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GoogleScholar: 63 citations

# Tzu-Han Hsu



## RESEARCH INTERESTS

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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

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| <b>Ph.D. Student in Computer Science Engineering</b><br>Michigan State University, East Lansing, MI, USA<br><i>GPA: 3.9/4.0    Advisor: Dr. Borzoo Bonakdarpour</i>       | 2020–present |
| <b>Bachelor of Science in Computer Science</b><br>Iowa State University, Ames, IA, USA<br><i>GPA: 3.86/4.0    Graduated with Magna Cum Laude</i>                          | 2016–2020    |
| <b>Bachelor of Music in Piano Performance</b><br>Iowa State University, Ames, IA, USA<br><i>GPA: 3.86/4.0    Outstanding Senior Nomination by the Department of Music</i> | 2013–2017    |

## RESEARCH EXPERIENCE

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- **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:    QBF-based Bounded Model checking for Hyperproperties  
Mentor:    *Borzoo Bonakdarpour*  
Keywords:   QBF-solvers, HyperLTL, non-interference

## CONFERENCE PAPERS

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- 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.*

- [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.*
- [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.*
- [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.*
- [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

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- [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)

## PROJECTS UNDER SUBMISSION

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- [Tzu-Han Hsu](#), Arshia Rafeioskouei, and Borzoo Bonakdarpour  
**Strategies Synthesis using Reinforcement Learning for Hyperproperties** (2024)
- [Tzu-Han Hsu](#), Borzoo Bonakdarpour, Twain Byrnes, Limin Jia  
**Syntax-guided Runtime Enforcement for Hyperproperties** (2024)

## PROFESSIONAL SERVICES

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- **Peer-evaluated Conference Paper Reviews:**
  - (CAV'24) *Computer Aided Verification*
  - (RV'23) *International Conference on Runtime Verification*
  - (TACAS'23) *International Conference on Tools and Algorithms for the Construction and Analysis of Systems*
  - (FM'23) *International Symposium on Formal Methods*
  - (ICCPS'23) *International Conference on Cyber-Physical Systems*
  - (VSTTE'23) *Verified Software: Theories, Tools, Experiments*
  - (NFM'23) *NASA Formal Methods*
  - (DISC'22) *International Symposium on Distributed Computing*
  - (CSF'22) *Computer Security Foundations Symposium*
  - (ATVA'21) *International Symposium on Automated Technology for Verification and Analysis*
- **Conference Artifact and Code Submission Reviews:**
  - (CAV'24) *International Conference on Computer Aided Verification*
  - (CAV'23) *International Conference on Computer Aided Verification*

- **Journal Reviews::**  
(ACTA'22) *Acta Informatica*
- **Student Volunteer:**  
(CAV'21) *International Conference on Computer Aided Verification*

## FELLOWSHIPS

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

## TEACHING EXPERIENCE

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- **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

## RESEARCH AWARD

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

## HONORS AND SCHOLARSHIPS

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

## LEADERSHIP AND VOLUNTEER EXPERIENCES

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- The Society for Collegiate Leadership & Achievement 2016–2020
- Iowa State University Student Council, Department Representative 2017–2018
- Iowa Education without Borders (non-profit) Volunteer/Event Coordinator 2017–2018
- Iowa Youth Leadership Summer Camp Student Volunteer 2017–2018
- Iowa State University Annual K-12 Computational Thinking Competition 2020

## MUSIC AWARDS

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- Soloist Winner, Fort Dodge Orchestra Young Artists Concerto Competition 2015
- 1st Prize Winner, Iowa State University Symphony Orchestra Concerto Competition 2014
- State Winner, Music Teacher National Association (MTNA) Piano Competition 2014

## INDUSTRIAL EXPERIENCE

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### **Software Engineer Intern**

2019–2020

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.