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#Citations: 63

Tzu-Han Hsu



RESEARCH INTERESTS

My research is on applications of **formal methods** in program **verification** and **synthesis** for **hyperproperties** including requirements of **information-flow security** and **privacy** analysis.

EDUCATION

- Ph.D. Student in Computer Science Engineering** 2020–Present
Michigan State University, East Lansing, MI, USA
GPA: 3.9/4.0 Advisor: Dr. Borzoo Bonakdarpour
- Bachelor of Science in Computer Science** 2016–20
Iowa State University, Ames, IA, USA
GPA: 3.86/4.0 Graduated with Magna Cum Laude
- Bachelor of Music in Piano Performance** 2013–17
Iowa State University, Ames, IA, USA
GPA: 3.86/4.0 Outstanding Senior Nomination by the Department of Music

RESEARCH EXPERIENCE

- **Graduate Research Assistant**, *Michigan State University* 2020–Present
Projects:
 - ◇ Runtime Enforcement (RE) for Hyperproperties
 - ◇ Automated Program Repair (APR) for Hyperproperties
 - ◇ Synthesis for Hyperproperties
 - ◇ Model Checking for Hyperproperties
- **Research Intern**, *Microsoft Research (MSR)* Summer 2023
Project: Theorem-Carrying-Transaction: Provable Security for Smart Contracts
Mentors: *Shuo Chen, Nikolaj Bjørner*
Keywords: Solidity, Boogie, EVM, Go-Ethereum, ERC20, UniSwap-V2
- **Applied Science Intern**, *Amazon Web Services Automated Reasoning Group (AWS-ARG)* Summer 2022
Project: Symbolic Model Checking for Distributed Protocol with Parallelization
Mentors: *Aman Goel, Michael Whalen*
Keywords: P Language, Symbolic execution, AWS Lambda, Amazon S3
- **Undergrad Research Assistant**, *Iowa State University* 2019–2020
Project: Bounded Model checking for Hyperproperties
Mentor: *Borzoo Bonakdarpour*
Keywords: QBF solvers, HyperLTL, information-flow security

CONFERENCE PAPERS

1. Raven Beutner, [Tzu-Han Hsu](#), Borzoo Bonakdarpour, and Bernd Finkbeiner
“**Syntax-Guided Automated Program Repair For Hyperproperties**”
In International Conference on Computer Aided Verification (CAV’24), Montreal, Canada.

2. [Tzu-Han Hsu](#), Borzoo Bonakdarpour, Bernd Finkbeiner, and César Sánchez
“Bounded Model Checking for Asynchronous Hyperproperties”
International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS’23), Paris, France.
3. [Tzu-Han Hsu](#), César Sánchez, Sarai Sheinvald, and Borzoo Bonakdarpour
“Efficient Loop Conditions for Bounded Model Checking Hyperproperties”
In International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS’23), Paris, France.
4. [Tzu-Han Hsu](#), Borzoo Bonakdarpour, Eunsuk Kang, and Stavros Tripakis
“Mapping Synthesis for Hyperproperties”
n IEEE International Symposium on Computer Security Foundations (CSF’22/FLoC’22), Haifa, Israel.
5. [Tzu-Han Hsu](#), César Sánchez, and Borzoo Bonakdarpour
“Bounded Model Checking for Hyperproperties”
In International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS’21), Luxembourg, Luxembourg.

ARXIV PREPRINTS

- [Tzu-Han Hsu](#), Borzoo Bonakdarpour, and César Sánchez
“HyperQB: A QBF-Based Bounded Model Checker for Hyperproperties” (2024, v5)
- [Tzu-Han Hsu](#), Yu Wang, Borzoo Bonakdarpour, Miroslav Pajic
“Multi-Agent Path Planning with Hyperproperties” (2020, v1)

RESEARCH FELLOWSHIPS

- **Michigan State University Graduate Research Fellowship** 2021, 2022
 Summer Support for Outstanding Students
- **Google Research Fellowship Nomination** 2021
 One of the only four nominees selected by Michigan State University Engineering Department

RESEARCH AWARD

- **Best Research Poster Award** 2024
 Michigan State University College of Engineering Graduate Research Symposium

PROFESSIONAL SERVICES

- **Peer-evaluated Conference Paper Reviews:**

- ◇ (CSL) ⟨2025⟩ *European Association for Computer Science Logic*
 - ◇ (SRDS) ⟨2024⟩ *International Symposium on Reliable Distributed Systems*
 - ◇ (EMSOFT) ⟨2024⟩ *International Conference on Embedded Software*
 - ◇ (CAV) ⟨2024⟩ *Computer Aided Verification*
 - ◇ (RV) ⟨2024⟩ *International Conference on Runtime Verification*
 - ◇ (TACAS) ⟨2023,2025⟩ *International Conf. on Tools and Algorithms for the Construction and Analysis of Systems*
 - ◇ (FM) ⟨2023⟩ *International Symposium on Formal Methods*
 - ◇ (ICCPs) ⟨2023⟩ *International Conference on Cyber-Physical Systems*
 - ◇ (VSTTE) ⟨2023⟩ *Verified Software: Theories, Tools, Experiments*
 - ◇ (NFM) ⟨2023⟩ *NASA Formal Methods*
 - ◇ (DISC) ⟨2022⟩ *International Symposium on Distributed Computing*
 - ◇ (CSF) ⟨2022⟩ *Computer Security Foundations Symposium*
 - ◇ (ATVA) ⟨2021⟩ *International Symposium on Automated Technology for Verification and Analysis*
- **Conference Artifact Evaluation:**
 - ◇ (CAV) ⟨2023, 2024⟩ *Computer Aided Verification*
 - **Journal Reviews::**
 - ◇ (ACTA) ⟨2022⟩ *Acta Informatica*
 - **Student Volunteer:**
 - ◇ (CAV) ⟨2021⟩ *Computer Aided Verification*

TEACHING EXPERIENCE

- **Graduate Teaching Assistant** Spring 2020
Michigan State University (CSE 260): Discrete Structures in Computer Science
- **Undergrad Teaching Assistant** Spring, Fall 2018
Iowa State University (COM S 227): Object-Oriented Programming

HONORS AND SCHOLARSHIPS

- **Outstanding Senior Nomination** by ISU Music Department 2020
- **Dean's List** of Iowa State University College of Liberal Arts and Sciences 2013–20
- **Future Leader Award** issued by U.S. Ambassador to China Terry Branstad 2018
- **Gold Level Scholarship Recipient** as Iowa State University International Student Ambassador 2013–18
- **Outstanding Student Scholarship Recipient** by Iowa State University Music Department 2013–18

LEADERSHIP AND VOLUNTEER EXPERIENCES

- **Certificate of Achievement** from The Society for Collegiate Leadership & Achievement 2016–20
- **Department Student Representative** of Iowa State University Student Council 2017–18
- **Volunteer/Event Coordinator** at Iowa Education without Borders (non-profit organization) 2017–18
- **Student Mentor** at Iowa Youth Leadership Summer Camp 2017–18
- **Student Volunteer** at Iowa State University Annual K-12 Computational Thinking Competition 2020

MUSIC AWARDS AND HONORS

- **Assistant Concert Master (Violin)** at Iowa State University Symphony Orchestra 2015-17
- **Soloist Winner - Piano Division** Fort Dodge Orchestra Young Artists Concerto Competition 2015
- **1st Prize Winner** Iowa State University Symphony Orchestra Concerto Competition 2014
- **State-Level Competition Winner** Music Teacher National Association (MTNA) Piano Competition 2014

INDUSTRIAL EXPERIENCE

Software Engineer Intern 2019–20

Worrell Medical Design Inc., Minneapolis, MN

- Developed a Virtual Reality Environment on Oculus Quest for Human Factor Engineering usability testing.
- Programed well-functioning C# scripts in Unity3D engine with desired behaviors and outcomes.
- Analyzed user feedback and debug/adjust/improve the existing versions of the program with HF engineers.