Yanbing Mao

264 Computing Applications Bldg, 605 E Springfield Ave, Champaign, IL 61820

✉ ybmao@illinois.edu ☐ 607-232-4867 ⌂ My Website 🎓 Google Scholar

RESEARCH INTERESTS

- Physical AI
- Self-Driving Vehicles
- Social Information Diffusion
- Social Sensing, Learning & Inference
- Safety, Security and Privacy of Socio-Cyber-Physical Systems

EDUCATION

State University of New York at Binghamton — **Binghamton, NY**
Ph.D. in Electrical and Computer Engineering — *Sept. 2015–Sept. 2019*
Thesis: Control- and Game-Theoretic Approaches to Secure Networked Systems
Committee: N. Hovakimyan (UIUC), H. Sayama, Z. Zhang, E. Akyol

University of Electronic Science and Technology of China — **Chengdu, Sichuan**
M.E. in Circuits and Systems — *Sept. 2010–Jul. 2013*

Liaocheng University — **Liaocheng, Shandong**
B.E. in Electronic Information Science and Technology — *Sept. 2006–Jul. 2010*

PROFESSIONAL APPOINTMENTS

Advanced Controls Research Laboratory & Department of Computer Science, UIUC
Postdoctoral Research Associate — *Oct. 2019–Present*
Host: Prof. N. Hovakimyan, Prof. L. Sha and Prof. T. Abdelzaher

Advanced Controls Research Laboratory & Coordinated Science Laboratory, UIUC
Visiting Researcher — *Oct. 2018–Jan. 2019*
Host: Prof. N. Hovakimyan

State University of New York at Binghamton
Research Assistant and Teaching Assistant — *Sept. 2015–Sept. 2019*
Host: Prof. E. Akyol and Prof. Z. Zhang

Oregon State University
Research Assistant — *Jan. 2014–Mar. 2015*
Host: Prof. H. Wang

GRANT EXPERIENCE

DoD: Foundations of Social Information Dynamics and Control — **04/01/2021–03/31/2024,**
No. HQ00342110002, $1.5 mln
- Architect, Leading Contributor
- Members: T. Abdelzaher (PI), N. Hovakimyan (Co-PI), E. Theodorou (Co-PI), C. Lebiere (Co-PI)

Discovery Partners Institute: Apollo-Rokwire: Spatio-Temporal Health Misinformation Management Framework — **Pending**

- ○ Architect, Leading Contributor
- ○ Members: N. Hovakimyan (PI), T. Abdelzaher (Co-PI), L. Varshney (Co-PI), W. Sullivan (Co-PI), J. Paul (Co-PI), **Y. Mao (SP)**

NSF CPS: SPEEDD: Safety Promised Energy Efficient Delivery Drones   **Rejected, 2020**
- ○ Architect, Leading Contributor
- ○ Members: N. Hovakimyan (PI), T. Abdelzaher (Co-PI), L. Sha (Co-PI)

RESEARCH PROJECTS

DoD #HQ00342110002: Foundations of Social Information Dynamics and Control
Leading Researcher   *Apr. 2021–Present*

NSF #1932529 CPS: Virtual Sully: Autopilot with Multilevel Adaptation for Handling Large Uncertainties
Leading Postdoctoral Researcher   *Oct. 2019–Present*

NSF #1739732 CPS: Against Coordinated Cyber and Physical Attacks: Unified Theory and Technologies
Leading Defense Developer   *Oct. 2018–Oct. 2020*

NSF #1663460 CMMI: Sampled Data Driven Attack Detection and Adaptation for Security in Control Systems
Leading Defense Developer   *Oct. 2018–Oct. 2020*

SUNY Interdisciplinary Collaboration Grant: Mathematical Models of Media Bias, Polarization and Misinformation Spread Over Networks
Leading Researcher   *Dec. 2018–Sep. 2019*

SUNY Collective Dynamics Seed Grant: Secure Networked CPS via Topology Switching
Leading Researcher   *Oct. 2017–Oct. 2018*

DEMO

- ○ Self-Driving Vehicles: Safe Velocity Regulation in Dynamic and Unforeseen Environments
  - - Model Learning Based RHAC v.s. RHAC: [YouTube]
  - - $\mathcal{L}_1$ Adaptive Controller v.s. Normal Controller: [YouTube]

Open Source

- ○ Codes:
  - - AutoRally: Safe Autonomous Driving in Dynamic and Unforeseen Environments: [GitHub]
  - - Ongoing: Apollo-Rokwire: Spatio-Temporal Health Misinformation Management Framework: building on the conjunctive efforts of [Rokwire - GitHub] and [Apollo].
- ○ Data:
  - - Processed US Ideology Data: [GitHub]

PUBLICATIONS

In Preparation...

1. **Yanbing Mao**, Naira Hovakimyan, Tarek Abdelzaher, and Lav R. Varshney, "Cost Function Learning with Asymmetric Cognitive Bias in Social Networks." [pdf]

2. **Yanbing Mao**, et al., "Polarization Evolution: Humans v.s. Social Media v.s. Information Sources."
3. Jiyang Chen, **Yanbing Mao**, Lui Sha, and Naira Hovakimyan, "Self-Mapping, Self-Searching and Self-Mission-Planing for Medical UAVs."

Journal Papers

1. **Yanbing Mao**, Naira Hovakimyan, Tarek Abdelzaher, and Evangelos Theodorou, "Social System Inference from Noisy Observations," *IEEE Transactions on Control of Network Systems (Special Issue on Dynamics and Behaviors in Social Networks), In Revision*. [pdf]
2. **Yanbing Mao**, Yuliang Gu, Naira Hovakimyan, Petros Voulgaris, and Lui Sha, "S$\mathcal{L}_1$-Simplex: Safe Velocity Regulation of Self-Driving Vehicles in Dynamic and Unforeseen Environments," *submitted to ACM Transactions on Cyber-Physical Systems (Special Issue on Special Issue on Automotive CPS Safety Security)*. [pdf]
3. **Yanbing Mao**, Naira Hovakimyan, Petros Voulgaris, and Lui Sha, "Finite-Time Model Inference from A Single Noisy Trajectory," *IEEE Transactions on Automatic Control, In Revision*. [pdf]
4. **Yanbing Mao**, Emrah Akyol, and Naira Hovakimyan, "Impact of Confirmation Bias on Competitive Information Spread in Social Networks," *to appear in IEEE Transactions on Control of Network Systems*, DOI: 10.1109/TCNS.2021.3050117. [url] & [pdf]
5. **Yanbing Mao**, Hamidreza Jafarnejadsani, Pan Zhao, Emrah Akyol, and Naira Hovakimyan, "Novel Stealthy Attack and Defense Strategies for Networked Control Systems," *IEEE Transactions on Automatic Control (Special Issue on Security and Privacy of Distributed Algorithms and Network Systems)*, vol. 65, no. 9, pp. 3847–3862, 2020. [url] & [pdf]
6. **Yanbing Mao**, and Emrah Akyol, "On Inference of Network Topology and Confirmation Bias in Cyber-Social Networks," *IEEE Transactions on Signal and Information Processing over Networks (Special Issue on Network Topology Inference)*, vol. 6, pp. 633–644, 2020. [url] & [pdf]
7. **Yanbing Mao**, Sadegh Bolouki, and Emrah Akyol, "Spread of Information with Confirmation Bias in Cyber-Social Networks," *IEEE Transactions on Network Science and Engineering (Special Issue on Network of Cyber-Social Networks: Modeling, Analyses, and Control)*, vol. 7, no. 2, pp. 688–700, 2020. [url] & [pdf]
8. **Yanbing Mao**, and Ziang Zhang, "Asymptotic Frequency Synchronization of Kuramoto Model by Step Force," *IEEE Transactions on Systems, Man, and Cybernetics: Systems*, vol. 50, no. 8, pp. 2768–2778, 2020. [url]
9. **Yanbing Mao**, Hongbin Zhang, and Ziang Zhang, "Finite-Time Stabilization of Discrete-Time Switched Nonlinear Systems without Stable Subsystems via Optimal Switching Signal Design," *IEEE Transactions on Fuzzy Systems*, vol. 25, no. 1. pp. 172–180, 2017. [url]
10. **Yanbing Mao**, Hongbin Zhang, and Shengyuan Xu, "The Exponential Stability and Asynchronous Stabilization of A Class of Switched Nonlinear System via The T–S Fuzzy Model," *IEEE Transactions on Fuzzy Systems*, vol. 22, no. 4. pp. 817–828, 2014. [url]
11. **Yanbing Mao**, Hongbin Zhang, and Chuangyin Dang, "Stability Analysis and Constrained Control of A Class of Fuzzy Positive Systems with Delays using Linear Copositive Lyapunov Functional," *Circuits, Systems, and Signal Processing*, vol. 31, no. 5. pp. 1863–1875, 2012. [url]

Conference Papers

1. Pan Zhao, **Yanbing Mao**, Chuyuan Tao, Naira Hovakimyan, and Xiaofeng Wang, "Adaptive Robust Quadratic Programs using Control Lyapunov and Barrier Functions," *in 59th IEEE Conference on Decision and Control*, Jeju Island, Korea, pp. 3353–3358, 2020. [url]
2. **Yanbing Mao**, and Emrah Akyol, "Competitive Information Spread with Confirmation Bias," *in 53rd Asilomar Conference on Signals, Systems, and Computers*, Pacific Grove, USA, pp. 391–395, 2019. [url]
3. **Yanbing Mao**, and Emrah Akyol, "On Network Topology Inference of Social Networks," *in 57th Annual Allerton Conference on Communication, Control, and Computing*, Monticello, USA, pp. 804–809,

2019. [url]

4. **Yanbing Mao**, Hamidreza Jafarnejadsani, Pan Zhao, Emrah Akyol, and Naira Hovakimyan, "Detectability of Intermittent Zero-Dynamics Attack in Networked Control Systems," *in 58th IEEE Conference on Decision and Control*, Nice, France, pp. 5605–5610, 2019. [url]

5. **Yanbing Mao**, Emrah Akyol, and Ziang Zhang, "A Novel Defense Strategy against Zero-Dynamics Attacks in Multi-Agent Systems," *in 58th IEEE Conference on Decision and Control*, Nice, France, pp. 3563–3568, 2019. [url]

6. **Yanbing Mao**, and Emrah Akyol, "Detectability of Cooperative Zero-Dynamics Attack," *in 56th Annual Allerton Conference on Communication, Control, and Computing*, Monticello, USA, pp. 227–234, 2018. [url]

7. **Yanbing Mao**, and Emrah Akyol, "Synchronization of Coupled Harmonic Oscillators by Time-Dependent Topology Switching," *in 7th IFAC Workshop on Distributed Estimation and Control in Networked Systems*, Groningen, Netherlands, 2018. [url]

8. **Yanbing Mao**, Emrah Akyol, and Ziang Zhang, "Second-Order Consensus for Multi-Agent Systems by Time-Dependent Topology Switching," *in 57th IEEE Conference on Decision and Control*, Miami Beach, USA, pp. 6151–6156, 2018. [url]

9. **Yanbing Mao**, Sadegh Bolouki, and Emrah Akyol, "On The Evolution of Public Opinion in the Presence of Confirmation Bias," *in 57th IEEE Conference on Decision and Control*, Miami Beach, USA, pp. 5352–5357, 2018. [url]

10. **Yanbing Mao**, and Ziang Zhang, "Second-Order Consensus for Multi-Agent Systems by State-Dependent Topology Switching," *in 2018 Annual American Control Conference*, Milwaukee, USA, pp. 3392–3397, 2018. [url]

11. **Yanbing Mao**, and Ziang Zhang, "Distributed Frequency Synchronization and Phase-Difference Tracking for Kuramoto Oscillators and Its Application to Islanded Microgrids," *in 55th IEEE Conference on Decision and Control*, Las Vegas, USA, pp. 4364–4369, 2016. [url]

Theses

Ph.D. Dissertation, "Control- and Game- Theoretic Approaches to Secure Networked Systems," State University of New York at Binghamton, 2020. [url]

MAJOR TALKS

"Apollo-Rokwire: Infodemics Management Framework"　　　　　　　　　**2021**
NSF CPS PI Meeting, Workshop on Rethinking Socio-Cyber-Physical System of Tomorrow, Invited Talk

"Topology Switching for Secure Networked Control Systems"　　　　　　　**2019**
Center for Collective Dynamics of Complex Systems at Binghamton University–SUNY, Invited Talk

"On Network Topology Inference of Social Networks"　　　　　　　　　　　**2019**
57th Annual Allerton Conference on Communication, Control, and Computing

"Detectability of Cooperative Zero-Dynamics Attack"　　　　　　　　　　　**2018**
56th Annual Allerton Conference on Communication, Control, and Computing

"On the Evolution of Public Opinion in the Presence of Confirmation Bias"　**2018**
57th IEEE Conference on Decision and Control

"Second-Order Consensus by State-Dependent Topology Switching"　　　　**2018**
2018 Annual American Control Conference

"Second-Order Consensus by Time-Dependent Topology Switching"　　　　**2018**
57th IEEE Conference on Decision and Control

"Distributed Frequency Synchronization and Phase-Difference Tracking"　　**2016**

55th IEEE Conference on Decision and Control

MENTORSHIP EXPERIENCE

Jiyang Chen (Ph.D. project, CS, UIUC) **Fall 2020–Present**
Project: "Resource-Efficient and Timing-Aware Safe Operation for Self-Driving Vehicles"

Yuliang Gu (Ph.D. project, ME, UIUC) **Fall 2020–Present**
Project: "Cost-Function Learning Based Behavior Inference"

Sitao Zhang (Master project, ME, UIUC) **Fall 2020–Spring 2021**
Project: "AutoRally: Complex Driving Environments Simulator"

TEACHING EXPERIENCE

Teaching Assistant **State University of New York at Binghamton, Department of ECE**
EECE315 Electronics *2017 Fall*

Teaching Assistant **State University of New York at Binghamton, Department of ECE**
EECE260 Electric Circuits *2018 Spring*

PROFESSIONAL SERVICE

Reviewer for Journals

- Automatica
- Asian Journal of Control
- IET Control Theory & Applications
- IEEE Transactions on Cybernetics
- IEEE Transactions on Fuzzy Systems
- IEEE Transactions on Automatic Control
- IEEE Transactions on Industrial Electronics
- IEEE Transactions on Control of Network Systems
- IEEE Transactions on Network Science and Engineering
- IEEE Transactions on Systems, Man, and Cybernetics: Systems
- International Journal of Robust and Nonlinear Control

Reviewer for Conferences

- American Control Conference (2018–2022)
- IEEE Conference on Decision and Control (2016–2022)
- IEEE Conference on Control Technology and Applications (2022)

Session Chair/Co-Chair

Session Title: Control of Networks I. 57th IEEE Conference on Decision and Control, Miami Beach, FL, USA, December 17-19, 2018

AWARDS

- Foundation Travel Award State University of New York at Binghamton (2018)
- Travel Award 55th IEEE Conference on Decision and Control (2016)
- Outstanding Graduate Student Award UESTC (2013)

REFERENCES

Tarek Abdelzaher
Sohaib and Sara Abbasi Professor and Willett Faculty Scholar
Department of Computer Science
University of Illinois at Urbana-Champaign
✉ zaher@illinois.edu
☎ (217)-265-6793

Naira Hovakimyan
W. Grafton and Lillian B. Wilkins Professor
Department of Mechanical Science and Engineering
University of Illinois at Urbana-Champaign
✉ nhovakim@illinois.edu
☎ (217)-244-1672

Lui Sha
Donald B. Gillies Chair
Department of Computer Science
University of Illinois at Urbana-Champaign
✉ lrs@illinois.edu
☎ (217)-244-1887

Evangelos Theodorou
Associate Professor
Department of Aerospace Engineering
Georgia Institute of Technology
✉ evangelos.theodorou@gatech.edu
☎ (404)-894-8197

Petros Voulgaris
Chair, Founding Aerospace Program Director, and Victor LaMar Lockhart Professor
Department of Mechanical Engineering
University of Nevada, Reno
✉ pvoulgaris@unr.edu
☎ (775)-682-5725