

# MINGSHUAI CHEN

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## EMPLOYMENT

<b>College of Computer Science and Technology, Zhejiang University</b> <i>Assistant Professor of Computer Science leading the <a href="#">Formal Verification Group</a></i>	Jan. 2023 - present
<b>Dept. of Computer Science, RWTH Aachen University</b> <i>Postdoctoral Researcher at Software Modeling and Verification Group Head: Prof. Dr. Joost-Pieter Katoen</i>	Sep. 2019 - Nov. 2022

## EDUCATION

<b>Institute of Software, Chinese Academy of Sciences</b> <i>Ph.D. in Computer Science (with honour) at St. Key Lab. Comput. Sci. Advisor: Prof. Dr. Naijun Zhan</i>	Sep. 2013 - Jun. 2019
· Dissertation: Verification and Synthesis of Time-Delayed Dynamical Systems · Award: CAS-President Special Award	
<b>Dept. of Computing Science, Carl von Ossietzky Universität Oldenburg</b> <i>Visiting scholar at Hybrid Systems Group Advisor: Prof. Dr. Martin Fränzele</i>	Fall, 2015 - 2018

**College of Computer Science and Technology, Jilin University** Sep. 2009 - Jun. 2013  
*B.Sc. in Computer Science (with honour)*

## RESEARCH INTERESTS

My primary research interest lies in the general scope of *formal verification* and *synthesis*, broadly construed in *mathematical logic* and *theoretical computer science*. I develop formal reasoning techniques for programs and hybrid discrete-continuous systems for ensuring the reliability and effectiveness of safety-critical cyber-physical systems, and aim to push the limits of automation as far as possible. My research interests include

- Logical Aspects of CS
- Formal Verification and Synthesis
- Programming Theory/Languages
- Cyber-Physical Systems
- Probabilistic/Quantum Systems
- AI for Formal Methods

## ACADEMIC SERVICES

### Lecturing

The Principles of Compilers, B.Sc., ZJU SS 24/25

### Teaching Assistant

Trends in Computer-Aided Verification, B.Sc./M.Sc., Seminar in Theoretical CS, RWTH Aachen SS 21/22

Concurrency Theory, M.Sc., RWTH Aachen WS 21-22

Probabilistic Programming, B.Sc./M.Sc., Seminar in Theoretical CS, RWTH Aachen WS 20-21

Theoretical Foundations of the UML, M.Sc., RWTH Aachen SS 20

Theories of Programming, M.Sc., UCAS WS 17-18/18-19

### Editor & Committee Chair

Program Co-Chair of QEST+FORMATS 2026 Sep. 2026

Workshop Chair of ICFEM 2025 Nov. 2025

Guest Editor of Special Issue on Formal Methods and Their Applications of Journal of Software Nov. 2024

Co-Chair of Forum on Formal Methods and Their Applications at ChinaSoft 2024 Nov. 2024

Co-Chair of Forum on Theor. Eng. Software under Uncertainty at ChinaSoft 2024 Nov. 2024

### Committee Member

Senior Member of the China Computer Federation (CCF) Sep. 2024 - present

Executive Member of CCF Technical Committee on Formal Methods	Jul. 2023 - present
Member of CCF Technical Committee on Theoretical Computer Science	Jul. 2023 - present
Reviewer Panel of Mathematical Reviews	Oct. 2021 - present
Program/Review Committee Member of CAV 2026, OOPSLA 2026, TACAS 2026/2025, ICFEM 2025, ATVA 2025, TASE 2025, FSEN 2025, SETSS 2025, SETTA 2024, RTCSA 2024/2021, ICWS 2024 (SRG Workshop), SYNASC 2022 (Logic and Programming Track)	
Repeatability/Artifact Evaluation Committee Member of ADHS 2021, VMCAI 2021	

### External Reviewer

FM '24, EMSOFT '24/19, VMCAI '24, TACAS '23/21, POPL '23, ICALP '22, TASE '22/15, SAFECOMP '22, CAV '21/20, ADHS '21/18, ECC '21/16, HSCC '20, FORMATS '20, RTSS '19, MEMOCODE '18, ATVA '18/15, ICECCS '17, TIME '16, VSTTE '16, UTP '16, J. Autom. Reason., ACM Trans. Cyber-Phys. Syst., Sci. Comput. Program., Form. Asp. Comput., Nonlinear Anal.: Hybrid Syst., J. Syst. Archit., C. Zhou's Festschrift, J.-P. Katoen's Festschrift, M. Fränzle's Festschrift, Royal Society Open Science

### HONORS & AWARDS

Recipient of the NSFC Excellent Young Scientists Fund Program (Overseas)	Oct. 2023
High-Impact Publication [36] in CS by Chinese Researchers across from Springer Nature	Feb. 2021
Nomination for the CAS Excellent Doctoral Dissertation Award [1]	Mar. 2020
CAS-President Special Award (1st awardee from ISCAS ever since its inception in 1985)	Jul. 2019
Best Paper Award [36] at FMAC 2019	Dec. 2019
Distinguished Paper Award [39] at ATVA 2018	Oct. 2018
National Scholarship	Oct. 2018/2010
Selected Attendee of the 6th Heidelberg Laureate Forum	Sep. 2018
Outstanding Student Award of UCAS Scientific Research Project	Dec. 2013

### GRANTS

[PI] NSFC General Program: Fixed-Point Theories for Quantitative Verifi. & Symb. Inference	2026 - 2029
[PI] NSFC Excellent Young Scientists Fund (Overseas): Formal Design of Safety-Critical CPS	2024 - 2027
[PI] ZJNSF Major Program: Hybrid Comput. Models and Theories for Heterogeneous Comput.	2024 - 2027
[PI] CASC Open Fund: Test Generation and Prioritization for Aerospace Embedded Software	2025 - 2026
[PI] CCF-Huawei Populus Grove Fund: Modular Verification via LLMs + Symbolic Reasoning	2025 - 2026
[Co-I] ZJNSF Major Program: Theory of Generative Operating Systems	2024 - 2027
[Co-I] ZJDST R&D Program: Adaptive Operating Systems Against Complex Environments	2024 - 2027
[Co-I] ZJDST R&D Program: Quantum Key Distribution Systems: Terminals and Protocols	2024 - 2027
[PI] CCF-Huawei Populus Grove Fund: Self-Adaptive Abstract Interpretation for C Programs	2023 - 2024
[PI] ZJU 100 Young Professor: Foundations of Cyber-Physical Systems	2023 - 2029
[PI] Qizhen Scholar: Talent program funded by ZJU Education Foundation	2023 - 2026
[Co-I] National Key R&D Program: General Theory and Tech. of Service Intelligent Supervision	2022 - 2025
[Co-I] NSFC General Program: Formal Verification of Delayed Dynamical and Hybrid Systems	2019 - 2022

### SELECTED PUBLICATIONS

cf. page 6 for a complete list of publications

<b>CAV '25</b>	On the Almost-Sure Termination of Probabilistic Counter Programs S. Novozhilov, M. Yang, M. Chen <sup>✉</sup> , Z. Li, and J. Yin <i>37th Int. Conf. on Computer Aided Verification (CAV 2025)</i>
<b>OOPSLA '24</b>	Exact Bayesian Inference for Loopy Probabilistic Programs L. Klinkenberg, C. Blumenthal, M. Chen <sup>✉</sup> , D. Haase, and J.-P. Katoen <i>The OOPSLA 2024 issue of the Proc. of the ACM on Programming Languages (PACMPL)</i>
<b>ASE '24</b>	PARF: Adaptive Parameter Refining for Abst. Interp. <b>2<sup>nd</sup> Prize at ChinaSoft 2024</b> Z. Wang, L. Yang, M. Chen <sup>✉</sup> , Y. Bu, Z. Li, Q. Wang, S. Qin, X. Yi, and J. Yin <i>39th IEEE/ACM Int. Conf. on Automated Software Engineering (ASE 2024)</i>
<b>FM '24</b>	Proving Functional Program Equivalence via Directed Lemma Synthesis Y. Sun, R. Ji, J. Fang, X. Jiang, M. Chen, and Y. Xiong <i>26th Int. Symp. on Formal Methods (FM 2024)</i>
<b>OOPSLA '23</b>	Lower Bounds for Possibly Divergent Probabilistic Programs S. Feng, M. Chen <sup>✉</sup> , H. Su, B. L. Kaminski, J.-P. Katoen, and N. Zhan <i>The OOPSLA 2023 issue of the Proc. of the ACM on Programming Languages (PACMPL)</i>
<b>TACAS '23</b>	Probabilistic Program Verification via Inductive Synthesis of Inductive Invariants K. Batz, M. Chen <sup>✉</sup> , S. Junges, B. L. Kaminski, J.-P. Katoen, and C. Matheja <i>29th Int. Conf. on Tools and Algorithms for Construction and Analysis of Systems (TACAS 2023)</i>
<b>Inf. Com.</b>	Encoding Inductive Invariants as Barrier Certificates Q. Wang, M. Chen <sup>✉</sup> , B. Xue, N. Zhan, and J.-P. Katoen <i>Information and Computation, 2022</i>
<b>CAV '22</b>	Does a Program Yield the Right Distribution? M. Chen <sup>✉</sup> , J.-P. Katoen, L. Klinkenberg, and T. Winkler <i>34th Int. Conf. on Computer Aided Verification (CAV 2022)</i>
<b>Acta Inf.</b>	Indecision and Delays Are the Parents of Failure M. Chen <sup>✉</sup> , M. Fränzle, Y. Li, P. N. Mosaad, and N. Zhan <i>Acta Informatica, 2021</i>
<b>CAV '21</b>	Latticed $k$ -Induction with an Application to Probabilistic Programs K. Batz, M. Chen <sup>✉</sup> , B. L. Kaminski, J.-P. Katoen, C. Matheja, and P. Schröer <i>33rd Int. Conf. on Computer Aided Verification (CAV 2021)</i>
<b>CAV '21</b>	Synthesizing Invariant Barrier Certificates via Difference-of-Convex Programming Q. Wang, M. Chen <sup>✉</sup> , B. Xue, N. Zhan, and J.-P. Katoen <i>33rd Int. Conf. on Computer Aided Verification (CAV 2021)</i>
<b>CAV '20</b>	Unbounded-Time Safety Verification of Stochastic Differential Dynamics S. Feng, M. Chen <sup>✉</sup> , B. Xue, S. Sankaranarayanan, and N. Zhan <i>32nd Int. Conf. on Computer Aided Verification (CAV 2020)</i>
<b>TACAS '20</b>	Learning One-Clock Timed Automata <b>Best Paper Award at FMAC 2019</b> J. An, M. Chen, B. Zhan, N. Zhan, and M. Zhang <i>26th Int. Conf. on Tools and Algorithms for Construction and Analysis of Systems (TACAS 2020)</i>
<b>CAV '19</b>	Taming Delays in Dynamical Systems S. Feng, M. Chen <sup>✉</sup> , N. Zhan, M. Fränzle, and B. Xue <i>31st Int. Conf. on Computer Aided Verification (CAV 2019)</i>
<b>CADE '19</b>	NIL: Learning Nonlinear Interpolants M. Chen <sup>✉</sup> , J. Wang, J. An, B. Zhan, D. Kapur, and N. Zhan <i>27th Int. Conf. on Automated Deduction (CADE 2019)</i>
<b>ATVA '18</b>	What's to Come Is Still Unsure <b>Distinguished Paper Award</b> M. Chen <sup>✉</sup> , M. Fränzle, Y. Li, P. N. Mosaad, and N. Zhan

<b>IEEE TAC</b>	Reachability Analysis for Solvable Dynamical Systems T. Gan, M. Chen, Y. Li, B. Xia, and N. Zhan <i>IEEE Trans. Automat. Contr., 2018</i>
<b>IJCAR '16</b>	Interpolant Synthesis for Quadratic Polynomial Inequalities and Combination with <i>EUF</i> T. Gan, L. Dai, N. Zhan, D. Kapur, and M. Chen <i>8th Int. Joint Conf. on Automated Reasoning (IJCAR 2016)</i>
<b>FM '16</b>	Validated Simulation-Based Verification of Delayed Differential Dynamics M. Chen, M. Fränzle, Y. Li, P. N. Mosaad, and N. Zhan <i>21st Int. Symp. on Formal Methods (FM 2016)</i>

## SELECTED TOOLS/PROTOTYPES

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- **PARF**: A tool geared towards automatically refining abstraction strategies of static analyzers for C programs; it has been awarded the 2nd prize (ranking 5/74) in the Software Prototype Competition as part of ChinaSoft 2024 and applied in Huawei's key product lines such as wireless base stations and cryptographic libraries.
- **PRODIGY**: A tool that decides whether a given probabilistic loop agrees with an (invariant) specification encoded as a loop-free program; it supports exact inference and efficient queries on posterior distributions.
- **CEGISPRO2**: A tool that proves upper- and/or lower bounds on expected outcomes of possibly infinite-state probabilistic programs by synthesizing piecewise linear quantitative invariants.
- **KIPRO2**: A tool that performs in parallel latticed  $k$ -induction and BMC to fully automatically verify upper bounds on expected values of possibly infinite-state probabilistic programs.
- **BMI-DC**: A prototype that proves unbounded-time safety of differential dynamical systems by synthesizing invariant barrier certificates via difference-of-convex programming.
- **NIL**: A learning-based tool that automatically synthesizes non-trivial (reverse) Craig interpolants for the quantifier-free theory of nonlinear arithmetic.
- **DGAME**: A tool that automatically synthesizes finite-memory controllers (a.k.a. winning strategies) for safety games under delayed information.
- **MPPs**: A procedure for deciding termination by computing the set of non-terminating inputs for multi-path polynomial programs with equality conditions.
- **MARS**: A toolchain for modelling, analyzing and verifying hybrid systems, which has been successfully applied in the verification of the Chinese lunar lander Chang'e-3 and the high-speed rail in China.

## SELECTED TALKS

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### Dissertation Defence

- Verification & Synthesis of Time-Delayed Dynamics, *Doctoral Dissertation Defence at ISCAS*, Beijing, China, May 2019.

### Tutorials

- Taming Delays in Cyber-Physical Systems, *ESWEEK*, Shanghai, China, Oct. 2022. [Tutorial co-presented with Naijun Zhan].
- Formal Analysis, Verification and Design of Safety-Critical CPS, *RTSS*, Houston, USA, Dec. 2020. [Tutorial co-presented with Lei Bu, Qixin Wang and Naijun Zhan].

### Conferences, Workshops, Seminars & Visits

- Derivative-Agnostic Inference of Nonlinear Hybrid Systems, *International Online Seminar on Interval Methods in Control Engineering*, Apr. 2025.
- PARF: An Adaptive Abstraction-Strategy Refiner for Static Analysis, *Dishui Lake Forum, East China Normal University*, Shanghai, China, Jan. 2025.

- Reasoning about Loopy Probabilistic Programs, *PurPL Seminar*, Purdue University, West Lafayette, USA, Sep. 2024 & *Colloquium Talk at Seminar on Software Engineering and Programming Languages*, Hong Kong University of Science and Technology, Hong Kong, China, Jan. 2024 & *CCF Beautiful Lake Seminars on Formal Verification of Large-Scale Infrastructure Software*, Suzhou, China, Aug. 2024.
- Lower Bounds for Possibly Divergent Probabilistic Programs, *MOVES' Colloquium at Schloss Dagstuhl*, Saarbrücken, Germany, Apr. 2022 & *ROCKS*, Nijmegen, Netherlands, May 2022 & *OOPSLA*, Lisbon, Portugal, Oct. 2023.
- Latticed  $k$ -Induction with an Application to Probabilistic Programs, *Information Sciences Seminar & Youth Forum*, Peking University, Beijing, China, Oct. 2021 & *ISCAS Seminar*, ISCAS, Beijing, China, Dec. 2022.
- Synthesizing Invariant Barrier Certificates via Difference-of-Convex Programming, *Seminar on Cyber-Physical Systems*, University of Southampton, Southampton, UK, Apr. 2021 & *CAV*, Los Angeles, USA, Jul. 2021.
- On  $\infty$ -Safety of Stochastic Differential Dynamics, *MOVES Seminar*, RWTH Aachen University, Aachen, Germany, Apr. 2020 & *CAV*, Los Angeles, USA, Jul. 2020.
- (In-)Variant Synthesis for Probabilistic Programs [Immature Idea], *MOVES' Winter Colloquium at Kleinwalsertal*, Kleinwalsertal, Austria, Feb. 2020.
- Interpolation over Nonlinear Arithmetic - Towards Program Reasoning and Verification, *PKU Seminar on Programming Languages*, Peking University, Beijing, China, Sep. 2019 & *MOVES Seminar*, RWTH Aachen University, Aachen, Germany, Nov. 2019 & *FACAS*, La Falda, Córdoba, Argentina, Mar. 2022.
- Taming Delays in Dynamical Systems - Unbounded Verification of Delay Differential Equations, *CAV*, New York City, USA, Jul. 2019.
- Modelling · Verification · Synthesis - A Peek into the Blueprint of Hybrid Systems, *RWTH Aachen University*, Aachen & *Technische Universität München*, München, Germany, Oct. 2018.
- What's to Come is Still Unsure - Synthesizing Controllers Resilient to Delayed Interaction, *ATVA*, Los Angeles, USA, Oct. 2018 & *CAP*, Beijing, China, Sep. 2018 & *MISSION@INVAP*, San Carlos de Bariloche, Argentina, Feb. 2022.
- Towards Delays in Dynamical and Control Systems - Verification & Synthesis, *Universität des Saarlandes*, Saarbrücken, Germany, Jul. 2016 & *LEDS*, Shanghai, China, Dec. 2016.
- Validated Simulation-Based Verification of Delayed Differential Dynamics, *FM*, Limassol, Cyprus, Nov. 2016.
- Computing Reachable Sets of Linear Vector Fields Revisited, *ECC*, Aalborg, Denmark, Jun. 2016.
- A Two-Way Path between Formal and Informal Design of Embedded Systems, *UTP* & *iFM*, Reykjavík, Iceland, Jun. 2016.
- HHL Prover: An Improved Interactive Theorem Prover for Hybrid Systems, *ICFEM*, Paris, France, Nov. 2015.
- Decidability of Reachability for a Family of Linear Vector Fields, *ATVA*, Shanghai, China, Oct. 2015.

## VISITS & PARTICIPATIONS

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### Academic Visits

ALPACAS Research Group, Hong Kong University of Science and Technology, Hong Kong, China Jan. 2024  
 Software Modeling and Verification Group, RWTH Aachen University, Aachen, Germany Oct. 2023/2018  
 St. Key Lab. Comput. Sci., Institute of Software, Chinese Academy of Sciences, Beijing, China Dec. 2022  
 Hybrid Systems Group, C. v. Ossietzky Universität Oldenburg, Oldenburg, Germany Fall, 2015 - 2018  
 Chair of Robotics, AI and Real-time Syst., Technische Universität München, München, Germany Oct. 2018  
 Dependable Systems and Software Group, Universität des Saarlandes, Saarbrücken, Germany Jul. 2016

## Conferences & Workshops

CAV '25, ChinaSoft '24, SPLASH '23, ESWEEK '22, ROCKS '22, FACAS '22, MISSION '22, RP '21, LPP '21, CPS-IoT Week '21, VSOW03 '21, CAV '21/20/19/17, RTSS '20, ETAPS '20, ATVA '18/15, HLF '18, CONFESTA '18, CAP '18/17, SETTA '17, FMAC '17/16, FM '16, ECC '16, iFM&UTP '16, LEDS '16/14, ICFEM '15, CDZ '14, SAVE '14, Dagstuhl Seminars (No. 22154), Shonan Meeting (No. 237), Beautiful Lake Seminars (No. 18)

## Summer/Autumn Schools

The Summer School on Formal Methods, Beijing, China	Aug. 2019/2018
The 3rd School on Engineering Trustworthy Software Systems, Chongqing, China	Apr. 2017
The 2nd AVACS Autumn School, Oldenburg, Germany	Oct. 2015
The 4th Summer School in Symbolic Computation, Beijing, China	Aug. 2015
The 5th Summer School on Formal Techniques, Atherton, CA, USA	May 2015
The 4th SAT/SMT Summer School, Semmering, Austria	Jul. 2014

## LANGUAGES

English: working-language      German: for survival only      Chinese: mother-tongue

## COMPLETE LIST OF PUBLICATIONS

### Dissertation

- [1] M. Chen<sup>✉</sup>. Verification and synthesis of time-delayed dynamical systems. *PhD Dissertation*, Institute of Software, Chinese Academy of Sciences, China, 2019 (in Chinese). [Nomination for the CAS Excellent Doctoral Dissertation Award].

### Book Chapters

- [2] Z. Li, M. Yang, S. Feng, and M. Chen<sup>✉</sup>. Fixed-point reasoning for stochastic systems: A survey of recent advancements and open challenges. In *Design and Verification of Cyber-Physical Systems: From Theory to Applications*. Springer, 2025. [To appear].
- [3] S. Feng, T. Yang, M. Chen<sup>✉</sup>, and N. Zhan. A unified framework for quantitative analysis of probabilistic programs. In *Principles of Verification: Cycling the Probabilistic Landscape*, pages 230–254. Springer, 2025.
- [4] M. Chen<sup>✉</sup>, X. Han, T. Tang, S. Wang, M. Yang, N. Zhan, H. Zhao, and L. Zou. MARS: A toolchain for modelling, analysis and verification of hybrid systems. In *Provably Correct Systems*, pages 39–58. Springer, 2017.

### Journal Articles

- [5] S. Tan, L. Lu, C. Lang, M. Chen, and J. Yin. Fast-USYN: Fast synthesis from unitary matrices to high-quality quantum circuits. *J. Softw.*, Special Issue on Formal Methods and Their Applications, 2025 (in Chinese). [To appear].
- [6] Z. Zhang, R. Chang, M. Chen, W. Shen, C. Yu, H. Huang, Q. Dai, and Y. Zhao. PA-Boot: A formally verified authentication protocol for multiprocessor secure boot under hardware supply-chain attacks. *IEEE Trans. Inf. Forensics Secur.*, 2025. [To appear].
- [7] D. Xiang, L. Lu, S. Tan, X. Jia, Z. Zhou, G. Sun, M. Chen, and J. Yin. AdaptDQC: Adaptive distributed quantum computing with quantitative performance analysis. *IEEE Trans. Comput.*, 2025. [To appear].
- [8] Z. Wang, M. Chen<sup>✉</sup>, T. Lin, L. Yang, J. Zhuo, Q. Wang, S. Qin, X. Yi, and J. Yin. PARF: An adaptive abstraction-strategy tuner for static analysis. *J. Comput. Sci. Technol.*, 40(4):993–1005, 2025.
- [9] L. Klinkenberg, C. Blumenthal, M. Chen<sup>✉</sup>, D. Haase, and J. Katoen. Exact Bayesian inference for loopy probabilistic programs. *Proc. ACM Program. Lang.*, 8(OOPSLA1):923–953, 2024. [Artifact Evaluated].

- [10] J. Chen, F. Wang, S. Pang, M. Chen<sup>✉</sup>, M. Xi, T. Zhao, and J. Yin. A privacy policy text compliance reasoning framework with large language models for healthcare services. *Tsinghua Sci. Tech.*, 2024. [To appear].
- [11] S. Feng, M. Chen<sup>✉</sup>, H. Su, B. L. Kaminski, J.-P. Katoen, and N. Zhan. Lower bounds for possibly divergent probabilistic programs. *Proc. ACM Program. Lang.*, 7(OOPSLA1):696–726, 2023.
- [12] Q. Wang, M. Chen<sup>✉</sup>, B. Xue, N. Zhan, and J.-P. Katoen. Encoding inductive invariants as barrier certificates: Synthesis via difference-of-convex programming. *Inf. Comput.*, 289:104965, 2022.
- [13] M. Chen<sup>✉</sup>, M. Fränzle, Y. Li, P. N. Mosaad, and N. Zhan. Indecision and delays are the parents of failure - Taming them algorithmically by synthesizing delay-resilient control. *Acta Informatica*, 58(5):497–528, 2021.
- [14] J. Wang, J. An, M. Chen, N. Zhan, L. Wang, M. Zhang, and T. Gan. From model to implementation: A network-algorithm programming language. *Sci. China Inf. Sci.*, 63(7), 2020.
- [15] M. Fränzle, M. Chen, and P. Kröger. In memory of Oded Maler: Automatic reachability analysis of hybrid-state automata. *ACM SIGLOG News*, 6(1):19–39, 2019.
- [16] T. Gan, M. Chen, Y. Li, B. Xia, and N. Zhan. Reachability analysis for solvable dynamical systems. *IEEE Trans. Automat. Contr.*, 63(7):2003–2018, 2018.

### Peer-Reviewed Conference Papers

- [17] K. Zhou, L. Lu, D. Xiang, C. Tao, A. Wu, J. Leng, F. Liu, M. Chen, and J. Yin. Vegapunk: Accurate and fast decoding for quantum ldpc codes with online hierarchical algorithm and sparse accelerator. In *Proc. of MICRO ’25*, 2025. [To appear].
- [18] Z. Wang, T. Lin, M. Chen<sup>✉</sup>, M. Yang, H. Li, X. Yi, S. Qin, and J. Yin. PREGUSS: It analyzes, it specifies, it verifies. In *Proc. of LMPL ’25*. ACM, 2025. [To appear].
- [19] W. Tian, L. Lu, S. Tan, S. Li, H. Li, T. Chu, X. Zhang, M. Chen, and J. Yin. Youtiao: Hybrid multiplexing with dynamic qubit grouping for low-cost and scalable quantum wiring. In *Proc. of MICRO ’25*, 2025. [To appear].
- [20] Y. Sun, M. Chen<sup>✉</sup>, T. Zhao, K. Zhao, H. Li, J. Chen, Z. Wang, L. Lu, X. Zhao, S. Deng, and J. Yin. HORAE: A domain-agnostic language for automated service regulation. In *Proc. of IJCAI ’25*, pages 9349–9356. International Joint Conferences on Artificial Intelligence Organization, 2025.
- [21] Y. Sun, M. Chen<sup>✉</sup>, T. Zhao, R. Xu, Z. Zhang, and J. Yin. The self-improvement paradox: Can language models bootstrap reasoning capabilities without external scaffolding? In *Proc. of ACL ’25 (Findings)*, 2025. [To appear].
- [22] S. Novozhilov, M. Yang, M. Chen<sup>✉</sup>, Z. Li, and J. Yin. On the almost-sure termination of probabilistic counter programs. In *Proc. of CAV ’25*, 2025. [To appear].
- [23] M. Yang, K. Batz, M. Chen, J.-P. Katoen, Z. Wu, and J. Yin. Latticed craig interpolation with an application to probabilistic verification. In *CIBD ’24*, 2024. [Extended Abstract].
- [24] Z. Wang, L. Yang, M. Chen<sup>✉</sup>, Y. Bu, Z. Li, Q. Wang, S. Qin, X. Yi, and J. Yin. PARF: Adaptive parameter refining for abstract interpretation. In *Proc. of ASE ’24*, pages 1082–1093. ACM, 2024.
- [25] S. Tan, H. Zhang, J. Yu, C. Lang, Y. Shang, X. Zhao, M. Chen, Y. Liang, L. Lu, and J. Yin. QuFEM: Fast and accurate quantum readout calibration using the finite element method. In *Proc. of ASPLOS ’24*, pages 948–963. ACM, 2024. [To appear].
- [26] S. Tan, D. Xiang, L. Lu, J. Lu, Q. Jiang, M. Chen, and J. Yin. MorphQPV: Exploiting isomorphism in quantum programs to facilitate confident verification. In *Proc. of ASPLOS ’24*, pages 671–688. ACM, 2024.
- [27] Y. Sun, R. Ji, J. Fang, X. Jiang, M. Chen, and Y. Xiong. Proving functional program equivalence via directed lemma synthesis. In *Proc. of FM ’24*, 2024. [To appear].

- [28] Y. Sun, M. Chen<sup>✉</sup>, K. Zhao, and J. Chen. HORAE: A domain-agnostic modeling language for automating multimodal service regulation. In *Proc. of ICWS (SRG) '24*, 2024. [Work-in-Progress Paper, To appear].
- [29] J. Chen, F. Wang, S. Pang, S. Tan, M. Chen<sup>✉</sup>, T. Zhao, M. Xi, and J. Yin. UniGM: Unifying multiple pre-trained graph models via adaptive knowledge aggregation. In *Proc. of MM '24*, pages 8556–8565. ACM, 2024.
- [30] L. Klinkenberg, T. Winkler, M. Chen, and J.-P. Katoen. Exact probabilistic inference using generating functions. In *LAFI '23*, 2023. [Extended Abstract].
- [31] K. Batz, M. Chen<sup>✉</sup>, S. Junges, B. L. Kaminski, J.-P. Katoen, and C. Matheja. Probabilistic program verification via inductive synthesis of inductive invariants. In *Proc. of TACAS '23*, pages 410–429, 2023. [Artifact Evaluated].
- [32] M. Chen<sup>✉</sup>, J.-P. Katoen, L. Klinkenberg, and T. Winkler. Does a program yield the right distribution? Verifying probabilistic programs via generating functions. In *Proc. of CAV '22*, pages 79–101, 2022. [Artifact Evaluated].
- [33] Q. Wang, M. Chen<sup>✉</sup>, B. Xue, N. Zhan, and J.-P. Katoen. Synthesizing invariant barrier certificates via difference-of-convex programming. In *Proc. of CAV '21*, pages 443–466, 2021. [Artifact Evaluated].
- [34] K. Batz, M. Chen<sup>✉</sup>, B. L. Kaminski, J.-P. Katoen, C. Matheja, and P. Schröer. Latticed  $k$ -induction with an application to probabilistic programs. In *Proc. of CAV '21*, pages 524–549, 2021. [Artifact Evaluated].
- [35] S. Feng, M. Chen<sup>✉</sup>, B. Xue, S. Sankaranarayanan, and N. Zhan. Unbounded-time safety verification of stochastic differential dynamics. In *Proc. of CAV '20*, pages 327–348, 2020. [Artifact Evaluated].
- [36] J. An, M. Chen, B. Zhan, N. Zhan, and M. Zhang. Learning one-clock timed automata. In *Proc. of TACAS '20*, pages 444–462, 2020. [Artifact Evaluated · Best Paper Award at FMAC 2019].
- [37] S. Feng, M. Chen<sup>✉</sup>, N. Zhan, M. Fränzle, and B. Xue. Taming delays in dynamical systems - Unbounded verification of delay differential equations. In *Proc. of CAV '19*, pages 650–669, 2019. [Artifact Evaluated].
- [38] M. Chen<sup>✉</sup>, J. Wang, J. An, B. Zhan, D. Kapur, and N. Zhan. NIL: Learning nonlinear interpolants. In *Proc. of CADE '19*, pages 178–196, 2019.
- [39] M. Chen<sup>✉</sup>, M. Fränzle, Y. Li, P. N. Mosaad, and N. Zhan. What's to come is still unsure - Synthesizing controllers resilient to delayed interaction. In *Proc. of ATVA '18*, pages 56–74, 2018. [Distinguished Paper Award].
- [40] B. Xue, P. N. Mosaad, M. Fränzle, M. Chen, Y. Li, and N. Zhan. Safe over- and under-approximation of reachable sets for delay differential equations. In *Proc. of FORMATS '17*, pages 281–299, 2017.
- [41] T. Gan, L. Dai, B. Xia, N. Zhan, D. Kapur, and M. Chen. Interpolant synthesis for quadratic polynomial inequalities and combination with EUF. In *Proc. of IJCAR '16*, pages 195–212, 2016.
- [42] T. Gan, M. Chen, Y. Li, B. Xia, and N. Zhan. Computing reachable sets of linear vector fields revisited. In *Proc. of ECC '16*, pages 419–426, 2016.
- [43] M. Chen, A. P. Ravn, S. Wang, M. Yang, and N. Zhan. A two-way path between formal and informal design of embedded systems. In *Proc. of UTP '16*, pages 65–92, 2016.
- [44] M. Chen, M. Fränzle, Y. Li, P. N. Mosaad, and N. Zhan. Validated simulation-based verification of delayed differential dynamics. In *Proc. of FM '16*, pages 137–154, 2016.
- [45] T. Gan, M. Chen, L. Dai, B. Xia, and N. Zhan. Decidability of the reachability for a family of linear vector fields. In *Proc. of ATVA '15*, pages 482–499, 2015.

## Manuscripts under Review

- [46] Y. Li, N. Zhan, M. Chen<sup>✉</sup>, H. Lu, G. Wu, and J.-P. Katoen. On termination of polynomial programs with equality conditions. 2024. [Under submission].

- [47] S. Feng, M. Chen, H. Wu, H. Su, and N. Zhan. Tolerant barrier certificates for stochastic systems. 2024.  
[Under submission].