

## RESEARCH INTERESTS

The mission of my research is to answer the question: *how can we provide people with cyber-physical systems they can bet their lives on?* [Jeannette Wing]. My research interests are in the intersection of machine learning, control theory, and formal verification towards the goal to enhance security and safety of safety-critical cyber-physical systems whilst deployed in dynamic, uncertain, and adversarial environments. I develop explainable and verifiable machine learning-based intrusion detection algorithms to protect industrial control systems, such as water treatment plants, from cyber attacks. I also rigorously verify safety properties of learning-enabled components and develop safety-guaranteed planning and control algorithms for autonomous driving systems.

## EDUCATION

<b>Delft University of Technology</b>	Delft the Netherlands
Ph.D. in Computer Science, Advisors: Prof. Sicco Verwer, Prof. Jan van den Berg	2015–2019
– Thesis: “Intelligent Control Systems: Learning, Interpreting, Verification”	
– Funded by Dutch Government Projects: VENI project MANTA & NWO project LEMMA	
<b>Tongji University</b>	Shanghai, China
M.Eng. in Control Theory and Control Engineering, Advisor: Prof. Jun Wang	2011–2014
– Thesis: “Research on Methods for Processing Wind Speed Data of Wind Farms”	
<b>Hefei University of Technology</b>	Hefei, China
B.Eng. in Automation	2007–2011

## APPOINTMENTS

<b>Department of Computer Science, Cleveland State University</b>	Cleveland, USA
Tenure-track Assistant Professor	from Jan 2022
<b>Robotics Institute, Carnegie Mellon University</b>	Pittsburgh, USA
Postdoc Research Fellow, Advisor: Prof. John M. Dolan	May 2019–Jan 2022
– Funded by DARPA Assured Autonomy project	
– Topic: Safety verification for learning-enabled components of autonomous vehicles	

## PUBLICATIONS

[Google scholar link](#)

### Journal papers

1. **Qin Lin**, Stefan Mitsch, André Platzer, and John M. Dolan, “Practically Safe and Recoverable Waypoint-following for Autonomous Vehicles”, *IEEE Control Systems Letters*, 6, pp.1574-1579
2. Shivesh Khaitan\*, **Qin Lin**<sup>+</sup>, Dolan M. Dolan, “Safe planning and control under uncertainty for self-driving”, *IEEE Transactions on Vehicular Technology*, 70(10), pp. 9826-9837.

\* supervised students

<sup>+</sup> corresponding author

3. **Qin Lin**, Yihuan Zhang, Sicco Verwer, and Jun Wang, 2019. “MOHA: a multi-mode hybrid automaton model for learning car-following behaviors”, *IEEE Transactions on Intelligent Transportation Systems*, 20(2), pp.790-796.
4. Yihuan Zhang, **Qin Lin**, Jun Wang, Sicco Verwer, and John M. Dolan, 2018. “Lane-change intention estimation for car-following control in autonomous driving”, *IEEE Transactions on Intelligent Vehicles*, 3(3), pp.276-286.
5. Huajie Gu, Jun Wang, **Qin Lin** and Qi Gong, 2015. “Automatic contour-based road network design for optimized wind farm micro-siting”, *IEEE Transactions on Sustainable Energy*, 6(1), pp.281-289.
6. **Qin Lin** and Jun Wang, 2014. “Vertically correlated echelon model for the interpolation of missing wind speed data”, *IEEE Transactions on Sustainable Energy*, 5(3), pp. 804-812.

## Conference papers

1. Emanuel Munoz Panduro\*, Dvij Kalaria, **Qin Lin**<sup>+</sup>, and John M. Dolan, “Online Adaptive Compensation for Model Uncertainty Using Extreme Learning Machine-based Control Barrier Functions” (accepted to IROS 2022)
2. Jialun Li\*, Xiaojia Xie, **Qin Lin**, Jianping He, and John M. Dolan, “Motion Planning by Search in Derivative Space and Convex Optimization with Enlarged Solution Space” (accepted to IROS 2022)
3. Dvij Kalaria\*, **Qin Lin**<sup>+</sup>, and John M. Dolan, “Delay-aware Robust Control for Safe Autonomous Driving” (accepted to 2022 IEEE Intelligent Vehicles Symposium (IV), **selected for oral presentation, top %10**)
4. Omid Jahanmahin\*, **Qin Lin**, Yanjun Pan, and John M. Dolan. “Jerk-Minimized CILQR for Human-Like Driving on Two-Lane Roadway.” In *2021 IEEE Intelligent Vehicles Symposium (IV)*, pp. 1282-1289. IEEE, 2021.
5. **Qin Lin**, Sicco Verwer, and John M. Dolan, “Safety Verification of a Data-driven Adaptive Cruise Controller”, in *31st IEEE Intelligent Vehicle Symposium (IV)*, 2020 (pp. 1875-1880). IEEE
6. Yanjun Pan\*, **Qin Lin**, Het Shah, John M. Dolan, “Safe Planning for Self-Driving Via Adaptive Constrained ILQR.” *2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, (pp. 2377-2383). IEEE.
7. **Qin Lin**, Xin Chen, Aman Khurana, John M. Dolan, “ReachFlow: An Online Safety Assurance Framework for Waypoint-Following of Self-driving Cars”. in *2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, (pp. 6627-6632). IEEE.
8. **Qin Lin**, Wenshuo Wang, Yihuan Zhang, and John M. Dolan, “Measuring Similarity of Interactive Driving Behaviors Using Matrix Profile”. In *2020 American Control Conference (ACC)* (pp. 3965-3970). IEEE.
9. **Qin Lin**, Sicco Verwer, Robert Kooij and Aditya Mathur, “Using Datasets from Industrial Control Systems for Cyber Security Research and Education”. In *International Conference on Critical Information Infrastructures Security* (pp. 122-133). Springer, 2019.
10. **Qin Lin**, Sridha Adepu, Sicco Verwer, and Aditya Mathur, “TABOR: A Graphical Model-based Approach for Anomaly Detection in Industrial Control Systems”. In *Proceedings of the 2018 on Asia Conference on Computer and Communications Security* (pp. 525-536). ACM. (**acceptance rate: 62/320=20%**)
11. Gaetano Pellegrino, Christian Hammerschmidt, **Qin Lin**, and Sicco Verwer, “Learning Deterministic Finite Automata from Infinite Alphabets”. In *2017 International Conference on Grammatical Inference* (pp. 120-131).
12. Gaetano Pellegrino, **Qin Lin**, Christian Hammerschmidt, and Sicco Verwer, “Learning Behavioral Fingerprints from Netflows Using Timed Automata”. In *Integrated Network and Service Management (IM)*, *2017 IFIP/IEEE Symposium on* (pp. 308-316). IEEE. (**acceptance rate: 44/154=28.6%**)
13. Xiaoran Liu\*, **Qin Lin**, Sicco Verwer, and Dmitri Jarnikov, “Anomaly Detection in a Digital Video Broadcasting System Using Timed Automata”, *Thirty-Second Annual ACM/IEEE Symposium on Logic in Computer Science (LICS) Workshop on Learning and Automata (LearnAut)*, 2017
14. Yihuan Zhang, Jun Wang, **Qin Lin**, Sicco Verwer, and John M. Dolan, “A Data-driven Behavior Generation Algorithm in Car-following Scenarios”. In *Dynamics of Vehicles on Roads and Tracks Vol 1: Proceedings of the 25th International Symposium on Dynamics of Vehicles on Roads and Tracks (IAVSD 2017)*, (pp. 227-232). CRC Press.

15. Yihuan Zhang, **Qin Lin**, Jun Wang, and Sicco Verwer, “Car-following Behavior Model Learning Using Timed Automata”. *IFAC-PapersOnLine*, 50(1), 2017 (pp.2353-2358)
16. **Qin Lin**, Christian Hammerschmidt, Gaetano Pellegrino, and Sicco Verwer, “Short-term Time Series Forecasting with Regression Automata”, *ACM SIGKDD 2016 Workshop on Mining and Learning from Time Series (MiLeTS)*
17. Christian Hammerschmidt, Sicco Verwer, and **Qin Lin**, “Interpreting Finite Automata for Sequential Data”, *Interpretable Machine Learning for Complex Systems: NIPS 2016 workshop proceedings*
18. **Qin Lin**, Jun Wang, and Weiting Qiao, “Denoising of Wind Speed Data by Wavelet Thresholding”. *In Chinese Automation Congress (CAC), 2013 (pp. 518-521). IEEE*

## Manuscripts

1. Dvij Kalariya\*, **Qin Lin**<sup>+</sup>, and John M. Dolan, “Delay-aware Robust Control for Safe Autonomous Driving and Racing”, submitted to IEEE TVT
2. Jinfeng Chen\*, **Qin Lin**<sup>+</sup>, Zhiqiang Gao, and Fan Zhang, “Extended State Observer with Control Lyapunov and Barrier Functions for Uncertain Safety-Critical Control”, submitted to IEEE ACC
3. Srujan Deolasee\*, **Qin Lin**<sup>+</sup>, Jialun Li, and John M. Dolan, “Spatio-temporal Motion Planning for Autonomous Vehicles with Trapezoidal Corridors and Bezier Curves”, submitted to IEEE ACC

## HONORS AND AWARDS

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- Winner of the Competition for Motion Planning of Autonomous Vehicles (ITSC 2021), with Shivesh Khaitan and John M. Dolan

## FUNDING

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I co-wrote a successful proposal on applying state machine learning for intrusion detection of cyber physical systems bridging an international cooperation between TU Delft and Singapore University of Technology and Design, together with Dr. Sicco Verwer and Prof. Aditya Mathur. The total research funding is **200k euro**.

## PROFESSIONAL SERVICE

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### Editorial Board

- Guest editor, Transportation Safety and Environment, Special Issue on *Eco-Safe and Efficient Automated Driving in Mixed Traffic: Theory and Applications*
- Editorial Board of Young Scientists, Journal of Computer Science and Technology (JCST), 2022.7-2024.6

### Program Committee Member

- AAAI Student Abstract and Poster Program (2022, 2023)
- AIOIS-2022, in conjunction with 20th International Conference on Applied Cryptography and Network Security (ACNS 2022)

### Journal reviewing

- Machine Learning
- IEEE Transactions on Intelligent Transportation Systems (TITS)
- IEEE Transactions on Vehicular Technology (TVT)
- IEEE Transactions on Intelligent Vehicles (TIV)

- IEEE Transactions on Human-Machine Systems (THMS)
- IEEE Robotics and Automation Letters (RA-L)
- IEEE Transactions on Automation Science and Engineering (TASE)
- IEEE Transactions on Dependable and Secure Computing (TDSC)
- IEEE Transactions on Sustainable Energy (TSE)
- Renewable Energy
- IET Renewable Power Generation
- Journal of Computer Science and Technology

## Conference reviewing

- ACM Symposium on Applied Computing (SAC) (2016, 2017)
- European Conference on Artificial Intelligence (ECAI) (2016)
- International Joint Conference on Artificial Intelligence (IJCAI) (2018)
- Association for the Advancement of Artificial Intelligence (AAAI) (2019)
- IEEE International Conference on Robotics and Automation (ICRA) (2020, 2021, 2022)
- IFIP/IEEE Symposium on Integrated Network and Service Management (IM) (2018)
- International Conference on the Integration of Constraint Programming, Artificial Intelligence, and Operations Research (CPAIOR) (2018)
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) (2020)
- IEEE Intelligent Vehicle Symposium (IV) (2020, 2021)

## TEACHING

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- **Teaching Assistant**, Delft University of Technology Cyber Data Analytics (CS4035), 2015-2018  
- published **one pedagogy paper** (C6) discussing how to design a project-centric cyber security graduate course.
- Lecture, CIS390/550, Introduction to Algorithms, CSU, 2022 Spring
- Lecture, CIS492, Machine Learning, CSU, 2022 Fall

## ADVISING

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- Xiaoran Liu, Anomaly Detection in a Digital Video Broadcasting System Using Timed Automata, master student, TU Delft
- Kaixin Ding, Real-time Intrusion Detection of Cyber Physical Systems, master student, TU Delft
- Alvin Shek, undergraduate research assistant, CMU
- Jialun Li, graduate from Shanghai Jiaotong University, research assistant, CMU
- Shivesh Khaitan, Master of Science in Robotics (MSR), CMU
- Dvij Kalaria, undergraduate from IIT Kanpur, India, 2021 RISS program intern, CMU
- Emanuel Munoz, undergraduate from UTEC, Peru, 2021 RISS program intern, CMU
- Fan Zhang, Ph.D. student, CSU
- Jinfeng Chen, Ph.D. student, cosupervised with Prof. Zhiqiang Gao, CSU
- Colman McGuan, MSc, co-supervised with Prof. Chansu Yu, CSU
- Kushagra Gupta, BSc, Remote Intern, IIT Delhi, CSU

## REFEREES

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