yang, X., Zeng, S., & Zhao, Y. (2022). Coupled variational inequalities: existence, stability and optimal control. *Journal of Optimization Theory and Applications*, 193(1), 877-909.
- Dang, D., Gao, F., & Hu, Q. (2020). Motion planning for autonomous vehicles considering longitudinal and lateral dynamics coupling. *Applied Sciences*, 10(9), 3180.
- Gajic, Z., Lim, M. T., Skataric, D., Su, W. C., & Kecman, V. (2018). *Optimal control: weakly coupled systems and applications*. CRC Press.
- Zhang, X., Kamgarpour, M., Georghiou, A., Goulart, P., & Lygeros, J. (2017). Robust optimal control with adjustable uncertainty sets. *Automatica*, 75, 249-259.
- Chen, Y., & Kurniawati, H. (2023). Pomdp planning for object search in partially unknown environment. *Advances in Neural Information Processing Systems*, 36, 53146-53157.
- Bhattacharya, S., Kailas, S., Badyal, S., Gil, S., & Bertsekas, D. (2023). Multiagent reinforcement learning: Rollout and policy iteration for pomdp with application to multirobot problems. *IEEE Transactions on Robotics*, 40, 2003-2023.
- Meng, D., Yang, S., He, C., Wang, H., Lv, Z., Guo, Y., & Nie, P. (2022). Multidisciplinary design optimization of engineering systems under uncertainty: a review. *International Journal of Structural Integrity*, 13(4), 565-593.
- Huang, X., Li, K., Xie, Y., Liu, B., Liu, J., Liu, Z., & Mou, L. (2022). A novel multistage constant compressor speed control strategy of electric vehicle air conditioning system based on genetic algorithm. *Energy*, 241, 122903.
- Chang, Z., Zhao, Y., Zhao, Y., Liu, G., Yang, Q., & Li, L. (2023). Off-design performance and control strategies of sCO₂ recompression power systems considering compressor operating safety. *Applied Thermal Engineering*, 232, 121044.
- Wu, Y., Bao, H., Fu, J., Wang, X., & Liu, J. (2023). Review of recent developments in fuel cell centrifugal air compressor: Comprehensive performance and testing techniques. *International Journal of Hydrogen Energy*, 48(82), 32039-32055.

- Xia, L., Han, J., He, W., & Xu, L. (2025, May). Theoretical Guidance System for Ultra-high Voltage Engineering Construction Adapted to External Environment. In *2nd International Conference on Educational Development and Social Sciences (EDSS 2025)* (pp. 506-513). Atlantis Press.
- Arcieri, G., Hoelzl, C., Schwery, O., Straub, D., Papakonstantinou, K. G., & Chatzi, E. (2024). POMDP inference and robust solution via deep reinforcement learning: An application to railway optimal maintenance. *Machine Learning*, 113(10), 7967-7995.
- Kurniawati, H. (2022). Partially observable markov decision processes and robotics. *Annual Review of Control, Robotics, and Autonomous Systems*, 5(1), 253-277.
- Lauri, M., Hsu, D., & Pajarinen, J. (2022). Partially observable markov decision processes in robotics: A survey. *IEEE Transactions on Robotics*, 39(1), 21-40.
- Morad, S., Kortvelesy, R., Bettini, M., Liwicki, S., & Prorok, A. (2023). Popgym: Benchmarking partially observable reinforcement learning. *arXiv preprint arXiv:2303.01859*.
- Zhang, Z., Liu, Q., Li, Y., Lin, K., & Li, L. (2024). Safe reinforcement learning in autonomous driving with epistemic uncertainty estimation. *IEEE Transactions on Intelligent Transportation Systems*, 25(10), 13653-13666.
- Shamsah, A., Gu, Z., Warnke, J., Hutchinson, S., & Zhao, Y. (2023). Integrated task and motion planning for safe legged navigation in partially observable environments. *IEEE Transactions on Robotics*, 39(6), 4913-4934.
- Guo, C., & Liang, Z. (2022). A predictive Markov decision process for optimizing inspection and maintenance strategies of partially observable multi-state systems. *Reliability Engineering & System Safety*, 226, 108683.
- Zheng, L., Yang, R., Zheng, M., Wang, M. Y., & Ma, J. (2025). Safe and real-time consistent planning for autonomous vehicles in partially observed environments via parallel consensus optimization. *IEEE Transactions on Intelligent Transportation Systems*.
- Xia, J., Luo, Y., Liu, Z., Zhang, Y., Shi, H., & Liu, Z. (2023). Cooperative multi-target hunting by unmanned surface vehicles based on multi-agent reinforcement learning. *Defence Technology*, 29, 80-94.

- Ye, Z., Wang, K., Chen, Y., Jiang, X., & Song, G. (2022). Multi-UAV navigation for partially observable communication coverage by graph reinforcement learning. *IEEE transactions on mobile computing*, 22(7), 4056-4069.
- Xu, H., & Zhu, D. (2025). Multiple Unmanned Aerial Vehicle Collaborative Target Search by DRL: A DQN-Based Multi-Agent Partially Observable Method. *Drones* (2504-446X), 9(1).
- Xie, H. L., Wang, Q. H., Ong, S. K., Li, J. R., & Chi, Z. P. (2022). Adaptive human-robot collaboration for robotic grinding of complex workpieces. *CIRP Annals*, 71(1), 285-288.
- Jiang, Y., Huang, Z., Yang, B., & Yang, W. (2022). A review of robotic assembly strategies for the full operation procedure: planning, execution and evaluation. *Robotics and Computer-Integrated Manufacturing*, 78, 102366.
- Lavaei, A., Soudjani, S., Frazzoli, E., & Zamani, M. (2022). Constructing MDP abstractions using data with formal guarantees. *IEEE Control Systems Letters*, 7, 460-465.
- Heinbach, B., Burggräf, P., & Wagner, J. (2023). Deep reinforcement learning for layout planning—An MDP-based approach for the facility layout problem. *Manufacturing Letters*, 38, 40-43.
- Mahajan, P., Palanisamy, B., Kumar, A., Chalapathi, G. S. S., Chamola, V., & Khabbaz, M. (2024). Multi-objective MDP-based routing in UAV networks for search-based operations. *IEEE Transactions on Vehicular Technology*, 73(9), 13777-13789.
- Kurniawati, H. (2022). Partially observable markov decision processes and robotics. *Annual Review of Control, Robotics, and Autonomous Systems*, 5(1), 253-277.
- Ororbia, M. E., & Warn, G. P. (2022). Design synthesis through a Markov decision process and reinforcement learning framework. *Journal of Computing and Information Science in Engineering*, 22(2), 021002.
- Bennett, A., & Kallus, N. (2024). Proximal reinforcement learning: Efficient off-policy evaluation in partially observed markov decision processes. *Operations Research*, 72(3), 1071-1086.
- Shi, C., Uehara, M., Huang, J., & Jiang, N. (2022, June). A minimax learning approach to off-policy evaluation in confounded partially observable markov decision processes. In

- International Conference on Machine Learning* (pp. 20057-20094). PMLR.
- Miao, R., Qi, Z., & Zhang, X. (2022). Off-policy evaluation for episodic partially observable markov decision processes under non-parametric models. *Advances in Neural Information Processing Systems*, 35, 593-606.
- Huang, Z., Tang, C., Lv, C., Tomizuka, M., & Zhan, W. (2024). Learning online belief prediction for efficient pomdp planning in autonomous driving. *arXiv preprint arXiv:2401.15315*.
- Wang, H., Yan, H., Rong, C., Yuan, Y., Jiang, F., Han, Z., ... & Li, Y. (2024). Multi-scale simulation of complex systems: a perspective of integrating knowledge and data. *ACM Computing Surveys*, 56(12), 1-38.
- Grieves, M. (2024). Intelligent digital twins and the development and management of complex systems. *Digital Twin*, 1(1), 8.
- Fang, C., Ping, Y., Gao, Y., Zheng, Y., & Chen, Y. (2022). Machine learning-aided multi-objective optimization of structures with hybrid braces—Framework and case study. *Engineering Structures*, 269, 114808.
- Feng, L., Lombardi, L., Antonini, G., & Benner, P. (2023). Multi-fidelity error estimation accelerates greedy model reduction of complex dynamical systems. *International Journal for Numerical Methods in Engineering*, 124(23), 5312-5333.
- Xu, Y., Wu, H., Liu, Z., Wang, P., & Li, Y. (2024). Multi-task learning for design under uncertainty with multi-fidelity partially observed information. *Journal of Mechanical Design*, 146(8), 081704.
- Lyu, Y., Zhao, X., Gong, Z., Kang, X., & Yao, W. (2023). Multi-fidelity prediction of fluid flow based on transfer learning using Fourier neural operator. *Physics of Fluids*, 35(7).
- Zhang, Z., Guan, Z., Gong, Y., Luo, D., & Yue, L. (2022). Improved multi-fidelity simulation-based optimisation: application in a digital twin shop floor. *International Journal of Production Research*, 60(3), 1016-1035.
- Liu, D., Yu, J., Macchiarella, N. D., & Vincenzi, D. A. (2023). Simulation fidelity. In *Human factors in simulation and training* (pp. 91-108). CRC Press.
- Sheng, Y. (2022, June). Discretization Analysis of Fluid Mechanical Flow Field Grid. In

- Journal of Physics: Conference Series* (Vol. 2292, No. 1, p. 012005). IOP Publishing.
- Kudela, J., & Matousek, R. (2022). Recent advances and applications of surrogate models for finite element method computations: a review: J. Kudela, R. Matousek. *Soft Computing*, 26(24), 13709-13733.
- Fang, J., Hu, W., Liu, Z., Zhou, Y., Wei, C., & Tan, J. (2024). A reduced order finite element-informed surrogate model for approximating global high-fidelity simulation. *Structural and Multidisciplinary Optimization*, 67(12), 211.
- Jia, W., Wang, W., & Zhang, Z. (2022). From simple digital twin to complex digital twin Part I: A novel modeling method for multi-scale and multi-scenario digital twin. *Advanced Engineering Informatics*, 53, 101706.
- Veers, P., Bottasso, C., Manuel, L., Naughton, J., Pao, L., Paquette, J., ... & Rinker, J. (2022). Grand challenges in the design, manufacture, and operation of future wind turbine systems. *Wind Energy Science Discussions*, 2022, 1-102.
- Liu, H., Xia, M., Williams, D., Sun, J., & Yan, H. (2022). Digital Twin-Driven Machine Condition Monitoring: A Literature Review. *Journal of Sensors*, 2022(1), 6129995.
- Schwarz, C., & Wang, Z. (2022). The role of digital twins in connected and automated vehicles. *IEEE Intelligent Transportation Systems Magazine*, 14(6), 41-51.
- Sharma, P., Chung, W. T., Akoush, B., & Ihme, M. (2023). A review of physics-informed machine learning in fluid mechanics. *Energies*, 16(5), 2343.
- Kundu, P. K., Cohen, I. M., Dowling, D. R., & Capecelatro, J. (2024). *Fluid mechanics*. Elsevier.
- Noah, S. T., & Sundararajan, P. (1995). Significance of considering nonlinear effects in predicting the dynamic behavior of rotating machinery. *Journal of Vibration and Control*, 1(4), 431-458.
- Bilal, S., Ullah, A., & Riaz, M. B. (2024). Analyzing the effectiveness of Nields constraint and stratification on dynamics of non-Newtonian fluid by executing numerical and machine learning approaches. *Heliyon*, 10(18).
- Peng, Q., Bao, R., Li, J., Ren, J., Tang, J., Li, J., ... & Tong, Y. (2024). Centrifugal compressor performance prediction and dynamic simulation of natural gas hydrogen blended.

- International Journal of Hydrogen Energy*, 52, 872-893.
- Ghasemzadeh, M., Mohabbatian, N., & Hadidi, K. (2023). CMOS implementation of a novel high speed 4: 2 compressor for fast arithmetic circuits. *IETE Journal of Research*, 69(5), 2392-2399.
- Nanmaran, R., Balasubramaniam, D., Kumar, P. S., Vickram, A. S., Saravanan, A., Thanigaivel, S., Srimathi & Rangasamy, G. (2023). Compressor speed control design using PID controller in hydrogen compression and transfer system. *International Journal of Hydrogen Energy*, 48(73), 28445-28452.
- He, L., Li, P., Zhang, Y., Jing, H., & Gu, Z. (2023). Control strategy analysis of multistage speed compressor for vehicle air conditioning based on particle swarm optimization. *Case Studies in Thermal Engineering*, 47, 103033.
- Lu, K., Sultan, I. A., & Phung, T. H. (2023). A literature review of the positive displacement compressor: current challenges and future opportunities. *Energies*, 16(20), 7035.
- Shahriyari, M. J., Firouzabadi, A., Khaleghi, H., & Esmailifar, S. M. (2024). A new model for compressor surge and stall control. *Scientific Reports*, 14(1), 5347.
- Deng, Y., Léchappé, V., Moulay, E., Chen, Z., Liang, B., Plestan, F., & Han, Q. L. (2022). Predictor-based control of time-delay systems: a survey. *International Journal of Systems Science*, 53(12), 2496-2534.
- Wu, K., Ren, C., Nan, Y., Li, L., Yuan, S., Shao, S., & Sun, Z. (2024). Experimental research on vehicle active suspension based on time-delay control. *International Journal of Control*, 97(5), 1157-1173.
- Lu, S., Ban, Y., Zhang, X., Yang, B., Liu, S., Yin, L., & Zheng, W. (2022). Adaptive control of time delay teleoperation system with uncertain dynamics. *Frontiers in Neurorobotics*, 16, 928863.
- Makhbouche, A., Boudjehem, B., Birs, I., & Muresan, C. I. (2023). Fractional-order PID controller based on immune feedback mechanism for time-delay systems. *Fractal and Fractional*, 7(1), 53.
- Huang, X., Li, K., Xie, Y., Liu, B., Liu, J., Liu, Z., & Mou, L. (2022). A novel multistage constant compressor speed control strategy of electric vehicle air conditioning system

- based on genetic algorithm. *Energy*, 241, 122903.
- Fang, X., Wang, H., Liu, G., Tian, X., Ding, G., & Zhang, H. (2022). Industry application of digital twin: from concept to implementation. *The International Journal of Advanced Manufacturing Technology*, 121(7), 4289-4312.
- Tsaramirsis, G., Kantaros, A., Al-Darraj, I., Piromalis, D., Apostolopoulos, C., Pavlopoulou, A., ... & Khan, F. Q. (2022). A modern approach towards an industry 4.0 model: From driving technologies to management. *Journal of Sensors*, 2022(1), 5023011.
- Kenett, R. S., & Bortman, J. (2022). The digital twin in Industry 4.0: A wide-angle perspective. *Quality and Reliability Engineering International*, 38(3), 1357-1366.
- Buede, D. M., & Miller, W. D. (2024). *The engineering design of systems: models and methods*. John Wiley & Sons.
- Zhang, M., Wu, W., & Zhou, C. (2023). Numerical model of predicting surge boundaries in high-speed centrifugal compressors. *Aerospace Science and Technology*, 141, 108518.
- Zhao, Z., Zhou, L., Bai, L., Wang, B., & Agarwal, R. (2024). Recent advances and perspectives of CFD–DEM simulation in fluidized bed. *Archives of Computational Methods in Engineering*, 31(2), 871-918.
- Wang, W., Liu, H. L., & Tan, K. C. (2022). A surrogate-assisted differential evolution algorithm for high-dimensional expensive optimization problems. *IEEE Transactions on Cybernetics*, 53(4), 2685-2697.
- Wang, Z., Yang, W., Liu, Q., Zhao, Y., Liu, P., Wu, D., ... & Chen, L. (2022). Data-driven modeling of process, structure and property in additive manufacturing: A review and future directions. *Journal of Manufacturing Processes*, 77, 13-31.
- Wang, J., Li, Y., Gao, R. X., & Zhang, F. (2022). Hybrid physics-based and data-driven models for smart manufacturing: Modelling, simulation, and explainability. *Journal of Manufacturing Systems*, 63, 381-391.
- Zubair, M., Iqbal, M. A., Shil, A., Chowdhury, M. J. M., Moni, M. A., & Sarker, I. H. (2024). An improved K-means clustering algorithm towards an efficient data-driven modeling. *Annals of Data Science*, 11(5), 1525-1544.
- He, C., Zhang, Y., Gong, D., & Ji, X. (2023). A review of surrogate-assisted evolutionary

- algorithms for expensive optimization problems. *Expert Systems with Applications*, 217, 119495.
- Ma, Z., Huang, Z., Chen, J., Cao, Z., & Gong, Y. J. (2025, July). Surrogate learning in meta-black-box optimization: A preliminary study. In *Proceedings of the Genetic and Evolutionary Computation Conference* (pp. 1137-1145).
- Ghafarinasl, P., Mahmoudan, A., Mohammadi, M., Nazarpour, A., Hoseinzadeh, S., Fathali, M., ... & Garcia, D. A. (2024). Neural network-based surrogate modeling and optimization of a multigeneration system. *Applied Energy*, 364, 123130.
- Cheng, M., Zhao, X., Dhimish, M., Qiu, W., & Niu, S. (2024). A review of data-driven surrogate models for design optimization of electric motors. *IEEE Transactions on Transportation Electrification*, 10(4), 8413-8431.
- Ling, C., Kuo, W., & Xie, M. (2022). An overview of adaptive-surrogate-model-assisted methods for reliability-based design optimization. *IEEE Transactions on Reliability*, 72(3), 1243-1264.
- Yu, Y., Buchanan, S., Pai, D., Chu, T., Wu, Z., Tong, S., ... & Ma, Y. (2023). White-box transformers via sparse rate reduction. *Advances in Neural Information Processing Systems*, 36, 9422-9457.
- Rajulapati, L., Chinta, S., Shyamala, B., & Rengaswamy, R. (2022). Integration of machine learning and first principles models. *AIChE Journal*, 68(6), e17715.
- Sheng, Y., Wang, S., Hu, Y., Xu, J., Ji, Z., & Bao, H. (2024). Integrating First-principles-based non-Fourier thermal analysis into nanoscale device simulation. *IEEE Transactions on Electron Devices*, 71(3), 1769-1775.
- Gao, H., Kaltenbach, S., & Koumoutsakos, P. (2025). Generative learning of the solution of parametric partial differential equations using guided diffusion models and virtual observations. *Computer Methods in Applied Mechanics and Engineering*, 435, 117654.
- Brunton, S. L., & Kutz, J. N. (2024). Promising directions of machine learning for partial differential equations. *Nature Computational Science*, 4(7), 483-494.
- Huang, Y., Zou, C., Li, Y., & Wik, T. (2024). Minn: Learning the dynamics of differential-algebraic equations and application to battery modeling. *IEEE Transactions on Pattern*

Analysis and Machine Intelligence.

- Xia, J., & Zou, G. (2023). Operation and maintenance optimization of offshore wind farms based on digital twin: A review. *Ocean Engineering*, 268, 113322.
- Liu, L., Zhang, X., Wan, X., Zhou, S., & Gao, Z. (2022). Digital twin-driven surface roughness prediction and process parameter adaptive optimization. *Advanced Engineering Informatics*, 51, 101470.
- Goodwin, T., Xu, J., Celik, N., & Chen, C. H. (2024). Real-time digital twin-based optimization with predictive simulation learning. *Journal of Simulation*, 18(1), 47-64.
- Liu, Q., Leng, J., Yan, D., Zhang, D., Wei, L., Yu, A., ... & Chen, X. (2021). Digital twin-based designing of the configuration, motion, control, and optimization model of a flow-type smart manufacturing system. *Journal of Manufacturing Systems*, 58, 52-64.
- Bäck, T., & Schwefel, H. P. (1993). An overview of evolutionary algorithms for parameter optimization. *Evolutionary computation*, 1(1), 1-23.
- Liu, J., Yang, F., Wu, Z., & Zhang, Z. (2023). Energy saving control and operation strategy analysis of thermal coupling system of fuel cell and metal hydride tank. *International Journal of Hydrogen Energy*, 48(57), 21850-21863.
- Li, Y., Zhang, L., Pan, Y., Tapkın, S., & Song, X. (2024). Energy-driven TBM health status estimation with a hybrid deep learning approach. *Expert Systems with Applications*, 249, 123701.
- Mahmoodzadeh, A., Nejati, H. R., Mohammadi, M., Ibrahim, H. H., Rashidi, S., & Rashid, T. A. (2022). Forecasting tunnel boring machine penetration rate using LSTM deep neural network optimized by grey wolf optimization algorithm. *Expert Systems with Applications*, 209, 118303.
- Zhang, L., Guo, J., Fu, X., Tiong, R. L. K., & Zhang, P. (2024). Digital twin enabled real-time advanced control of TBM operation using deep learning methods. *Automation in Construction*, 158, 105240.
- Li, X., Zhao, S., Shen, Y., Xue, Y., Li, T., & Zhu, H. (2024). Big data-driven TBM tunnel intelligent construction system with automated-compliance-checking (ACC) optimization.

- Expert Systems with Applications*, 244, 122972.
- Li, L., Tao, J. F., Yu, H. D., Huang, Y. X., & Liu, C. L. (2017). Online condition monitoring of gripper cylinder in TBM based on EMD method. *Chinese Journal of Mechanical Engineering*, 30(6), 1325-1337.
- Pan, Y., Zhou, X., Qiu, S., & Zhang, L. (2023). Time series clustering for TBM performance investigation using spatio-temporal complex networks. *Expert Systems with Applications*, 225, 120100.
- Chen, J. J., Zhang, W., & Wang, J. H. (2017). Data fusion analysis method for assessment on safety monitoring results of deep excavations. *Journal of Aerospace Engineering*, 30(2), B4015005.
- Huang, M. Q., Ninić, J., & Zhang, Q. (2021). BIM, machine learning and computer vision techniques in underground construction: Current status and future perspectives. *Tunnelling and Underground Space Technology*, 108, 103677.
- Abdollahi, M. S., Najafi, M., Bafghi, A. Y., & Marji, M. F. (2019). A 3D numerical model to determine suitable reinforcement strategies for passing TBM through a fault zone, a case study: Safaroud water transmission tunnel, Iran. *Tunnelling and Underground Space Technology*, 88, 186-199.
- Adoko, A. C., & Yagiz, S. (2019). Fuzzy inference system-based for TBM field penetration index estimation in rock mass. *Geotechnical and Geological Engineering*, 37(3), 1533-1553.
- Huang, Z., Xu, Y., Du, W., Cheng, E., Yan, Q., & Shen, X. (2021). A noncontact cutterhead dynamic coordinate measurement method for double-shield TBM guidance based on photographic imaging. *IEEE Transactions on Instrumentation and Measurement*, 71, 1-16.
- Sugimoto, M., Sramoon, A., Konishi, S., & Sato, Y. (2007). Simulation of shield tunneling behavior along a curved alignment in a multilayered ground. *Journal of geotechnical and geoenvironmental engineering*, 133(6), 684-694

- Chen, C., & Seo, H. (2023). Prediction of rock mass class ahead of TBM excavation face by ML and DL algorithms with Bayesian TPE optimization and SHAP feature analysis. *Acta Geotechnica*, 18(7), 3825-3848.
- Shao, C., Liao, J., Liu, Z., & Su, H. (2019). Indirect adaptive robust trajectory tracking control of hard rock TBM with load variation of tunneling face. *Chinese Journal of Mechanical Engineering*, 32(1), 34.
- Liu, W., Li, A., & Liu, C. (2022). Multi-objective optimization control for tunnel boring machine performance improvement under uncertainty. *Automation in Construction*, 139, 104310..
- Naghadehi, M. Z., Samaei, M., Ranjbarnia, M., & Nourani, V. (2018). State-of-the-art predictive modeling of TBM performance in changing geological conditions through gene expression programming. *Measurement*, 126, 46-57.
- Mostafa, S., & Sousa, R. L. (2024). Deep learning uncertainty quantification for enhancing TBM operational predictions. *Geodata and AI*, 1, 100003.
- Fu, X., Wu, M., Tiong, R. L. K., & Zhang, L. (2023). Data-driven real-time advanced geological prediction in tunnel construction using a hybrid deep learning approach. *Automation in Construction*, 146, 104672.
- Zhang, Y., Chen, Z., Jin, F., Jing, L., Xing, H., & Li, P. (2023). Cross-project prediction for rock mass using shuffled TBM big dataset and knowledge-based machine learning methods. *Science China Technological Sciences*, 66(3), 751-770.
- Zhang, X., Zheng, K., Wang, C., Chen, J., & Qi, H. (2025). A novel deep reinforcement learning for POMDP-based autonomous ship collision decision-making. *Neural Computing and Applications*, 37(21), 15963-15977.
- Pajarinen, J., Lundell, J., & Kyrki, V. (2022). POMDP planning under object composition uncertainty: Application to robotic manipulation. *IEEE Transactions on Robotics*, 39(1), 41-56.
- Song, C., Zhang, C., Shafieezadeh, A., & Xiao, R. (2022). Value of information analysis in

- non-stationary stochastic decision environments: A reliability-assisted POMDP approach. *Reliability Engineering & System Safety*, 217, 108034.
- Singla, A., Padakandla, S., & Bhatnagar, S. (2019). Memory-based deep reinforcement learning for obstacle avoidance in UAV with limited environment knowledge. *IEEE transactions on intelligent transportation systems*, 22(1), 107-118.
- Miki, T., Lee, J., Hwangbo, J., Wellhausen, L., Koltun, V., & Hutter, M. (2022). Learning robust perceptive locomotion for quadrupedal robots in the wild. *Science robotics*, 7(62), eabk2822.
- Lei, X., Zhang, Z., & Dong, P. (2018). Dynamic path planning of unknown environment based on deep reinforcement learning. *Journal of Robotics*, 2018(1), 5781591.
- Hu, Y., Fu, J., & Wen, G. (2023). Safe reinforcement learning for model-reference trajectory tracking of uncertain autonomous vehicles with model-based acceleration. *IEEE Transactions on Intelligent Vehicles*, 8(3), 2332-2344.
- Ye, D., Zhu, T., Cheng, Z., Zhou, W., & Yu, P. S. (2020). Differential advising in multiagent reinforcement learning. *IEEE transactions on cybernetics*, 52(6), 5508-5521.
- Zhao, S., Wang, J., Xu, H., & Wang, B. (2022). Composite observer-based optimal attitude-tracking control with reinforcement learning for hypersonic vehicles. *IEEE Transactions on Cybernetics*, 53(2), 913-926.
- Perrusquía, A., & Yu, W. (2020). Neural H₂ control using continuous-time reinforcement learning. *IEEE Transactions on Cybernetics*, 52(6), 4485-4494.
- Hao, Y., Lu, Q., Wang, X., & Jiang, B. (2023). Adaptive model-based reinforcement learning for fast-charging optimization of lithium-ion batteries. *IEEE Transactions on Industrial Informatics*, 20(1), 127-137.
- Pan, Z., Wang, L., Dong, C., & Chen, J. F. (2023). A knowledge-guided end-to-end optimization framework based on reinforcement learning for flow shop scheduling. *IEEE Transactions on Industrial Informatics*, 20(2), 1853-1861.

- Eskandari, M., Savkin, A. V., & Fletcher, J. (2023). Convolutional neural network with reinforcement learning for trajectories boundedness of fault ride-through transients of grid-feeding converters in microgrids. *IEEE Transactions on Industrial Informatics*, 20(3), 4906-4918.
- Silver, D., Huang, A., Maddison, C. J., Guez, A., Sifre, L., Van Den Driessche, G., ... & Hassabis, D. (2016). Mastering the game of Go with deep neural networks and tree search. *nature*, 529(7587), 484-489.
- Yan, H., Cui, Z., Chen, X., & Ma, X. (2022). Distributed multiagent deep reinforcement learning for multiline dynamic bus timetable optimization. *IEEE Transactions on Industrial Informatics*, 19(1), 469-479.
- Weerakody, P. B., Wong, K. W., Wang, G., & Ela, W. (2021). A review of irregular time series data handling with gated recurrent neural networks. *Neurocomputing*, 441, 161-178.
- Yu, W., Yin, L., Zhang, C., Chen, Y., & Liu, A. X. (2024). Application of quantum recurrent neural network in low-resource language text classification. *IEEE Transactions on Quantum Engineering*, 5, 1-13.
- Ravanelli, M., Brakel, P., Omologo, M., & Bengio, Y. (2018). Light gated recurrent units for speech recognition. *IEEE Transactions on Emerging Topics in Computational Intelligence*, 2(2), 92-102.
- Encalada-Dávila, Á., Moyón, L., Tutiven, C., Puruncajas, B., & Vidal, Y. (2022). Early fault detection in the main bearing of wind turbines based on gated recurrent unit (GRU) neural networks and SCADA data. *IEEE/ASME Transactions On Mechatronics*, 27(6), 5583-5593.
- Liu, Y., Zhang, G., Li, J., Huang, C., Wang, X., Li, L., & Zhao, X. (2023). Steering feedback torque prediction based on sequence-to-sequence network with switcher-assisted training algorithm. *IEEE Transactions on Industrial Informatics*, 20(3), 4894-4905.
- Sramoon, A., Sugimoto, M., & Kayukawa, K. (2002). Theoretical model of shield behavior during excavation. II: Application. *Journal of Geotechnical and Geoenvironmental*

- Engineering*, 128(2), 156-165.
- Fan, S., Yue, D., Yan, H., Xie, X., & Deng, C. (2024). Resilient cooperative optimization control for fuzzy nonlinear MASs under DoS attacks. *IEEE Transactions on Fuzzy Systems*, 32(7), 3903-3913.
- Liu, J., Zhu, J., Zhao, D., & Liu, C. (2024). Integrated optimization design and motion control of multi-configuration unmanned metamorphic vehicle. *Advanced Engineering Informatics*, 59, 102325.
- Huynh, T. N., Do, D. T., & Lee, J. (2021). Q-Learning-based parameter control in differential evolution for structural optimization. *Applied Soft Computing*, 107, 107464.
- Lai, Y., Yin, P., Yang, J., Ha, J., Deo, K. A., & Park, S. (2023, May). Reflow oven zone temperature advisor using the AI-driven smart recipe generator. In *2023 IEEE 73rd electronic components and technology conference (ECTC)* (pp. 1773-1778). IEEE.
- Sankar, V. U., Lakshmi, G., & Sankar, Y. S. (2022). A review of various defects in PCB. *Journal of Electronic Testing*, 38(5), 481-491.
- Tao, F., Xiao, B., Qi, Q., Cheng, J., & Ji, P. (2022). Digital twin modeling. *Journal of Manufacturing Systems*, 64, 372-389.
- Hao, H., Zhang, X., & Zhou, A. (2024). Large language models as surrogate models in evolutionary algorithms: A preliminary study. *Swarm and Evolutionary Computation*, 91, 101741.
- Ghafariasl, P., Mahmoudan, A., Mohammadi, M., Nazarpour, A., Hoseinzadeh, S., Fathali, M., ... & Garcia, D. A. (2024). Neural network-based surrogate modeling and optimization of a multigeneration system. *Applied Energy*, 364, 123130.
- Kataoka, J., Farrag, A., Lai, Y., Park, S., Jin, Y., & Won, D. (2025). ReflowNet: ConvLSTM-based direct reflow oven recipe optimization framework. *Journal of Intelligent Manufacturing*, 36(8), 5859-5873.
- Lai, Y., Ha, J. H., Deo, K. A., Yang, J., Yin, P., & Park, S. (2023). Reflow recipe establishment

- based on CFD-Informed machine learning model. *IEEE transactions on components, packaging and manufacturing technology*, 13(1), 127-134.
- Sorensen, N. J. (2021). Efficiency-optimized design of PCB-integrated magnetorquers for CubeSats. *IEEE Transactions on Aerospace and Electronic Systems*, 57(6), 3623-3632.
- Bo, T., Zhouping, Y., Han, D., & Yiping, W. (2009). Reflow profile optimization of μ BGA solder joints considering reflow temperature and time coupling. *Soldering & surface mount technology*, 21(4), 38-44.
- Illés, B. (2010). Distribution of the heat transfer coefficient in convection reflow oven. *Applied Thermal Engineering*, 30(13), 1523-1530.
- Pan, E. S., Jin, Y., Xu, H., & Liao, W. Z. (2010). Forecasting and parameters optimization of reflow soldering profile based on BPNN and GA. *Advanced materials research*, 139, 990-995.
- Tsai, T. N. (2012). Thermal parameters optimization of a reflow soldering profile in printed circuit board assembly: A comparative study. *Applied Soft Computing*, 12(8), 2601-2613.
- Suseno, E. W., & Ma'arif, A. (2021). Tuning of PID controller parameters with genetic algorithm method on DC motor. *International Journal of Robotics and Control Systems*, 1(1), 41-53.
- Ma, G., Huang, X., & Liu, S. (2021). Heat transfer modeling and oven temperature curve optimization of integrated circuit board reflow soldering. *IEEE Access*, 9, 141876-141889.
- Liu, J., Zhou, H., & Yang, B. (2021, December). THE Furnace temperature curve based on one-dimensional unsteady heat conduction model. In *2021 14th International Symposium on Computational Intelligence and Design (ISCID)* (pp. 325-328). IEEE.
- Ulger, F., Yuksel, S. E., Yilmaz, A., & Gokcen, D. (2023). Solder joint inspection on printed circuit boards: A survey and a dataset. *IEEE Transactions on Instrumentation and Measurement*, 72, 1-21.
- Ming, Z., Tang, B., Deng, L., Yang, Q., & Li, Q. (2025). Digital twin-assisted fault diagnosis

- framework for rolling bearings under imbalanced data. *Applied Soft Computing*, 168, 112528.
- Bhatti, G., Mohan, H., & Singh, R. R. (2021). Towards the future of smart electric vehicles: Digital twin technology. *Renewable and Sustainable Energy Reviews*, 141, 110801.
- Lu, Y., Li, Y., Fu, G., Jiang, Y., Huang, Y., Zhu, J., & Sheng, B. (2024). The physical information LSTM surrogate model for establishing a digital twin model of reciprocating air compressors. *Applied Soft Computing*, 167, 112309.
- Ye, F., Jin, D., Wan, Y., & Xie, X. (2023, August). A digital twin framework of reflow soldering based on a novel high dimension surrogate model. In *2023 24th International Conference on Electronic Packaging Technology (ICEPT)* (pp. 1-5). IEEE.
- Yu, E., Yu, Z., Hu, L., Hu, M., Lu, Y., Gao, W., ... & Liu, J. (2024, December). Design and Optimization of SMT Reflow Soldering Curves Driven by Digital Twins. In *2024 20th International Conference on Mobility, Sensing and Networking (MSN)* (pp. 367-373). IEEE Computer Society.
- Lee, J. R., Aziz, M. S. A., Ishak, M. H. H., & Khor, C. Y. (2022). A review on numerical approach of reflow soldering process for copper pillar technology. *The International Journal of Advanced Manufacturing Technology*, 121(7), 4325-4353.
- Priya, G. V., & Ganguly, S. (2024). Multi-swarm surrogate model assisted PSO algorithm to minimize distribution network energy losses. *Applied Soft Computing*, 159, 111616.
- Agarwal, L., Jaint, B., & Mandpura, A. K. (2025). Hybrid AI framework for detecting cyberattacks and predicting cascading failures in power systems. *Sustainable Computing: Informatics and Systems*, 101222.
- Gu, J., Hua, W., Yu, W., Zhang, Z., & Zhang, H. (2022). Surrogate model-based multiobjective optimization of high-speed PM synchronous machine: Construction and comparison. *IEEE Transactions on Transportation Electrification*, 9(1), 678-688.
- Zhang, X., Xie, F., Ji, T., Zhu, Z., & Zheng, Y. (2021). Multi-fidelity deep neural network surrogate model for aerodynamic shape optimization. *Computer Methods in Applied*

- Mechanics and Engineering*, 373, 113485.
- Sun, J., Wang, L., & Gong, D. (2023). A joint optimization algorithm based on the optimal shape parameter–gaussian radial basis function surrogate model and its application. *Mathematics*, 11(14), 3169.
- Karkaria, V., Goeckner, A., Zha, R., Chen, J., Zhang, J., Zhu, Q., ... & Chen, W. (2024). Towards a digital twin framework in additive manufacturing: Machine learning and bayesian optimization for time series process optimization. *Journal of Manufacturing Systems*, 75, 322-332.
- Lee, C. H., Lin, K. X., & Chou, C. W. (2025). Surrogate-based optimization framework for enhancing SMT process quality and productivity in electronics manufacturing services. *The International Journal of Advanced Manufacturing Technology*, 136(11), 5103-5122.
- Gao, J., Wu, Y., & Ding, H. (2007). Optimization of a reflow soldering process based on the heating factor. *Soldering & surface mount technology*, 19(1), 28-33.
- Agarwal, L., Jaint, B., & Mandpura, A. K. (2024). Reducing overfitting in deep learning intrusion detection for power systems with CTGAN. *Chaos, Solitons & Fractals*, 188, 115603.
- Yang, F., & Wang, B. (2024). Dual Channel-Spatial Self-Attention Transformer and CNN synergy network for 3D medical image segmentation. *Applied Soft Computing*, 167, 112255.
- Mishra, N. K., Singh, P., Gupta, A., & Joshi, S. D. (2025). PP-CNN: probabilistic pooling CNN for enhanced image classification. *Neural Computing and Applications*, 37(6), 4345-4361.
- Yang, F., Song, X., Yi, W., Li, R., Wang, Y., Xiao, Y., ... & Ma, X. (2025). Lost data reconstruction for structural health monitoring by parallel mixed Transformer-CNN network. *Mechanical Systems and Signal Processing*, 224, 112142.
- Ak, S. E., & Cadirci, S. (2022). Investigation of suction flow control on centrifugal

- compressor with vaned diffuser. *Energies*, 15(2), 583.
- Alsuwian, T., Amin, A. A., Iqbal, M. S., & Maqsood, M. T. (2023). A review of anti-surge control systems of compressors and advanced fault-tolerant control techniques for integration perspective. *Heliyon*, 9(9).
- Cortinovis, A., Ferreau, H. J., Lewandowski, D., & Mercangöz, M. (2014, December). Safe and efficient operation of centrifugal compressors using linearized MPC. In *53rd IEEE Conference on Decision and Control* (pp. 3982-3987). IEEE.
- Daniarta, S., Wardana, A. N., & Rosita, W. (2016, August). Performance evaluation of compressor anti-surge control based on model predictive in ammonia plant. In *2016 International Seminar on Application for Technology of Information and Communication (ISemantic)* (pp. 75-79). IEEE.
- Fu, J., Wang, H., Sun, X., Bao, H., Wang, X., & Liu, J. (2024). Multi-objective optimization for impeller structure parameters of fuel cell air compressor using linear-based boosting model and reference vector guided evolutionary algorithm. *Applied Energy*, 363, 123057.
- Ge, X., Han, Q. L., Ding, L., Wang, Y. L., & Zhang, X. M. (2020). Dynamic event-triggered distributed coordination control and its applications: A survey of trends and techniques. *IEEE Transactions on Systems, Man, and Cybernetics: Systems*, 50(9), 3112-3125.
- Ju, Y., Liu, Y., Jiang, W., & Zhang, C. (2021). Aerodynamic analysis and design optimization of a centrifugal compressor impeller considering realistic manufacturing uncertainties. *Aerospace Science and Technology*, 115, 106787.
- Kurz, R., Mistry, J., Davis, P., & Cole, G. J. (2021, September). Application and control of variable speed centrifugal compressors in the oil and gas industry. In *PCIC Conference*.
- Li, Y., Pei, P., Ma, Z., Ren, P., & Huang, H. (2020). Analysis of air compression, progress of compressor and control for optimal energy efficiency in proton exchange membrane fuel cell. *Renewable and Sustainable Energy Reviews*, 133, 110304.
- Liang, K. (2017). A review of linear compressors for refrigeration. *International Journal of*

Refrigeration, 84, 253-273.

- Mohammadi, H., & Kermani, M. (2011, November). Optimization of electrical power in multistage centrifugal compressors. In *2011 IEEE International Conference on Control System, Computing and Engineering* (pp. 193-197). IEEE.
- Peng, Z., Wang, J., Wang, D., & Han, Q. L. (2020). An overview of recent advances in coordinated control of multiple autonomous surface vehicles. *IEEE Transactions on Industrial Informatics*, 17(2), 732-745.
- Rodríguez, D., Bejarano, G., Alfaya, J. A., & Ortega, M. G. (2018). Robust and decoupling approach to PID control of vapour-compression refrigeration systems. *IFAC-PapersOnLine*, 51(4), 698-703.
- Shi, Y., Hu, Q., Shao, X., & Shi, Y. (2022). Adaptive neural coordinated control for multiple euler-lagrange systems with periodic event-triggered sampling. *IEEE transactions on neural networks and learning systems*, 34(11), 8791-8801.
- Sun, X., Zhang, G., He, T., Fu, J., & Long, W. (2024). Hierarchical evolutionary modeling and performance multi-objective optimization of centrifugal air compressors for fuel cells under multi-operating conditions. *Journal of Cleaner Production*, 484, 144355.
- Torrìsi, G., Grammatico, S., Cortinovis, A., Mercangöz, M., Morari, M., & Smith, R. S. (2017). Model predictive approaches for active surge control in centrifugal compressors. *IEEE Transactions on Control Systems Technology*, 25(6), 1947-1960.
- Wang, Z., Tan, W., Li, H., Ge, J., & Wang, W. (2023). A voltage coordination control strategy based on the reactive power-active network loss partitioned aggregation domain. *International Journal of Electrical Power & Energy Systems*, 144, 108585.
- Wei, J., Wu, D., & Wang, R. (2025). A Multi-Objective evolutionary algorithm-based optimization framework for hybrid absorption-compression heat pump systems. *Applied Energy*, 382, 125228.
- Xie, Q., Zheng, Z., Huang, C., & Dai, T. (2021). Coordinated fault ride through method for PMSG-based wind turbine using SFCL and modified control strategy. *IEEE Transactions*

on Applied Superconductivity, 31(8), 1-5.

Zhao, D., Zheng, Q., Gao, F., Bouquain, D., Dou, M., & Miraoui, A. (2014). Disturbance decoupling control of an ultra-high speed centrifugal compressor for the air management of fuel cell systems. *International Journal of Hydrogen Energy*, 39(4), 1788-1798.

List of publications

- **Xiaohan Wei**, Qing Zhang, Thomas Bäck, and Hao Wang. A hierarchical partially observable Markov decision process framework for tunnel boring machine trajectory navigation. *Engineering Applications of Artificial Intelligence*, 166(Part B):113663, 2026.
- **Xiaohan Wei**, Qing Zhang, Zhigang Ren, Jinping Luo, Thomas Bäck, and Hao Wang. Model-based safe coordinated control for centrifugal compressors using evolution strategy. *Results in Engineering*, 30:111297, 2026.
- **Xiaohan Wei**, Qing Zhang, Thomas Bäck, and Hao Wang. A Sequence-to-Sequence Multi-Fidelity Surrogate Modeling Approach for the Reflow Soldering Process. In *Proceeding of the 7th International Conference on Robotics, Intelligent Control and Artificial Intelligence*, Hangzhou, China, November 14 – 16, 2025, (pp. 822-826). IEEE.
- Qing Zhang, **Xiaohan Wei**, Ye Wang, and Chenggang Hou. Convolutional neural network with attention mechanism and visual vibration signal analysis for bearing fault diagnosis. *Sensors*, 24(6):1831, 2024.
- Tingting Jiang, Qing Zhang, Junshen Zhang, and **Xiaohan Wei**. Variational multi-harmonic duality mode pursuit method for extracting repetitive transient components from vibration signals. *Measurement*, 225:113987, 2024.
- Qing Zhang, Tingting Jiang, and **Xiaohan Wei**. Instantaneous speed estimation of induction motor by time-varying sinusoidal mode extraction from stator current. *Mechanical Systems and Signal Processing*, 200:110608, 2023.
- Tingting Jiang, Qing Zhang, **Xiaohan Wei**, and Junshen Zhang. Variational multi-harmonic mode extraction for characterising impulse envelope of bearing failures. *ISA Transactions*, 132:524-543, 2023.
- Jin Zhao, Qing Zhang, and **Xiaohan Wei**. An integrated approach of a field-circuit

coupling model and multi-physics finite-element simulation for analysing transient electromagnetic vibration of pump motors. *IET Electric Power Applications*, 16(9):1030–1056, 2022.

- Jin Zhao, Zhiwen Fang, **Xiaohan Wei** and Qing Zhang. A measurement method for compressor polytropic efficiency utilising vibrational components induced by electromagnetic excitations. *Measurement Science and Technology*, 37(16): 166001, 2026.