

# BRIAN HU ZHANG

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## EDUCATION

### Carnegie Mellon University

Ph.D. in Computer Science

08/2019 — present

**Advisor:** Tuomas Sandholm

**Research Interests:** computational game theory, especially equilibrium-finding in imperfect-information games; mechanism design; artificial intelligence; algorithms and complexity

### Stanford University

M.S. in Computer Science

03/2018 — 06/2019

B.S. in Computer Science with Distinction and Departmental Honors 09/2015 — 06/2019

**Advisor:** Greg Valiant

## PUBLICATIONS

*Reverse chronological order.*

*“with” and \* denote authors ordered either alphabetically or randomly*

- [13] Subgame Solving in Adversarial Team Games  
**Brian Hu Zhang\***, Luca Carminati\*, Federico Cacciamani, Gabriele Farina, Pierriccardo Olivieri, Nicola Gatti, and Tuomas Sandholm  
To appear in *Neural Information Processing Systems* (NeurIPS) 2022
- [12] [Polynomial-Time Optimal Equilibria with a Mediator in Extensive-Form Games](#)  
**Brian Hu Zhang** and Tuomas Sandholm  
To appear in *Neural Information Processing Systems* (NeurIPS) 2022
- [11] [Optimal Correlated Equilibria in General-Sum Extensive-Form Games: Fixed-Parameter Algorithms, Hardness, and Two-Sided Column-Generation](#)  
**Brian Hu Zhang**, Gabriele Farina, Andrea Celli, and Tuomas Sandholm  
*ACM Conference on Economics and Computation* (EC) 2022
- [10] [Team Belief DAG: A Concise Representation for Team-Correlated Game-Theoretic Decision Making](#)  
**Brian Hu Zhang**, Gabriele Farina, and Tuomas Sandholm  
*ICLR Workshop on Gamification and Multiagent Solutions* (GMAS) 2022

- [9] [Polynomial-Time Sum-of-Squares Can Robustly Estimate Mean and Covariance of Gaussians Optimally](#)  
with Pravesh K. Kothari and Peter Manohar  
*International Conference on Algorithmic Learning Theory (ALT)* 2022
- [8] [Team Correlated Equilibria in Zero-Sum Extensive-Form Games via Tree Decompositions](#)  
**Brian Hu Zhang** and Tuomas Sandholm  
*AAAI Conference on Artificial Intelligence (AAAI)* 2022
- [7] [Subgame solving without common knowledge](#)  
**Brian Hu Zhang** and Tuomas Sandholm  
*Neural Information Processing Systems (NeurIPS)* 2021 (Acceptance rate 26%)  
**Spotlight** (top ~10% of accepted papers)  
*AAAI Workshop on Reinforcement Learning in Games (RLG)* 2021  
**Oral Presentation** (4 out of 52 accepted papers)
- [6] [Finding and Certifying \(Near-\)Optimal Strategies in Black-Box Extensive-Form Games](#)  
**Brian Hu Zhang** and Tuomas Sandholm  
*AAAI Conference on Artificial Intelligence (AAAI)* 2021 (Acceptance rate 21%)  
*AAAI Workshop on Reinforcement Learning in Games (RLG)* 2021  
**Oral Presentation** (4 out of 52 accepted papers)  
Presented talk to Fei Fang’s research group, 02/2021  
Guest lecture for CMU course 15-888 (Computational Game Solving), 11/2021
- [5] [Small Nash Equilibrium Certificates in Very Large Games](#)  
**Brian Hu Zhang** and Tuomas Sandholm  
*Neural Information Processing Systems (NeurIPS)* 2020 (Acceptance rate 20%)
- [4] [Sparsified Linear Programming for Zero-Sum Equilibrium Finding](#)  
**Brian Hu Zhang** and Tuomas Sandholm  
*International Conference on Machine Learning (ICML)* 2020 (Acceptance rate 22%)
- [3] [A Spectral View of Adversarially Robust Features](#)  
Shivam Garg, Vatsal Sharan\*, **Brian Hu Zhang\***, and Gregory Valiant  
*Neural Information Processing Systems (NeurIPS)* 2018 (Acceptance rate 21%)  
**Spotlight** (top 16% of accepted papers)
- [2] [Mitigating Unwanted Biases with Adversarial Learning](#)  
**Brian Hu Zhang**, Blake Lemoine, and Margaret Mitchell  
*AAAI/ACM Conference on AI, Ethics, and Society (AIES)* 2018. (Acceptance rate 38%)
- [1] [Advantages of Unfair Quantum Ground State Sampling](#)  
**Brian Hu Zhang**, Gene Wagenbreth, Victor Martin-Mayor, and Itay Hen  
*Scientific Reports* 2016 (Acceptance rate 45%)

## PATENT APPLICATIONS

- [2] Job scheduling on distributed computing devices  
Sheng Li, **Brian Hu Zhang**, Liqun Cheng, Norman Paul Jouppi, Ni Yun  
*Patent pending*, filed 2019.
- [1] Detective method and system for activity-or-behavior model construction and automatic detection of the abnormal activities or behaviors of a subject system without requiring prior domain knowledge  
Phone Lin, Tao Zhang, En-Hau Yeh, Xin-Xue Lin, Chia-Peng Lee, and **Brian Hu Zhang**  
*Patent pending*, filed 2017.

## RESEARCH AND WORK EXPERIENCE

**Research Assistant,  
Carnegie Mellon University**

08/2019 — present

**Advisor:** Tuomas Sandholm

I am simultaneously studying the theoretical foundations and design of practical algorithms for game solving, with the goal of developing a framework with which theoretically robust algorithms can be built and applied to large-scale real-world problems. The work has led to several publications, listed in previous sections.

**Research Assistant, Stanford University**

09/2018 — 12/2018

**Advisor:** Tim Roughgarden

Studied incentive schemes for new proof-of-stake blockchain systems, such as the recently-proposed Algorand.

**Summer Intern, Google Inc.**

06/2018 — 08/2018

Designed and implemented a machine learning model that uses graph convolutional networks (GCNs) to match machine learning models (expressed as TensorFlow graphs) to hardware accelerator types to increase efficiency of accelerator fleets. A patent application has been filed on which I am a co-inventor.

**Undergraduate Honors Thesis,  
Stanford University**

09/2017 — 06/2018

**Advisor:** Gregory Valiant

Designed new algorithms for constructing features for machine learning that are robust to adversarial attacks. The work was published and presented in NeurIPS 2018 as a spotlight paper.

## Summer Intern, Google Inc.

06/2017 — 09/2017

Designed new methods for reducing unwanted biases in machine learning models. The work was published at the 2018 AAAI/ACM AIES conference, and has since been implemented by IBM in its AI Fairness 360 Open Source Toolkit.

## General Game Playing (GGP) Project, Stanford University

03/2016 — 08/2016

Developed a GGP program that can play a wide variety of games given their descriptions only at runtime. Won Stanford GGP Championship 2016, placed 5th at the International GGP Competition (IGGPC) 2016.

## Research Intern, Stanford University

06/2016 — 08/2016

**Advisor:** Michael Genesereth

Developed a new method to allow General Game Playing (GGP) programs to play many games that were previously impractical. Also partly responsible for organizing, creating games for, running, and commentating the International GGP Competition (IGGPC) 2016.

## Research Intern, University of Southern California

01/2015 — 01/2017

**Advisor:** Itay Hen

Investigated new ways to assess the benefits and limitations of quantum computing. The work was presented at the 2016 AGU Fall Meeting and published in *Scientific Reports*.

## Research Intern, Princeton University

06/2014 — 09/2014

**Advisor:** Mung Chiang

Developed, under the guidance of Prof. Mung Chiang, a software simulation tool to study the performance of several algorithms that use game theory, such as Nash Bargaining, to optimize application performance over networks.

## TEACHING AND ADDITIONAL EXPERIENCE

### Service

- **ICLR 2023** Reviewer
- **AAAI 2023** Program Committee Member
- **ICML 2022** Reviewer

- **ICLR 2022** Reviewer
- **AAAI 2022 Workshop on Reinforcement Learning in Games** Program Committee Member
- **CMU Theory Lunch** Organizer, Spring & Fall 2021
- **NeurIPS 2021** Program Committee Member
- **AAAI 2021** Program Committee Member (*selected as top 25% PC member*)

## Teaching Assistanceships

### Stanford University

- **CS 227B** General Game Playing, Spring 2017–2019
- **CS 161** Design and Analysis of Algorithms, Winter 2019
- **CS 106B** Programming Abstractions, Fall 2016–Winter 2017
- **CS 106A** Programming Methodology, Spring–Summer 2016

## SELECTED COURSEWORK

### Carnegie Mellon University

- **15-740** Computer Architecture
- **15-751** A Theorist’s Toolkit
- **15-780** Graduate Artificial Intelligence
- **15-814** Types and Programming Languages
- **15-859FF**: Coping with Intractability: Parameterized & Fast-Exponential Algorithms
- **15-888**: Computational Game Solving

### Stanford University

- **CS 155** Computer and Network Security
- **CS 166** Data Structures

- **CS 168** The Modern Algorithmic Toolbox
- **CS 224N** Natural Language Processing with Deep Learning
- **CS 224W** Analysis of Networks
- **CS 228** Probabilistic Graphical Models
- **CS 229T** Statistical Learning Theory
- **CS 234** Reinforcement Learning
- **CS 265** Randomized Algorithms
- **CS 269I** Incentives in Computer Science
- **CS 269Q** Elements of Quantum Computing
- **CS 354** Topics in Intractability: Unfulfilled Algorithmic Fantasies
- **CS 355** Advanced Topics in Cryptography
- **EE 364A** Convex Optimization I
- **ECON 180** Honors Game Theory
- **MATH 51H, 62DM, 63DM** Modern Mathematics (linear algebra, real analysis, number theory, field theory, topology, probability theory)
- **MATH 120** Groups and Rings
- **MATH 147** Differential Topology
- **MATH 152** Elementary Theory of Numbers

## **AWARDS**

- **2019:** The Frederick Emmons Terman Engineering Scholastic Award — top 5% of each year's undergraduate senior engineering class.
- **2018:** Putnam Competition — Honor Roll (top 10 in Stanford University; top 400 globally)
- **2018:** Google Games (Stanford/Berkeley) — 2nd place (2018)

- **2017:** Stanford University President's Award for Academic Excellence in the Freshman Year — top 3% of the class
- **2017:** Google Games (Stanford/Berkeley) — 3rd place (2017)