謝 橋/Hsieh, Chiao/シェ チャオ

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RESEARCH INTEREST

Software Verification and Testing · Formal Methods · Cyber-physical System Verification

Topics: Assuring and certifying safety of cyber-physical systems containing complex or incompletely specified components. My main insight is to develop search algorithms for approximate abstractions of these components so that the approximations are tractable for existing formal verification techniques. In particular, I have been studying systems with vision-based perception, blackbox dynamics, and distributed coordination.

ONGOING RESEARCH PROJECTS

科研費
KAKENHI
FY 2024 – 2025 "Safety Verification of Black Box Cyber-Physical Systems via Lyapunov Stability Certificates"
Category: JSPS Grant-in-Aid for Research Activity Start-Up (Grant # 24K23861)

EDUCATION

CS@Illinois   *2015 – 2023*   Doctor of Philosophy

Reliable Autonomy Group in Department of Computer Science at University of Illinois Urbana-Champaign
Thesis: "Abstractions for Safety Assurance of Autonomous Systems"
Advisor: Prof. Mitra, Sayan · mitras@illinois.edu

臺大電子所   *2013 – 2015*   Master of Science

Verification Automation & Software Testing Lab in Graduate Institute of Electronics Engineering at National Taiwan University
Thesis: "Verifying Recursive Programs Using Intraprocedural Analyzers"
Advisors: Prof. Chen, Yu-Fang · yfc@iis.sinica.edu.tw, Prof. Wang, Farn · farn@ntu.edu.tw

臺大電機系   *2007 – 2011*   Bachelor of Science

Design Verification Lab in Department of Electrical Engineering at National Taiwan University
Projects: "Symbolic model checking on SystemC designs" with Prof. Huang, Chung-Yang · cyhuang@ntu.edu.tw

WORK EXPERIENCES

京都大学
情報学研究科
2023 – Today   Postdoc in **Computer Software Group** at Graduate School of Informatics, Kyoto University

CSL@Illinois   *2018 – 2023*   Graduate Research Assistant in **Reliable Autonomy Group** at Coordinated Science Laboratory, UIUC

CS@Illinois   *2017 – 2018*   TA at Department of Computer Science, UIUC

IBM Research   *Summer 2016*   Research Intern in **Cloud DevOps and Cognitive Platform group** at IBM Research, New York

CS@Illinois   *2015 – 2017*   RA in **Automated Software Engineering Group** at Department of Computer Science, UIUC

中研院資訊所   *2012 – 2015*   RA in **Programming Languages and Formal Methods Group** at Institute of Information Science, Academia Sinica, Taipei

海軍   *2011 – 2012*   Secondary Lieutenant. Compulsory Military Service at Republic of China Navy

SERVICES AND VOLUNTEERING

2024 · Fast Abstracts Track Committee at 35th Intl. Symp. Software Reliability Engineering (ISSRE 2024)
2022 · Artifact Evaluation Committee at 2022 European Conf. Object-Oriented Programming (ECOOP 2022)
2022 · Student Volunteer at 34th Intl. Conf. Computer Aided Verification (CAV 2022)
2018 · Graduate Mentor in Promoting Undergraduate Research in Engineering (PURE) at UIUC
2017 · Student Volunteer at 32nd Intl. Conf. Automated Software Engineering (ASE 2017)

JOURNAL ARTICLES

1 "Perception Contracts for Safety of ML-Enabled Systems" Peer-reviewed
Angello Astorga*, <u>Chiao Hsieh</u>*, P. Madhusudan, Sayan Mitra. *Proc. ACM on Programming Languages (PACMPL), vol. 7, iss. OOPSLA2, Article No. 232, Oct. 2023.* doi:10.1145/3622875
*Equal contributions as co-first authors. ⁂This paper is accepted by OOPSLA, a CORE rank "A" conference.

2 "Verifying Controllers with Vision-based Perception using Safe Approximate Abstractions" Peer-reviewed
<u>Chiao Hsieh</u>, Yangge Li, Dawei Sun, Keyur Joshi, Sasa Misailovic, Sayan Mitra. *IEEE Trans. Computer-Aided Design of Integrated Circuits and Systems (TCAD), vol. 41, no. 11, Nov. 2022.* doi:10.1109/TCAD.2022.3197508
⁂This paper is accepted by EMSOFT, a CORE rank "A" conference.

3 "Koord: A Language for Programming and Verifying Distributed Robotics Application." Peer-reviewed
Ritwika Ghosh, <u>Chiao Hsieh</u>, Sasa Misailovic, Sayan Mitra. *Proc. ACM on Programming Languages (PACMPL), vol. 4, iss. OOPSLA, Article No. 232, Nov. 2020.* doi:10.1145/3428300
⁂This paper is accepted by OOPSLA, a CORE rank "A" conference.

CONFERENCE PUBLICATIONS

4 "GAS: Generating Fast and Accurate Surrogate Models for Autonomous Vehicle Systems" Peer-reviewed
Keyur Joshi, <u>Chiao Hsieh</u>, Sayan Mitra, Sasa Misailovic. *To appear in 35th Intl. Symp. Software Reliability Engineering (ISSRE 2024).* preprint doi:10.48550/arXiv.2208.02232 ⁂ISSRE is a CORE rank "A" conference.

5 "Assuring Safety of Vision-based Swarm Formation Control" Peer-reviewed
<u>Chiao Hsieh</u>, Yangge Li, Yubin Koh, Sayan Mitra. *Proc. 2024 American Control Conf. (ACC 2024).* doi:10.23919/ACC60939.2024.10644491

6 "Industry-track: Challenges in Rebooting Autonomy with Deep Learned Perception" Peer-reviewed
Michael Abraham, Aaron Mayne, Tristan Perez, Italo Romani De Oliveira, Huafeng Yu, <u>Chiao Hsieh</u>, Yangge Li, Dawei Sun, and Sayan Mitra. *Proc. 2022 Intl. Conf. Embedded Software (EMSOFT 2022).* doi:10.1109/EMSOFT55006.2022.00016

7 "Programming Abstractions for Simulation and Testing on Smart Manufacturing Systems" Peer-reviewed
<u>Chiao Hsieh</u>, Daniel Wu, Yubin Koh, Sayan Mitra. *Proc. 18th Intl. Conf. Automation Science and Engineering (CASE 2022).* doi:10.1109/CASE49997.2022.9926564

8 "SkyTrakx: A Toolkit for Simulation and Verification of Unmanned Air-Traffic Management Systems." Peer-reviewed
<u>Chiao Hsieh</u>, Hussein Sibai, Hebron Taylor, Yifeng Ni, Sayan Mitra. *Proc. 2021 IEEE Intl. Intelligent Transportation Systems Conf. (ITSC 2021).* doi:10.1109/ITSC48978.2021.9564492

9 "CyPhyHouse: A Programming, Simulation, and Deployment Toolchain for Heterogeneous Distributed Coordination." Peer-reviewed
Ritwika Ghosh, Joao P. Jansch-Porto, <u>Chiao Hsieh</u>, Amelia Gosse, Minghao Jiang, Hebron Taylor, Peter Du, Sayan Mitra, Geir Dullerud. *Proc. 2020 IEEE Intl. Conf. Robotics and Automation (ICRA 2020),* doi:10.1109/ICRA40945.2020.9196513 ⁂ICRA is a CORE rank "A*" conference.

10 "Dione: A Protocol Verification System Built with Dafny for I/O Automata." Peer-reviewed
<u>Chiao Hsieh</u>, Sayan Mitra. *Proc. 15th Intl. Conf. integrated Formal Methods (iFM 2019).* doi:10.1007/978-3-030-34968-4_13

11 "PAC Learning-Based Verification and Model Synthesis." Peer-reviewed
Yu-Fang Chen, <u>Chiao Hsieh</u>, Ondřej Lengál, Tsung-Ju Lii, Ming-Hsien Tsai, Bow-Yaw Wang, Farn Wang. *Proc. 38th Intl. Conf. Software Engineering (ICSE 2016).* doi:10.1145/2884781.2884860 ⁂ICSE is a CORE rank "A*" conference.

12 "CPArec: Verifying Recursive Programs via Source-to-Source Program Transformation - (Competition Contribution)." Peer-reviewed
Yu-Fang Chen, <u>Chiao Hsieh</u>, Ming-Hsien Tsai, Bow-Yaw Wang, Farn Wang. *Proc. 21st Intl. Conf. Tools and Algorithms for the Construction and Analysis of Systems (TACAS 2015).* doi:10.1007/978-3-662-46681-0_35

13 "Verifying Recursive Programs Using Intraprocedural Analyzers." Peer-reviewed
Yu-Fang Chen, <u>Chiao Hsieh</u>, Ming-Hsien Tsai, Bow-Yaw Wang, Farn Wang. *Proc. 21st Intl. Static Analysis Symposium (SAS 2014).* doi:10.1007/978-3-319-10936-7_8

14 "Symbolic model checking on SystemC designs." Peer-reviewed
Chun-Nan Chou, Yen-Sheng Ho, <u>Chiao Hsieh</u>, Chung-Yang (Ric) Huang. *Proc. 49th Annual Design Automation Conf. (DAC 2012).* doi:10.1145/2228360.2228421

TEACHING EXPERIENCE

CS@Illinois   *Spring 2018*   TA for CS 421 Programming Languages and Compilers

       Fall 2017   TA for CS 527 Topics in Software Engineering

臺大   *Summer 2015*   TA for Formosan Summer School on Logic, Language, and Computation (FLOLAC 2015)