Meiyi Ma

meiyi.ma@vanderbilt.edu
Assistant Professor, Computer Science, Vanderbilt University

Research Interest

- Cyber-Physical Systems
- Internet of Things
- Machine Learning
- Data Science
- Formal Methods
- Smart Cities, Health Care

Working Experience

Assistant Professor Aug. 2021 - Now
Department of Computer Science, Vanderbilt University, TN, U.S.

Education

Ph.D. in Computer Science Aug. 2021
University of Virginia, VA, U.S.

- Advisor: John A. Stankovic & Lu Feng
- Thesis: "Formal Methods enhanced Deep Learning for Integrated Cyber-Physical Systems"

M.S. in Computer Science March 2015
East China University of Science and Technology, Shanghai, China

- Thesis: "Models of Crystal-Cluster Behaviors: Theoretical Analysis and Applications" [**Best Thesis Award**]

B.S. in Computer Science and B.E. in Economics July 2012
East China University of Science and Technology, Shanghai, China

- Thesis: "Dynamic Network Programming based on Social Group Search Optimizer" [**Best Thesis Award**]

Honors and Awards

- **Best Paper Award**, International Conference on Cyber-Physical Systems April. 2021
- **EECS Rising Star**, University of California, Berkeley Oct. 2020
- **Rising Star in Data Science**, Center for Data and Computing (CDAC) at the University of Chicago Dec. 2020
- **Outstanding Graduate Research Award**, Link Lab (2/250), University of Virginia May 2020
- **NSF Student Award** to 2018 Federated Logic Conference (Floc) CAV mentoring workshop (only 10 students selected from U.S.) May 2018
- **NSF Student Travel Awards** to present papers/posters at 2018 ACM Sensys, 2018 CPS Week, 2017 ACM Sensys, 2017 IEEE MASS, 2017 CPS Week, 2016 IEEE SmartComputing
- **Computing Research Association (CRA) grant** for CRA-W grad cohort 2016, 2017
- **Graduate Fellowship**, Department of Computer Science, University of Virginia Aug. 2015
- **Best Thesis Award** (1/635), East China University of Science and Technology Oct. 2015
- **Shanghai Outstanding Graduates** (1/635), Shanghai Department of Education Mar. 2015
- **Shanghai Excellent Student Cadre**, Shanghai Department of Education Dec. 2014
- **National Scholarship** (1/635), China Ministry of Education Oct. 2014
- **University Honor Student**, East China University of Science and Technology Sep. 2014
- **Outstanding Research Award** (3/267), East China University of Science and Technology Nov. 2013

- **Creative Technology Award in Science&Technology Innovation**, Shanghai Education Department Oct. 2013
- **The 1st Prize National Fellowship for Grad Student**, China Ministry of Education Sep. 2012
- **Best Thesis Award**, East China University of Science and Technology (1/267) Oct. 2012
- **Haiding Industrial Fellowship**, Haiding Group Co., Ltd., China Oct. 2012
- **Outstanding Volunteer**, World Expo 2010 Shanghai, China Oct. 2010
- **Wanhua Industrial Fellowship**, Wanhua Chemical Group Co., Ltd., China Oct. 2010

Publications

Conference & Journal Publications:

1. Predictive Monitoring with Logic-Calibrated Uncertainty for Cyber-Physical Systems
   Meiyi Ma, John Stankovic, Ezio Bartocci, Lu Feng.
   International Conference on Embedded Software (EMSOFT), 2021.11

2. Towards Formal Methods for Smart Cities
   Meiyi Ma, John Stankovic, Lu Feng.
   IEEE Computer magazine, 2021.

3. Challenges and Directions for Ambient Intelligence: A Cyber Physical Systems Perspective (Invited Paper)
   John A. Stankovic, **Meiyi Ma**, Sarah M. Preum, Homa Alemzadeh
   IEEE International Conference on Cognitive Machine Intelligence, 2021.11

4. A Novel Spatial-Temporal Specification-Based Monitoring System for Smart Cities
   Meiyi Ma, Ezio Bartocci, John Stankovic, Lu Feng.
   IEEE Internet of Things Journal (IoTJ) 2021. (Impact Factor: 11.7)

5. Out-of-the-Box Deployment to Support Research on In-Home Care of Alzheimer's Patients
   Ye Gao, Jason Jabbour, Emma Schlegel, **Meiyi Ma**, Matthew McCall, Lahiru Wijayasingha, Eunjung Ko, Kristina Gordon, Karen Rose, Hongning Wang, and John Stankovic
   IEEE Pervasive Computing, 2021

6. STLnet: Signal Temporal Logic Enforced Multivariate Recurrent Neural Networks.
   Meiyi Ma, Ji Gao, Lu Feng, and John Stankovic.
   Conference on Neural Information Processing Systems (**NeurIPS**) 2020. (Acceptance Rate: 1900/9454 = 20%)

7. DeResolver: A Decentralized Negotiation and Conflict Resolution Framework for Smart City Services.
   Yukun Yuan, **Meiyi Ma**, Songyang Han, Desheng Zhang, Fei Miao, John A. Stankovic, Shan Lin.
   ACM/IEEE 11th International Conference on Cyber-Physical Systems (**ICCPS**), 2021 Acceptance Rate: 26%) **Best Paper Awards**

8. ViFin: Continuous Micro Finger Writing for AR/VR Interaction Using Vibration on a Commodity Smartwatch
   Wenqiang Chen, Lin Chen, **Meiyi Ma**, Farshid Parizi, Patel Shwetak, John Stankovic.
   ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (**IMWUT**), 2021

9. Validity and Feasibility of the Monitoring and Modeling Family Eating Dynamics (M2FED) System to Automatically Detect In-Field Family Eating Behavior
   Brooke M. Bell, Ridwan Alam,Abu S. Mondol, **Meiyi Ma**, Ifat Emi, Sarah M. Preum, Kayla de la Haye, John A. Stankovic, John Lach, Donna Spruijt-Metz
   Journal of Medical Internet Research (JMIR), preprint

10. SaSTL: Spatial Aggregation Signal Temporal Logic for Runtime Monitoring in Smart Cities.
    Meiyi Ma, Ezio Bartocci, Eli Lifland, John Stankovic, and Lu Feng.
    In 2020 ACM/IEEE 11th International Conference on Cyber-Physical Systems (**ICCPS**), pp. 51-62. 2020.4
    (Acceptance Rate: 23.7%)

11. MFED: A System for Monitoring Family Eating Dynamics
Md A. Mondol, Brooke Bell, **Meiyi Ma**, Ifat Emi, Ridwan Alam, Sarah M. Preum, Kayla Haye, John Lach, Donna Sprujt-Metz, John A. Stankovic, arXiv preprint.

12. Smarthealth Technology Study Protocol to Improve Relationships between Older Adults with Dementia and Family Caregivers.
Karen M. Rose, Kristina Coop Gordon, Emma C. Schlegel, Matthew McCall, Ye Gao, **Meiyi Ma**, Katherine A. Lenger, Kathy Wright, Hongning Wang, John Stankovic.
Journal of Advanced Nursing (in press) (Impact Factor: 2.561).

13. Data Sets, Modeling and Decision Making in Smart Cites: A survey.
Meiyi Ma, Sarah Masud Preum, Mohsin Ahmed, William Tarneberg, Matt Ruiters, and John Stankovic.
ACM Transaction on Cyber Physical System (**TCPS**). 2019.12

14. A Review of Cognitive Assistants for Healthcare: Trends, Prospects, and Future Directions.
Sarah Preum, Sirajum Munir, **Meiyi Ma**, Mohammad Yasar, Ronald Williams, Homa Alemzadeh, John Stankovic.
ACM Computing Surveys (**CSUR**), 2020 (Impact Factor: 7.99)

15. Sensing Eating Mimicry among Family Members.
Brooke Bell, Donna Spruijt-Metz, George G. Vega Yon, Abu Mondol, Ridwan Alam, **Meiyi Ma**, Ifat Emi, John Lach, John Stankovic, and Kayla De la Haye.
Translational behavioral medicine (TBM) 9, no. 3 (2019): 422-430. (Impact Factor: 3.212)

16. CityResolver: A Decision Support System for Conflict Resolution in Smart Cities.
The ACM/IEEE International Conference on Cyber-Physical Systems (**ICCPS**). 2018.4. (Acceptance Rate: 30%)

17. Runtime Monitoring of Safety and Performance Requirements in Smart Cities.
Meiyi Ma, John Stankovic, Lu Feng.
ACM Internet of Safe Things (Safethings). 2017.11.

18. M2G: A Monitor of Monitoring Systems with Ground Truth Validation Features for Research-oriented Residential Applications.
Meiyi Ma, R. Alam, B. Bell,K. Haye, D. Spruijt-Metz, J. Lach and J. Stankovic.
14th IEEE International Conference on Mobile Ad hoc and Sensor Systems (MASS). 2017.10

19. CityGuard: A Watchdog for Safety-Aware Conflict Detection in Smart Cities.
Meiyi Ma, Sarah Masud Preum, and John A. Stankovic.
IEEE/ACM Second International Conference on Internet-of-Things Design and Implementation (IoTDI), 2017. (Acceptance Rate 29%)

20. Preclude2: Personalized Conflict Detection in Heterogeneous Health Applications.
Sarah Masud Preum, Abu Sayeed Mondol, **Meiyi Ma**, Hongning Wang, and John A. Stankovic.
Pervasive and Mobile Computing 42 (2017): 226-247.

21. Preclude: Conflict Detection in Textual Health Advice.
Sarah Preum, Abu Mondol, **Meiyi Ma**, Hongning Wang, and John A. Stankovic.
IEEE conference Pervasive Computing and Communications (**PerCom**), 2017. (Acceptance Rate 16.5%)

22. Detection and Resolution of Conflicts among Services in Smart Cites.
Meiyi Ma, S. Masud Preum, M. Ahmed, W. Tarneberg, M. Ruiters, and J. Stankovic.
IEEE International Conference on Smart Computing. 2016.4 (Paper H-Index: 8)

23. Social Group Search Optimizer Algorithm for Ad Hoc Network.
Xiang Feng, **Meiyi Ma**, Huiqun Yu.
Ad Hoc & Sensor Wireless Networks, 2015, 12(28) (Impact Factor: 1.034)

24. Crystal Energy Optimization Algorithm.
Xiang Feng, **Meiyi Ma**, Huiqun Yu.
Computational Intelligence, 2014,11. (Impact Factor: 1.196)

25. Lake-Energy Optimization Algorithm for Traveling Salesman Problem.
Xiang Feng, **Meiyi Ma**, Huiqun Yu.
Journal of Computer Research and Development. 2013, 50(9): 2015-2027.

26. Path Planning for Mobile Robots Based on Social Group Search Algorithm.
Xiang Feng, **Meiyi Ma**, Yin Shi, Huiqun Yu.
Journal of Computer Research and Development. 2013, 50(12): 2543-2553.

27. Cell Optimization Algorithm for Cache Resource Allocation of CDN.
Xiang Feng, **Meiyi Ma**, Huiqun Yu.
Journal of Computer Science. 2014, 41(1): 105-110

28. Intrusion Detection System Based On Hybrid Immune Algorithm.
Xiang Feng, **Meiyi Ma**, Tianling Zhao, Huiqun Yu.
Journal of Computer Science. 2014,41(12):43-47.

29. Virtual Emergency Rehearse System for Dangerous Gas Diffusion in Chemical Industry Park.
Gaoqi He, Wentao Ou, **Meiyi Ma**, Lipeng Zhang, Qincheng Hu, and Zhiyi Xu.
In Proceedings of the 10th ACM International Conference on Virtual Reality Continuum and Its Applications in Industry, pp. 455-458. 2011.

Full Papers under Review:

30. DeResolver2: A Decentralized Negotiation and Conflict Resolution Framework for Smart City Services.
Yukun Yuan, **Meiyi Ma**, Songyang Han, Desheng Zhang, Fei Miao, John A. Stankovic, Shan Lin.
ACM Transaction on Cyber-Physical Systems (under major revision)

Demo & Poster Publications:

31. A Smart City Simulation Platform with Uncertainty
Shuyang Dong, **Meiyi Ma**, Lu Feng.
ACM/IEEE International Conference on Cyber-Physical Systems (**ICCPS**) 2021.

32. Poster Abstract: Predictive Monitoring with Uncertainty forDeep Learning Enabled Smart Cities
Meiyi Ma, Lu Feng, Ezio Bartocci and John A. Stankovic.
ACM Conference on Embedded Networked Sensor Systems (**Sensys**) 2020.

33. Demo Abstract: A Monitoring, Modeling, and Interactive Recommendation System for in-home Caregivers
Ye Gao, **Meiyi Ma**, Karen M. Rose, Kristina Coop Gordon, Hongning Wang, and John A. Stankovic.
ACM Conference on Embedded Networked Sensor Systems (**Sensys**) 2020.

34. Demo Abstract: Continuous Micro Finger Writing Recognition with a Commodity Smartwatch,
Wenqiang Chen, Lin Chen, **Meiyi Ma**, Farshid Parizi, Patel Shwetak, John Stankovic.
ACM Conference on Embedded Networked Sensor Systems (**Sensys**) 2020.

35. Evaluating the impact of time demographic, and social effects on compliance to eating event-triggered EMA surveys in families.
Brooke Bell, Abu Mondol, **Meiyi Ma**, Ridwan Alam, Ifat Emi, Kayla de la Haye, John Lach, John Stankovic, and Donna Spruijt-Metz.
In annals of behavioral medicine, vol. 54, pp. S307-S307. Oxford Univ Press Inc, 2020. (Impact Factor: 4.48]

36. Detecting Eating Mimicry in Families.
Kayla de la Haye, Brooke Bell, George G. Vega Yon, Abu Mondol, Ridwan Alam, **Meiyi Ma**, Ifat Emi, John Lach, Stankovic J.A., Donna Spruijt-Metz.
5th International Conference on Computational Social Science 2019.

37. Simulating Conflict Detection in Heterogeneous Services of a Smart City: Demo Abstract.
Meiyi Ma, Sarah Masud Preum, and John A. Stankovic.
2017 IEEE/ACM Second International Conference on Internet-of-Things Design and Implementation (IoTDI).

38. Conflict Detection in Online Textual Health Advice: Demo Abstract.
Sarah Preum, Abu S. Mondol, **Meiyi Ma**, Hongning Wang, and John A. Stankovic.
ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN). 2017.

Grants

Two NSF proposals were submitted with a major component based on my research:

- **NSF SCC-IRG: Socially Informed Services Conflict Governance through Specification, Detection, Resolution and Prevention.** *(Funded, 2020)*
  - This proposal is collaborative across four universities, partially based on my work Detection and Resolution of Conflicts among Services in Smart Cities (SmartComp 2016), CityGuard (IoTDI 2017), CityResolver (ICCPS 2018) and SaSTL (ICCPS 2020).
- **NSF CPS: Safe Imitation Learning for Medical CPS with Uncertainty**
  - This proposal is collaborative across two universities, partially based on my work CityPM (under review) and STLnet (NeurIPS 2020).

Students

Ph.D. Students:

- David Wang — Fall 2021 - Now
- Zirong Chen — Fall 2021 - Now

Master Students:

- Oindrila Ghosh (Master Student) — Spring 2019
  Deep Spatial-Temporal Prediction for Smart Cities
- Omkar Bhat (Master Student) — Spring 2019
  Deep Spatial-Temporal Prediction for Smart Cities.

Undergraduate Students:

- David Atwood — Fall 2021 - Now
- Melissa Wang — Fall 2021 - Now
- Xuqing Cao — Fall 2021 - Now
- Peize Li — Fall 2021 - Now
- Yunuo Zhang — Fall 2021 - Now
- Nick Zhao — Fall 2021 - Now
- Hao (Issac) Li — Fall 2020 - Summer 2021
  Cognitive Assistant for City Requirement Specification
- Haoxiang Zhang — Fall 2020 - Summer 2021
  Converting Natural Language to Formal Specification
- Eli Lifland (Undergraduate) — Fall 2018 - Spring 2019
  Spatial Aggregation Signal Temporal Logic
- Nova Zhang (Undergraduate) — Spring 2019
  City Requirement Formalization
- Rahul Tuladhar (Undergraduate) — Fall 2018 - Spring 2019
  Simulation and Prediction for Smart Cities
- Timothy Davison (Undergraduate) — Fall 2017 - Spring 2018
  Spatial STL Monitor for Smart Cities.

Teaching Experience

- **Instructor**, CS8395-04 AI for Cyber-Physical Systems — Fall 2021
- **Guest Lecturer**, Algorithm — Oct. 2021
- **Guest Lecturer**, CS6501 Signal Processing, Machine Learning, and Control (Graduate Level Class) — Oct. 2020, 2021
  How to Build Deep Learning Models with Pytorch
- **Guest Lecturer**, CS6190 Computer Science Perspectives (Graduate Level Class) — Oct. 2020
  Research in Smart Cities
- **Guest Lecturer**, CS6501 Cyber Physical Systems and the Internet of Things (Graduate Level Class) — April 2020
  SaSTL: Spatial Aggregation Signal Temporal Logic for Runtime Monitoring in Smart Cities
- **Guest Lecturer**, CS6501 Signal Processing, Machine Learning, and Control (Graduate Level Class) — Oct. 2019
  How to Build Deep Learning Models with Pytorch
- **Guest Lecturer**, CS6501 Formal Methods for CPS &Robots (Graduate Level Class) — March 2019
  Signal Temporal Logic and Runtime Verification in Smart Cities
- **Guest Lecturer**, CS4501 Smart Worlds (Undergraduate Level Class) — Nov. 2017
  Conflict Detection in Smart Cities
- **TA**, CS6456: Operating System (Graduate Level Class, 24 students) — Fall 2015
- **TA**, CS6501: Defense against Dark Arts (Graduate Level Class, 73 students) — Fall 2015
- **TA**, CS6750: Database (Graduate Level Class, 36 students) — Spring 2016
- **TA**, CS4750: Database (Undergraduate Level Class, 113 students) — Spring 2016
- **Lab Instructor**, Operation System (Undergraduate Level Class, 120 students),
  East China University of Science and Technology — 2011 - 2013
- **Part-time Teacher** (Volunteer), Shanghai Caohang Elementary School — 2011 - 2012

Selected Talks

- **Paper Presentation**, Embedded Systems Week — Oct. 2021
  Predictive Monitoring with Logic-calibrated Uncertainty for Cyber Physical Systems
- **Paper Presentation**, Conference on Neural Information Processing Systems (NeurIPS) — Nov. 2020
  STLnet: Signal Temporal Logic Enforced Multivariate Recurrent Neural Networks
- **Presentation**, EECS Rising Stars Workshop at UC Berkeley — Nov. 2020
  Formal Logic enhanced Learning for Internet of Things
- **Poster Presentation**, EECS Rising Stars Workshop at UC Berkeley — Nov. 2020
  Formal Logic enhanced Learning for CPS/IoT
- **Poster Presentation**, Conference on Embedded Networked Sensor Systems (Sensys) — Nov. 2020
  Predictive Monitoring with Uncertainty for Deep Learning enabled Smart Cities
- **Paper Presentation**, Cyber-Physical System Week — April 2020
  SaSTL: Spatial Aggregation Signal Temporal Logic for Runtime Monitoring in Smart Cities
- **Demo Presentation**, UVa Linklab Opening House — March 2019
  Spatial-Temporal Runtime Verification for Smart Cities
- **Invited Presentation**, Commonwealth Conference on National Defense and Intelligence — July 2019
  Conflict Detection and Resolution among Smart Services in Smart Cities
- **Paper Presentation**, Cyber-Physical System Week — April 2018
  CityResolver: A Decision Support System for Conflict Resolution in Smart Cities.
- **Demo Presentation**, Cyber-Physical System Week — April 2018
  Simulating Conflict Detection in Heterogeneous Services of a Smart City
- **Demo presentation**, UVa Linklab Opening House — March 2018
- **Paper Presentation**, ACM Internet of Safe Things (Safethings) — Nov. 2017
  Runtime Verification for Smart Cities

- **Paper Presentation**, IEEE International Conference on Mobile Ad hoc and Sensor Systems (MASS) Oct. 2017
  M2G: A Monitor of Monitoring Systems with Ground Truth Validation Features for Research-oriented Residential Applications.
- **Demo presentation**, NSF Smart and Connected Health PI workshop Sep. 2017
  Simulating Conflict Detection in Heterogeneous Services of a Smart City
- **Paper Presentation**, The ACM/IEEE International Conference on Internet of Things Design and Implementation
  CityGuard: Conflict Detection among Services in Smart Cities April 2017
- **Demo presentation**, UVa SEAS Open House March 2017
  Runtime Detection and Resolution of Conflicts in Smart Cities
- **Demo presentation**, UVa SEAS Open House March 2016
  AsthmaGuide: an asthma monitoring and advice ecosystem

Professional Services

- **Faculty Advisor**, the Women in Computing Vanderbilt University ACM-W Student Chapter, 2021 - Now
- **Information Director**, ACM Transactions on Computing for Healthcare 2018 - Now
- **PC member**, BuildSys Oct.2021 - Now
- **PC member**, 6th Workshop on Monitoring and Testing of Cyber-Physical Systems 2020
- **Web and Publicity Chair**, 6th Workshop on Monitoring and Testing of Cyber-Physical Systems 2020 - Now
- **Student Volunteer**, Conference on Embedded Networked Sensor Systems (Sensys) Nov. 2020
- **Department Representative**, Society of Women Engineers (GradSWE) Sep. 2019 - Sep. 2020
- **Chair of Leadership and Student Success**, UVa CS Graduate Student Council Sep. 2019 - Jan. 2020
- **Publicity Chair**, ACM Workshop on the Internet of Safe Things 2018, 2019
- **Local Chair**, International Workshop on Next-Generation Cyber-Physical Systems 2018
- **UVa International Graduate TA Panelist**, Center for Teaching Excellence and the Center for American English Language and Culture (4 years) Aug. 2016 - Aug. 2019
- **Invited Paper reviewer** (reviewed 40+ papers for journals and conferences in areas of Formal Method, Machine Learning, Cyber-Physical System, and Healthcare):
  - Smart Health Journal 2018
  - Runtime Verification Conference (RV) 2018, 2019, 2020
  - International Conference on Quantitative Evaluation of SysTems (QEST) 2019
  - ACM-IEEE International Conference on Formal Methods and Models for System Design 2019
  - ACM Transaction on Computing for Healthcare 2019, 2020
  - International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS) 2019
  - ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS) 2019, 2020
  - Springer GeoJournal 2020
  - Springer Autonomous Robots (AURO) 2020
  - Springer's International Journal on Software Tools for Technology Transfer. 2020
  - International Symposium on Automated Technology for Verification and Analysis (ATVA) 2020
  - Conference on Robot Learning (CoRL) 2020

Intern

- **Research Intern**, Business Intelligence, Trip.com Group Limited, Shanghai, China Feb. 2015 - Aug. 2015
- **Software Engineering Intern**, HK-Macao Information Industry Co., Ltd, Shanghai, China Apr. 2011 - Sep. 2011