Name: Xiang Wu (吴祥)

Title: Professor

Degree: Ph.D.

Type of Supervisor: Doctoral Supervisor, Master Supervisor

Major: Control Theory and Control Engineering

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Basic Information

Xiang Wu (吴祥) was born in Zhenxiong county, Yunnan province. He received the B.S. degree in information and computing science from School of Mathematics and Statistics, Xi'an Jiaotong University, Xi'an, China, in 2003, the M.S. degree in systems engineering from School of IoT Engineering, Jiangnan University, Wuxi, China, in 2010, and the Ph.D. degree in control theory and control engineering from School of Automation, Southeast University, Nanjing, China, in 2014. From 2016-2020, he worked as a Postdoctoral Fellow with School of Electrical Engineering, Southeast University, Nanjing, China. He is currently a Full Professor with the School of Mathematical Sciences, Guizhou Normal University, Guiyang, China. He has authored or coauthored more than 60 peer-reviewed reputable journal articles. His main research interests include optimization, optimal control, computational intelligence, and their engineering applications.

Research Interests

1. Optimization, including nonlinear optimization, mixed-integer optimization, chance constrained optimization, etc.

2. Optimal control, including optimal control for nonlinear and switched systems

3. Computational intelligence, including genetic algorithm, evolutionary algorithm, particle swarm algorithm, hybrid intelligent algorithm, etc.

4. Engineering applications of optimization, computational intelligence, and optimal control, including smart micro-grid, hybrid electric vehicle, biochemical process, etc.

Academic Part-time Jobs

1. 《ChemEngineering》(SCI), Topical Advisory Panel Member

   https://www.mdpi.com/journal/ChemEngineering/topical_advisory_panel

2. 《Algorithms》(ESCI, EI), Topical Advisory Panel Member

   https://www.mdpi.com/journal/algorithms/topical_advisory_panel

3. 《Modelling》, Topical Advisory Panel Member

   https://www.mdpi.com/journal/modelling/topical_advisory_panel

4. 《Journal of Modern Industry and Manufacturing》, Editorial Board Member

   https://www.innovationforever.com/aboutjournal/JMIM/EditorialBoardMembers/XiangWu

5. 《Modern Intelligent Times》, Editorial Board Member

   https://www.innovationforever.com/aboutjournal/MIT/EditorialBoardMembers/XiangWu

6. 《Chemistry in Building Materials》, Editorial Board Member

   https://www.sandermanpub.com/index/journals/show/id/3.html

7. American Mathematical Society 《Mathematical Reviews》, Reviewer

   http://www.ams.org/publications/math-reviews/math-reviews

8. National Natural Science Foundation of China, Letter evaluation expert

9. Youth Working Committee of Chinese Institute of Command and Control, Member

10. Institute of Electrical and Electronics Engineers, Member

11. Chinese Association for Artificial Intelligence, Member

12. 2022 IEEE International Conference on Real-time Computing and Robotics (IEEE RCAR 2022) , Organizing Co-Chair

    http://www.ieee-rcar.org/commitee.html

13. Invited Reviewer of the Following International Journals:

    Automatica, IEEE Transactions on Automatic Control, IEEE Transactions on Industrial Informatics, SIAM Journal on Control and Optimization, Applied Soft Computing, Engineering Applications of Artificial Intelligence, Nonlinear Analysis-Hybrid Systems, Journal of Optimization Theory and Applications, etc.

Representative Research Grants

1. **Xiang Wu**, PI. 2020.01-2023.12. Research on optimal control algorithms of energy management problems for a stand-alone wind-solar-diesel-battery microgrid based on switched system models. Sponsored by the National Natural Science Foundation of China under Grant No. 61963010, 458,400 Chinese Yuan (RMB).

2. **Xiang Wu**, PI. 2015.01-2019.12. Research on robust optimal control for switched systems with input and state constraints. Sponsored by the National Natural Science Foundation of China under Grant No. 61563011, 470,000 Chinese Yuan (RMB).

Selected Journal Publications as First Author

1. **Xiang Wu**, Kanjian Zhang, Ming Cheng. Hypersonic vehicle optimal flight control: A switched dynamic system approach. Journal of Computational and Applied Mathematics, To Appear.

2. **Xiang Wu**, Kanjian Zhang. A penalty function-based greedy diffusion search algorithm for the optimization of constrained nonlinear dynamical processes with discrete-valued input. Journal of Industrial & Management Optimization, To Appear.

3. **Xiang Wu**, Jinxing Lin, Kanjian Zhang, Ming Cheng. Sensitivity analysis for the optimization of switched dynamical processes with state-dependent switching conditions and its application. Journal of Industrial & Management Optimization, To Appear.

4. **Xiang Wu**, Kanjian Zhang. A limited-memory BFGS-based differential evolution algorithm for optimal control of nonlinear systems with mixed control variables and probability constraints. Numerical Algorithms, 2022, doi: 10.1007/s11075-022-01425-5. (50 pages long paper)

5. **Xiang Wu**, Jinxing Lin, Kanjian Zhang, Ming Cheng. Numerical algorithm for optimal control of switched systems and its application in cancer chemotherapy. Applied Soft Computing, 2022, 115: 108090.

6. **Xiang Wu**, Kanjian Zhang. Chance constrained dynamic optimization approach for single machine scheduling involving flexible maintenance, production, and uncertainty. Engineering Applications of Artificial Intelligence, 2022, 114: 105024.

7. **Xiang Wu**, Jinxing Lin, Kanjian Zhang, Ming Cheng. A penalty function-based random search algorithm for optimal control of switched systems with stochastic constraints and its application in automobile test-driving with gear shifts. Nonlinear Analysis: Hybrid Systems, 2022, 45: 101218.

8. **Xiang Wu**, Kanjian Zhang, Ming Cheng. Optimal control of constrained switched systems and application to electrical vehicle energy management. Nonlinear Analysis: Hybrid

Systems, 2018, 30: 171-188.

9. **Xiang Wu**, Kanjian Zhang, Ming Cheng. Computational method for optimal control of switched systems with input and state constraints. Nonlinear Analysis: Hybrid Systems, 2017, 26: 1-18.

10. **Xiang Wu**, Kanjian Zhang, Ming Cheng. Optimal control of nonlinear systems with integer-valued control inputs and stochastic constraints. International Journal of Robust and Nonlinear Control , 2022, doi: 10.1002/rnc.6362.

11. **Xiang Wu**, Jinxing Lin, Kanjian Zhang, Ming Cheng. A switched dynamical system approach towards the optimal control of chemical processes based on a gradient-based parallel optimization algorithm. Computers & Chemical Engineering, 2018, 118: 180-194.

12. **Xiang Wu**, Qiaodan Liu, Kanjian Zhang, Ming Cheng, Xin Xin. Optimal-tuning of proportional-integral-derivative-like controller for constrained nonlinear systems and application to ship steering control. Journal of the Franklin Institute, 2018, 355: 5667-5689.

13. **Xiang Wu**, Kanjian Zhang, Ming Cheng. Computational method for optimal machine scheduling problem with maintenance and production. International Journal of Production Research, 2017, 55: 1791-1814.

14. **Xiang Wu**, Kanjian Zhang. Three-dimensional trajectory design for horizontal well based on optimal switching algorithms. ISA Transactions, 2015, 58: 348-356.

15. **Xiang Wu**, Kanjian Zhang, Changyin Sun. Optimal scheduling of multiple sensors in continuous time. ISA Transactions, 2014, 53(3): 793-801.

16. **Xiang Wu**, Kanjian Zhang, Ming Cheng. A gradient-based algorithm for non-smooth constrained optimization problems governed by discrete-time nonlinear equations with application to long-term hydrothermal optimal scheduling control. Journal of Computational and Applied Mathematics, 2022, 412: 114335.

17. **Xiang Wu**, Kanjian Zhang, Ming Cheng, Xin Xin. A switched dynamical system approach towards the economic dispatch of renewable hybrid power systems. International Journal of Electrical Power & Energy Systems, 2018, 103: 440-457.

18. **Xiang Wu**, Yuzhou Hou, Kanjian Zhang. Switched system optimal control approach for drug administration in cancer chemotherapy. Biomedical Signal Processing and Control, 2022, 75:

103575.

19. **Xiang Wu**, Kanjian Zhang, Changyin Sun. Numerical algorithm for a class of constrained optimal control problems of switched systems. Numerical Algorithms, 2014, 67(4): 771-792.

20. **Xiang Wu**, Kanjian Zhang, Changyin Sun. Parameter tuning of multi-proportional-integral-derivative controllers based on optimal switching algorithms. Journal of Optimization Theory and Applications, 2013, 159: 454-472.

21. **Xiang Wu**, Bangjun Lei, Kanjian Zhang, Ming Cheng. Hybrid stochastic optimization method for optimal control problems of chemical processes. Chemical Engineering Research and Design, 2017, 126: 297-310.

22. **Xiang Wu**, Kanjian Zhang, Ming Cheng. Sensitivity analysis for an optimal control problem of chemical processes based on a smoothing cost penalty function approach. Chemical Engineering Research and Design, 2019, 146: 221-238.

23. **Xiang Wu**, Kanjian Zhang, Changyin Sun. Constrained optimal control of switched systems based on modified BFGS algorithm and filled function method. International Journal of Computer Mathematics, 2014, 91: 1713-1729.

24. **Xiang Wu**, Kanjian Zhang, Changyin Sun. Constrained optimal control of switched systems and its application. Optimization, 2015, 64: 539-557.

25. **Xiang Wu**, Kanjian Zhang, Changyin Sun. Optimal control of switched systems with an inequality constraint based on smooth penalty function method. Sensor Letters, 2013, 11(5): 945-952.

26. **Xiang Wu**, Kanjian Zhang, Ming Cheng. Optimal control of bioprocess systems using hybrid numerical optimization algorithms. Optimization, 2018, 67: 1287-1306.

27. **Xiang Wu**, Jinxing Lin, Kanjian Zhang, Ming Cheng. Optimal impulsive control for advertising strategy problems based on a gradient-based PSO algorithm. Transactions of the Institute of Measurement and Control, 2019, 41: 2280-2292.

28. **Xiang Wu**, Qiaodan Liu, Kanjian Zhang, Ming Cheng, Xin Xin. Optimal switching control for drug therapy process in cancer chemotherapy. European Journal of Control, 2018, 42: 49-58.

29. **Xiang Wu**, Kanjian Zhang, Ming Cheng. Adaptive numerical approach for optimal control of

a single train. Journal of Systems Science and Complexity, 2019, 32: 1053-1071.

30. **Xiang Wu**, Yuzhou Hou, Kanjian Zhang. Optimal feedback control for a class of fed-batch fermentation processes using switched dynamical system approach. AIMS Mathematics, 2022, 7(5): 9206-9231.

31. **Xiang Wu**, Kanjian Zhang, Xin Xin, Ming Cheng. Fuel-optimal control for soft lunar landing based on a quadratic regularization approach. European Journal of Control, 2019, 49: 84-93.

32. **Xiang Wu**, Yuzhou Hou, Kanjian Zhang. Optimal control approach for nonlinear chemical processes with uncertainty and application to a continuous stirred-tank reactor problem. Arabian Journal of Chemistry, 2022, 15: 104257.

33. **Xiang Wu**, Yuzhou Hou, Kanjian Zhang, Ming Cheng. Dynamic optimization of 1, 3-propanediol fermentation process: A switched dynamical system approach. Chinese Journal of Chemical Engineering, 2022, 44: 192-204.

Representative Honors and Awards

1. Advanced Individual in Natural Science Research of Guizhou Normal University, 2019

2. Advanced Individual in Natural Science Research of Guizhou Normal University, 2015

3. Felix Scholarship, 2013

4. Yunnan Provincial Three Good Students, 1998

Enrollment information

1. Expected Number of Students: 1-2 Doctoral Degree Candidate Per Year; 1-2 Master Degree Candidate Per Year

2. Discipline: Mathematics

3. Basic Requirements: CET-4 or Above (Score >425); Solid Mathematical Foundation; Good Programming Skills; Ability to Work Independently and to Organize Your Work