Weiming Xiang

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Summary

Current Position: *Postdoctoral Research Scholar, Department of Electrical Engineering and Computer Science, Vanderbilt University, Nashville Tennessee, USA.*

Brief Bio: Dr. Weiming Xiang received his Ph.D degree in Southwest Jiaotong University, Chengdu, China in 2014. His Ph.D dissertation was awarded as the *Outstanding Doctoral Dissertation* of Southwest Jiaotong University. After finishing Ph.D, he was appointed to be an Associate Professor at Southwest Jiaotong University. Then, from May 2015 to October 2015, he joined and worked in the Department of Mechanical Engineering at The University of Hong Kong as a Research Associate. During November 2015 to July 2016, he worked as a Postdoctoral Research Associate in the Department of Computer Science and Engineering at the University of Texas at Arlington. After that, he joined Department of Electrical Engineering and Computer Science at Vanderbilt University in Nashville working as a Postdoctoral Research Scholar. Dr. Xiang's current research interests are focusing on cyber-physical systems, hybrid and switched systems, formal methods in verification, robust control, nonlinear systems and control, distributed control systems.

Dr. Xiang has authored or co-authored more than 60 papers in top academic journals including IEEE Transactions on Automatic Control, Automatica, International Journal of Control, etc. His publications have received over 1090 citations (Google Scholar, by December 1, 2018). One article with over 130 citations is the *Most Cited Article* in the Journal of Franklin Institute since 2011 (Ranking No. 1 by December 31, 2016). Dr. Xiang is an active reviewer for a number of journals and conferences, and he was awarded as *Outstanding Reviewer* for *IEEE Transactions on Automatic Control, 2015*, *Nonlinear Analysis: Hybrid Systems, 2016*, *Neurocomputing, 2017*, *Journal of the Franklin Institute, 2017*. He held *Co-Chair for Regular Session Switched Systems II* in CDC 2016. He is the *Leading Guest Editor of Special Issue: Recent Advances in Control and Verification for Hybrid Systems in IET Control Theory and Applications*. He is currently serving as *Associate Editor of Neurocomputing*. Dr. Xiang is an *IEEE Senior Member*.

Academic and Research Positions

Vanderbilt University — Nashville, TN USA
Postdoctoral Research Scholar — *August 2016 – present*

Univerisity of Texas at Arlington — Arlington, TX USA
Postdoctoral Research Associate — *November 2015 – July 2016*

University of Hong Kong — Hong Kong
Research Associate — *May 2015 – October 2015*

Southwest Jiaotong University — Chengdu, China
Associate Professor — *June 2014 – May 2015*

Please refer to my Research Gate profile for the complete list of experiences and research contributions.

Education

Ph.D Degree — *2009 – 2014*

Department of Transportation and Logistics, Southwest Jiaotong University, China

Dissertation: *Characteristic Analysis for Hybrid Transportation System Based on Switched System Theory*

- ◇ Outstanding Ph.D Dissertation of Southwest Jiaotong University, 2014.

Master Degree — *2005 – 2007*

Department of Automation, Nanjing University of Science and Technology, China

Thesis: *Analysis and Control for a Class of Switched Nonlinear Systems*

◇ Outstanding Master Dissertation of Nanjing University of Science and Technology, 2007.
◇ Outstanding Master Dissertation of Jiangsu Province, China, 2007.

Bachelor Degree *2001 – 2005*

Department of Electrical Engineering, East China Jiaotong University, China

Service for International Journal and Conferences

◇ Associate Editor, Neurocomputing, 2014 – present.
◇ Leading Guest Editor, Special Issue: Recent Advances in Control and Verification for Hybrid Systems, IET Control Theory and Applications, 2018.
◇ Co-Chair, Regular Session of Switched Systems II, 55th IEEE Conference on Decision & Control, 2016.
◇ PC Member, 6th International Conference on Intelligent Control & Information Processing, 2015.

Membership

◇ IEEE Senior Member, 2017 – present

Awards

◇ Top 1% of reviewers in Engineering on Publons' global reviewer database.
◇ Outstanding Reviewer, Journal of the Franklin Institute, 2017.
◇ Outstanding Reviewer, Neurocomputing, 2017.
◇ Outstanding Reviewer, Nonlinear Analysis: Hybrid Systems, 2016.
◇ Outstanding Reviewer, IEEE Transactions on Automatic Control, 2015.
◇ Outstanding Reviewer, Journal of the Franklin Institute, 2015.
◇ Most Cited Article since 2011, Journal of the Franklin Institute (Ranking No. 1, by 12/31/2016).
◇ Annual Ph.D Thesis of Southwest Jiaotong University, 2014.
◇ Annual Master Thesis of Nanjing University of Science and Technology, 2007.
◇ Annual Master Thesis of Jiangsu Province, China, 2007.

Fundings and Projects

PI/Co-PI Grants

Research on Set Computation for Switched Systems and Application in Formal Verification for Nonlinear Systems
Role: PI; Duration: 2015 – 2017; Sponsor: National Natural Science Foundation of China; Amount: 220,000 RMB (approx. $35,000).

Characteristic Analysis for Hybrid Transportation System Based on Switched System Theory
Role: PI; Duration: 2012 – 2014; Sponsor: Outstanding Doctoral Cultivation Fund in Southwest Jiaotong University; Amount: 100,000 RMB (approx. $16,000).

Research on Robust Control for High-Speed Train Electrical Motor Based on LPV Switched System Theory
Role: Co-PI; Duration: 2014 – 2017; Sponsor: National Natural Science Foundation of China; Amount: 640,000 RMB (approx. $100,000).

Research on Adhesive Control of High Speed Trains in Vehicle Controlled Traction Mode
Role: Co-PI; Duration: 2016 – 2018; Sponsor: National Natural Science Foundation of China; Amount: 210,000 RMB (approx. $35,000).

Participating in Projects

Formal Modeling of Emergence in Distributed Cyber-Physical Systems
Supervised by Prof. Taylor T. Johnson; Sponsored by Air Force Research Laboratory, USA.

Assurance-Based Learning-Enabled Cyber-Physical Systems
Supervised by Prof. Taylor T. Johnson; Sponsored by Defense Advanced Research Projects Agency (DARPA), USA.

CPS: Safe Cyber-Physical Systems Upgrades
Supervised by Prof. Taylor T. Johnson; Sponsored by National Science Foundation (NSF), USA.

Structured and Fixed-order Synthesis for Positive Systems under Gain Performances
Supervised by Prof. James Lam; Sponsored by RGC General Research Fund, Hong Kong.

Synthesis of Switched Systems using Hybrid Laws
Supervised by Prof. James Lam; Sponsored by RGC General Research Fund, Hong Kong.

Review Service for International Journals

- ◇ Applied Mathematics and Computation
- ◇ Asian Journal of Control
- ◇ Automatica
- ◇ Circuits, Systems, and Signal Processing
- ◇ Control and Intelligent Systems
- ◇ IEEE Transactions on Automatic Control
- ◇ IEEE Transactions on Fuzzy Systems
- ◇ IEEE Transactions on Systems, Man, and Cybernetics-Part B: Cybernetics
- ◇ IET Control Theory and Applications
- ◇ IMA Journal of Mathematical Control and Information
- ◇ International Journal of Adaptive Control and Signal Processing
- ◇ International Journal of Control
- ◇ International Journal of Control, Automation, and Systems
- ◇ International Journal of Robust and Nonlinear Control
- ◇ International Journal of System Science
- ◇ Journal of the Franklin Institute
- ◇ Mathematical Problems in Engineering
- ◇ Neurocomputing
- ◇ Optimal Control, Applications and Methods
- ◇ Recent Patents on Electrical and Electronic Engineering
- ◇ SIAM Journal on Control and Optimization
- ◇ System and Control Letters
- ◇ Transactions of the Institute of Measurement and Control

Review Service for International Conferences

- ◇ American Control Conference
- ◇ IEEE Control and Decision Conference
- ◇ IEEE Intelligent Transportation Systems Conferences
- ◇ IEEE Conference on Control Technology and Applications

Teaching and Mentoring Experiences

- ◇ *Linear Control System*, Teaching Assistant, Southwest Jiaotong University, Fall, 2013.
- ◇ *Control System Design*, Instructor, Southwest University of Science and Technology, Spring, 2008, 2009.
- ◇ *Circuit Analysis*, Instructor, Southwest University of Science and Technology, Fall, 2008, 2009.
- ◇ Assist mentoring Ph.D student Hoang-Dung Tran, *Formal Verification, Model Reduction, Synthesis for Hybrid System*, Vanderbilt University, 2015 – present.
- ◇ Assist mentoring Ph.D student Diego Manzanas Lopez, *Safe Neural Network Control Systems*, Vanderbilt University, 2017 – present.
- ◇ Assist mentoring Ph.D student Patrick Musau, *Formal Methods in Recurrent Neural Network Systems*, Vanderbilt University, 2017 – present.
- ◇ Assist mentoring Ph.D student Xiaodong Yang, *Learning Hybrid Automata*, Vanderbilt University, 2015 – present.
- ◇ Assist mentoring Ph.D student Muhammad Naveed Iqbal, Thesis: *Finite-time Filtering and State Estimation for Switched Control Systems*, Southwest Jiaotong University, 2011 – 2013.
- ◇ Assist mentoring Ph.D student Lu Han, Thesis: *Stability Analysis for Switched System and Application in Power Electronic Systems*, Southwest Jiaotong University, 2013 – 2014.

Selected Publications

- ◇ *Book Chapter*

1. **Weiming Xiang**, Diego Manzanas Lopez, Patrick Musau, Taylor T. Johnson. Reachable Set Estimation and Verification for Neural Network Models of Nonlinear Dynamic Systems, In *Unmanned System Technologies: Safe, Autonomous and Intelligent Vehicles*, Springer, 2018, September

- ◇ *Journal papers*

1. **Weiming Xiang**, Hoang-Dung Tran, Taylor T. Johnson. Output reachable set estimation and verification for multi-layer neural networks, *IEEE Transactions on Neural Networks and Learning Systems*, 29(11), 5777 - 5783, 2018.
2. **Weiming Xiang**, James Lam, Panshuo Li. On stability and $\mathcal{H}_\infty$ control of switched systems with random switching signal, *Automatica*, 95, 419-425, 2018.
3. **Weiming Xiang**. Parameter-memorized Lyapunov functions for discrete-time systems with time-varying parametric uncertainties, *Automatica*, 87, 450-454, 2018.
4. Simone Baldi, **Weiming Xiang**. Reachable set estimation for switched linear systems with dwell-time switching, *Nonlinear Analysis: Hybrid Systems*, 29, 20-33, 2018.
5. **Weiming Xiang**, Hoang-Dung Tran, Taylor T. Johnson. Robust exponential stability and disturbance attenuation for discrete-time switched systems under arbitrary switching, *IEEE Transactions on Automatic Control*, 63(5), 1450-1456, 2017.
6. **Weiming Xiang**, Hoang-Dung Tran, Taylor T. Johnson. Output reachable set estimation for switched linear systems and its application in safety verification, *IEEE Transactions on Automatic Control*, 62(10), 5380– 5387, 2017.
7. **Weiming Xiang**, Taylor T. Johnson, Event-triggered control for continuous-time switched linear systems, *IET Control Theory and Applications*, 11 (11), 1694–1703, 2017.
8. **Weiming Xiang**, James Lam, Jun Shen, Stability analysis and L_1-gain characterization for switched positive systems under dwell-time constraint, *Automatica*, 85, 1–8, 2017.
9. Hoang-Dung Tran, Luan Nguyen, **Weiming Xiang**, Taylor T. Johnson. Order-reduction abstractions for safety verification of high-dimensional linear systems, *Discrete Event Dynamic Systems*, 27(2), 443–461, 2017.
10. **Weiming Xiang**. Necessary and sufficient condition for stability of switched uncertain linear systems under dwell-time constraint, *IEEE Transactions on Automatic Control*, 2016, 61(11): 3619–3624.
11. **Weiming Xiang**, Guisheng Zhai, Corentin Briat. Stability analysis for LTI control systems with controller failures and its application in failure tolerant Control, *IEEE Transactions on Automatic Control*, 61(3): 811–816, 2016.

12. Lixian Zhang, **Weiming Xiang**. Mode-identifying time estimation and switching-delay tolerant control for switched systems: An elementary time unit approach, *Automatica*, 64, 174–181, 2016.
13. **Weiming Xiang**. On equivalence of two stability criteria for continuous-time switched systems with dwell time constraint, *Automatica*, 54, 36–40, 2015.
14. **Weiming Xiang**, Guisheng Zhai, Jian Xiao. Stability analysis and failure tolerant control for discrete-time linear systems with controller failure, *International Journal of Control*, 88(3), 559–570, 2015.
15. **Weiming Xiang**, Jian Xiao, M. S. Mahmoud. $\mathcal{H}_\infty$ filtering for switched discrete-time systems under asynchronous switching: A dwell-time dependent Lyapunov functional method, *International Journal of Adaptive Control and Signal Processing*, 29(8), 971–990, 2015.
16. **Weiming Xiang**, Jian Xiao, Guisheng Zhai. Dissipativity and dwell time specifications of switched discrete-time systems and its applications in $\mathcal{H}_\infty$ and robust passive control, *Information Sciences*, 320, 206–222, 2015.
17. **Weiming Xiang**, Jian Xiao, Yangsheng Jiang. Real-time signalization for an oversaturated intersection via static state feedback control: a switched system approach, *Journal of the Franklin Institute* , 352(8), 3304–3324, 2015.
18. **Weiming Xiang**, Jian Xiao. Stabilization of switched continuous-time system with all modes unstable via dwell time switching, *Automatica*, 50(3), 940–945, 2014.
19. **Weiming Xiang**, Jian Xiao, Lu Han. Decentralized weighted $\mathcal{H}_\infty$ control for a class of large-scale systems with multi-modes, *International Journal of Robust and Nonlinear Control*, 24, 3387–3408, 2014.
20. **Weiming Xiang**, Jian Xiao. Convex sufficient conditions on asymptotic stability and ℓ_2 gain performance for uncertain discrete-time switched linear systems, *IET Control Theory & Applications*, 8(3), 211–218, 2014.
21. **Weiming Xiang**, Jian Xiao, Muhammad Naveed Iqbal. State estimation for short-time switched linear systems under asynchronous switching, *International Journal of Adaptive Control & Signal Processing*, 28, 553–561, 2014.
22. **Weiming Xiang**, Jian Xiao, Lu Han. Switching PDC control for discrete-time T-S fuzzy system: a membership function ranking approach, *Journal of the Franklin Institute*, 351, 3536–3558, 2014.
23. **Weiming Xiang**, Jian Xiao. Robust fault detection for a class of uncertain switched nonlinear systems via state updating approach, *Nonlinear Analysis: Hybrid Systems*, 12, 232–146, 2014.
24. **Weiming Xiang**, Jian Xiao, Lu Han. A new approach for stability analysis of time-dependent switched continuous-time linear systems, *Asian Journal of Control*, 16(2), 461–468, 2014.
25. Jian Xiao, **Weiming Xiang**. New results on asynchronous $\mathcal{H}_\infty$ control for switched discrete-time linear systems under dwell time constraint. *Applied Mathematics and Computation*, 242, 601–11, 2014.
26. Muhammad Naveed Iqbal, Jian Xiao, **Weiming Xiang**. Parameter-dependent finite-time observer design for time-varying polytopic uncertain switched systems, *Journal of the Franklin Institute*, 351, 1657–1672, 2014.
27. Yongchi Zhao, Shengxian Zhuang, **Weiming Xiang**, and Lin Du, Discretized Lyapunov function approach for switched linear systems under dwell time constraint, Abstract and Applied Analysis (Vol. 2014), Hindawi, 2014.
28. Muhammad Naveed Iqbal, Jian Xiao, **Weiming Xiang**. Finite-time $\mathcal{H}_\infty$ state estimation for discretetime switched control systems under asynchronous switching, Asian Journal of Control, 16 (4), 1112–1121, 2014.
29. **Weiming Xiang**, Jian Xiao. $\mathcal{H}_\infty$ control synthesis of switched discrete-time fuzzy systems via hybrid approach, *Optimal Control, Applications & Methods*, 34, 635–655, 2013.
30. **Weiming Xiang**, Jian Xiao. Finite-time stability analysis and stabilization for switched linear systems, *International Journal of System Science*, 44(2), 384–400, 2013.
31. **Weiming Xiang**, Jian Xiao, Lu Han. $\mathcal{H}_\infty$ control synthesis for short-time Markovian jump continuous-time linear systems, *Circuits, Systems, & Signal Processing*, 32, 2799–2820, 2013.
32. **Weiming Xiang**, Jian Xiao. $\mathcal{H}_\infty$ filtering for switched nonlinear systems with polytopic uncertainties via filter state impulsive jump approach, *Transactions of the Institute of Measurement and Control*, 35(4), 540–550, 2013.

33. **Weiming Xiang**, Jian Xiao, Muhammad Naveed Iqbal. $\mathcal{H}_\infty$ control for switched fuzzy systems via dynamic output feedback: hybrid and switched approaches, *Communications in Nonlinear Science and Numerical Simulation*, 18(1), 1499–1514, 2013.
34. Muhammad Naveed Iqbal, Jian Xiao, **Weiming Xiang**. Finite time $\mathcal{H}_\infty$ filtering for uncertain discrete-time switching systems, *Transactions of the Institute of Measurement and Control*, 36(6), 851–862, 2013.
35. **Weiming Xiang**, Jian Xiao, Discussion on stability, ℓ_2-gain and asynchronous $\mathcal{H}_\infty$ control of discrete-time switched systems with average dwell time, *IEEE Transactions on Automatic Control*, 57(12), 3259–3261, 2012.
36. **Weiming Xiang**, Jian Xiao. Stability analysis and control synthesis of switched impulsive systems, *International Journal of Robust and Nonlinear Control*, 22, 1440–1459, 2012.
37. **Weiming Xiang**, Jian Xiao, Muhammad Naveed Iqbal. Asymptotic stability, ℓ_2 gain boundness analysis and control synthesis for switched systems: a switching frequency approach, *International Journal of Adaptive Control and Signal Processing*, 26(4), 350–373, 2012.
38. **Weiming Xiang**, Jian Xiao, and Muhammad Naveed Iqbal. Robust observer design for nonlinear uncertain switched systems under asynchronous switching, *Nonlinear Analysis: Hybrid Systems*, 6(1), 754–773, 2012.
39. **Weiming Xiang**, Jian Xiao, Muhammad Naveed Iqbal. Robust finite-time bounded observer design for a class of uncertain non-linear Markovian jump systems, *IMA Journal of Mathematical Control and Information*, 29(4), 551–572, 2012.
40. **Weiming Xiang**, Jian Xiao, Muhammad Naveed Iqbal, $\mathcal{H}_\infty$ filtering for short-time switched discrete-time linear systems, *Circuits, Systems, and Signal Processing*, 31, 1927–1949, 2012.
41. **Weiming Xiang**, Jian Xiao. $\mathcal{H}_\infty$ controller design for a class of switched linear discrete-time system with polytopic uncertainties, *Proceedings of the Institution of Mechanical Engineers, Part I, Journal of Systems and Control Engineering*, 226, 1311–1322, 2012.
42. **Weiming Xiang**, Jian Xiao, Muhammad Naveed Iqbal. Fault detection for switched nonlinear systems under asynchronous switching, *International Journal of Control*, 84(8), 1362–1376, 2011.
43. **Weiming Xiang**, Jian Xiao. $\mathcal{H}_\infty$ filtering for switched nonlinear systems under asynchronous switching, *International Journal of System Science*, 42(5), 751–765, 2011.
44. **Weiming Xiang**, Jian Xiao. $\mathcal{H}_\infty$ finite-time control for switched nonlinear discrete-time systems with norm-bounded disturbance, *Journal of the Franklin Institute*, 348(2), 331–352, 2011.
45. **Weiming Xiang**, Jian Xiao, Chengyong Xiao. Comments on "Finite-time $\mathcal{H}_\infty$ control for linear continuous system with norm-bounded disturbance", *Communications in Nonlinear Science and Numerical Simulation*, 16, 2443–3445, 2011.
46. **Weiming Xiang**, Jian Xiao. $\mathcal{H}_\infty$ filtering for uncertain switched nonlinear system via filter state impulsive jump approach, *Control and Intelligent Systems*, 39(1), 60–67, 2011.
47. **Weiming Xiang**, Jian Xiao, Chengyong Xiao. On finite-time stability and stabilization for switched discrete linear systems, *Control and Intelligent Systems*, 39(2), 122–128, 2011.
48. Zhengrong Xiang, **Weiming Xiang**. Stability analysis of switched systems under dynamical dwell time control approach, *International Journal of Systems Science*, 40(3), 347–355, 2009.

◇ *Conference papers*

1. **Weiming Xiang**, Hoang-Dung Tran, and Taylor T. Johnson. Reachable set estimation and safety verification for piecewise linear systems with neural network controllers, *31th IEEE American Control Conference (ACC 2018)*, 1574–1579, 2018.
2. **Weiming Xiang**, Hoang-Dung Tran and Taylor T. Johnson. On reachable set estimation for discrete-time switched linear systems under arbitrary awitching, *30th IEEE American Control Conference (ACC 2017)*, 4534–4539, 2017.
3. **Weiming Xiang**, Hoang-Dung Tran and Taylor T. Johnson. Reachable set estimation and control for switched linear systems with dwell-time restriction, *55th IEEE Conference on Decision and Control (CDC 2016)*, 7246-7251, 2016.
4. Parasara Sridhar Duggirala, Chuchu Fan, Matthew Potok, Bolun Qi, Sayan Mitra, Mahesh Viswanathan, Stanley Bak, Sergiy Bogomolov, Taylor T. Johnson, Luan Viet Nguyen, Christian Schilling, Andrew Sogokon, Hoang-Dung Tran, **Weiming Xiang**. Tutorial: software tools for hybrid systems verification, transformation, and synthesis: C2E2, HyST, and TuLiP. In Control Applications (CCA), 2016 IEEE Conference on (pp. 1024-1029). IEEE.

5. **Weiming Xiang**, Jian Xiao. Reliable tracking control for high speed train against actuator failures: A parallel control architecture, *IEEE 17th International Conference on Intelligent Transportation Systems (ITSC)*, 828–833.
6. **Weiming Xiang**, Jian Xiao. Real-time signalization for an oversaturated intersection via switched system approach, *33rd Chinese Control Conference (CCC)*, 3350–3355, 2014.
7. **Weiming Xiang**, Jian Xiao, Chengyong Xiao. Finite-time stability analysis for switched linear systems, *23rd Chinese Control and Decision Conference (CCDC)*, 3115–3120, 2011.
8. **Weiming Xiang**, Mingxia Che, Chengyong Xiao, Zhengrong Xiang. Stabilization of a class of switched systems with mismatched switching, *2009 International Conference on Measuring Technology and Mechatronics Automation*, Apr., 2009.
9. **Weiming Xiang**, Mingxia Che, Chengyong Xiao, Zhengrong Xiang. Observer design and analysis for switched systems with mismatching switching signal, *2008 International Conference on Intelligent Computation Technology and Automation*, 650–654, 2008.
10. Zhengrong Xiang, **Weiming Xiang**. Stabilization of a class of switched nonlinear systems based on average dwell time, *7th World Congress on Intelligent Control and Automation*, June, 25-27, 1673-1676, 2008.
11. Zhengrong Xiang, **Weiming Xiang**. Stability analysis of a class of switched nonlinear systems based on dynamical dwell time, *2008 IEEE International Conference On Networking, Sensing and Control*, 1758–1763, 2008.

Please refer to my Google Scholar for the complete list of publications and citations.

References

1. **Professor Taylor T. Johnson**
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2. **Professor James Lam, Chair of Control Engineering**
   Department of Mechanical Engineering
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