

# Lijie Chen

## Curriculum Vitae

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🌐 <http://www.mit.edu/lijieche/>

### Education

- 2017–Now **EECS, Massachusetts Institute of Technology, Cambridge.**  
Ph.D. in Electrical Engineering and Computer Science,  
advised by Ryan Williams  
S. M. thesis: *Fine-Grained Complexity Meets Communication Complexity*
- 2013–2017 **Institute for Interdisciplinary Information Sciences, Tsinghua University, Beijing.**  
Bachelor of Engineering in Computer Science and Technology

### Visiting and Internship

- 2021 Summer **IBM, New York(remote).**  
Research Intern hosted by Ramis Movassagh.
- 2020 Summer **Google, Mountain View (remote).**  
Research Intern hosted by Ravi Kumar.
- 2020 Winter **Weizmann Institute of Science, Rehovot.**  
(Jan - Feb) Visiting Student of Guy Rothblum.
- 2018 Fall **Simons Institute for the Theory of Computing, Berkeley.**  
Visiting Graduate Student. Lower Bounds in Computational Complexity.
- 2016 Spring **EECS, Massachusetts Institute of Technology, Cambridge.**  
Visiting Student, advised by Scott Aaronson.

### Selected Awards and Scholarships

- 2020 IBM Fellowship
- 2019 **FOCS 2019 Best Student Paper**
- 2019 **STOC 2019 Best Student Paper**
- 2017 MIT Akamai Presidential Graduate Fellowship
- 2017 International Collegiate Programming Contest, World Final, **6th place**
- 2016 Tsinghua Top-Grade Scholarship (**10 best undergraduate students** a year)
- 2016 China Collegiate Programming Contest, Final, **1st place**
- 2015/2016/2017 Internet Problem Solving Contest, **4th/5th/5th Place**
- 2015/2016 International Collegiate Programming Contest, Asia-East Continent Final, **1st place**
- 2014 Topcoder Open Algorithm Finalist
- 2014 International Collegiate Programming Contest, World Final, **11th place**
- 2013 International Olympiad in Informatics, Gold medal, **1st place**

### Special Issue Invitations

STOC 2021, STOC 2020, FOCS 2019, FOCS 2019, CCC 2018, FOCS 2017, CCC 2017

## Research Interests

- Computational Complexity
- Algorithm Design
- Fine-Grained Complexity
- Quantum Computing / Complexity
- Learning Theory

## Languages

- Chinese (Native)
- English (Fluent)
- Japanese (N2)

## Programming Languages

- C++
- Java
- Python

## Selected Publications

- 10 Hardness vs Randomness, Revised: Uniform, Non-Black-Box, and Instance-Wise.  
**Lijie Chen**, Roei Tell.  
**FOCS 2021**.
- 9 Simple and fast derandomization from very hard functions: Eliminating randomness at almost no cost.  
**Lijie Chen**, Roei Tell.  
**STOC 2021**
- 8 Almost Everywhere Circuit Lower Bounds from Non-Trivial Derandomization.  
**Lijie Chen**, Xin Lyu, Ryan Williams.  
**FOCS 2020**.
- 7 Strong Average-Case Circuit Lower Bounds from Non-trivial Derandomization.  
**Lijie Chen**, Hanlin Ren.  
**STOC 2020**. (Invited to the **SICOMP Special Issue for STOC 2020**)
- 6 Efficient Construction of Rigid Matrices Using an NP Oracle.  
Josh Alman, **Lijie Chen**.  
**FOCS 2019**. (**Machtey Award (Best Student Paper)**)  
(Invited to the **SICOMP Special Issue for FOCS 2019**)
- 5 Non-deterministic Quasi-Polynomial Time is Average-case Hard for ACC Circuits.  
**Lijie Chen**.  
**FOCS 2019**. (Invited to the **SICOMP Special Issue for FOCS 2019**)
- 4 Bootstrapping Results for Threshold Circuits “Just Beyond” Known Lower Bounds.  
**Lijie Chen**, Roei Tell.  
**STOC 2019**. (**Danny Lewin Best Student Paper Award**)
- 3 On The Hardness of Approximate and Exact (Bichromatic) Maximum Inner Product.  
**Lijie Chen**.  
**CCC 2018**. (Invited to the **Toc Special Issue for CCC 2018**)
- 2 On The Power of Statistical Zero Knowledge.  
Adam Bouldan, **Lijie Chen**, Dhiraj Holden, Justin Thaler, Prashant Nalini Vasudevan.  
**FOCS 2017**. (Invited to the **SICOMP Special Issue for FOCS 2017**)
- 1 Complexity-Theoretic Foundations of Quantum Supremacy Experiments.  
Scott Aaronson, **Lijie Chen**.  
**CCC 2017**. (Invited to the **Toc Special Issue for CCC 2017**).

## Full Publications

- 35 Constructive Separations and Their Consequences.  
**Lijie Chen**, Ce Jin, Rahul Santhanam, Ryan Williams.  
**FOCS 2021.**
- 34 Hardness vs Randomness, Revised: Uniform, Non-Black-Box, and Instance-Wise.  
**Lijie Chen**, Roei Tell.  
**FOCS 2021.**
- 33 Majority vs. Approximate Linear Sum and average-case complexity below NC1.  
**Lijie Chen**, Zhenjian Lu, Xin Lyu, Igor Oliveira.  
**ICALP 2021.**
- 32 Near-Optimal Two-Pass Streaming Algorithm for Sampling Random Walks over Directed Graphs.  
**Lijie Chen**, Gillat Kol, Dmitry Paramonov, Raghuvansh Saxena, Zhao Song, Huacheng Yu.  
**ICALP 2021.**
- 31 Almost Optimal Super-Constant-Pass Streaming Lower Bounds for Reachability.  
**Lijie Chen**, Gillat Kol, Dmitry Paramonov, Raghuvansh Saxena, Zhao Song, Huacheng Yu.  
**STOC 2021. (Invited to the SICOMP Special Issue for STOC 2021)**
- 30 Inverse-Exponential Correlation Bounds and Extremely Rigid Matrices from a New Derandomized XOR Lemma.  
**Lijie Chen**, Xin Lyu.  
**STOC 2021.**
- 29 Simple and fast derandomization from very hard functions: Eliminating randomness at almost no cost.  
**Lijie Chen**, Roei Tell.  
**STOC 2021.**
- 28 On Distributed Differential Privacy and Counting Distinct Elements.  
**Lijie Chen**, Badih Ghazi, Ravi Kumar, Pasin Manurangsi.  
**ITCS 2021.**
- 27 Almost Everywhere Circuit Lower Bounds from Non-Trivial Derandomization.  
**Lijie Chen**, Xin Lyu, Ryan Williams.  
**FOCS 2020.**
- 26 On Exponential-Time Hypotheses, Derandomization, and Circuit Lower Bounds.  
**Lijie Chen**, Ron Rothblum, Roei Tell, Eylon Yogev.  
**FOCS 2020.**
- 25 Sharp Threshold Results for Computational Complexity.  
**Lijie Chen**, Ce Jin, Ryan Williams.  
**STOC 2020.**
- 24 Strong Average-Case Circuit Lower Bounds from Non-trivial Derandomization.  
**Lijie Chen**, Hanlin Ren.  
**STOC 2020. (Invited to the SICOMP Special Issue for STOC 2020)**
- 23 Beyond Natural Proofs: Hardness Magnification and Locality.  
**Lijie Chen**, Shuichi Hirahara, Igor Oliveira, Jan Pich, Ninad Rajgopal, Rahul Santhanam.  
**ITCS 2020.**
- 22 Hardness Magnification for all Sparse NP Languages.  
**Lijie Chen**, Ce Jin, Ryan Williams.  
**FOCS 2019.**

- 21 Efficient Construction of Rigid Matrices Using an NP Oracle.  
Josh Alman, **Lijie Chen**.  
**FOCS 2019**. (**Machtey Award (Best Student Paper)**)  
(**Invited to the SICOMP Special Issue for FOCS 2019**)
- 20 Non-deterministic Quasi-Polynomial Time is Average-case Hard for ACC Circuits.  
**Lijie Chen**.  
**FOCS 2019**. (**Invited to the SICOMP Special Issue for FOCS 2019**)
- 19 Broadcast Congested Clique: Planted Cliques and Pseudorandom Generators.  
**Lijie Chen**, Ofer Grossman.  
**PODC 2019**.
- 18 Relations and Equivalences Between Circuit Lower Bounds and Karp-Lipton Theorems.  
**Lijie Chen**, Dylan McKay, Cody Murray, Ryan Williams.  
**CCC 2019**.
- 17 Stronger Connections Between Circuit Analysis and Circuit Lower Bounds, via PCPs of Proximity.  
**Lijie Chen**, Ryan Williams.  
**CCC 2019**.
- 16 Bootstrapping Results for Threshold Circuits “Just Beyond” Known Lower Bounds.  
**Lijie Chen**, Roei Tell.  
**STOC 2019**. (**Danny Lewin Best Student Paper Award**)
- 15 Classical Algorithms from Quantum and Arthur-Merlin Communication Protocols.  
**Lijie Chen**, Ruosong Wang.  
**ITCS 2019**.
- 14 An Equivalence Class for Orthogonal Vectors.  
**Lijie Chen**, Ryan Williams.  
**SODA 2019**.
- 13 Fine-grained Complexity Meets  $IP = PSPACE$ .  
**Lijie Chen**, Shafi Goldwasser, Kaifeng Lyu, Guy N. Rothblum, Aviad Rubinfeld.  
**SODA 2019**.
- 12 Nearly Optimal Separation Between Partially And Fully Retroactive Data Structures.  
**Lijie Chen**, Erik D. Demaine, Yuzhou Gu, Virginia Vassilevska Williams, Yinzhao Xu, Yuanheng Yu.  
**SWAT 2018**.
- 11 An Improved Algorithm for Incremental DFS Tree in Undirected Graphs.  
**Lijie Chen**, Ran Duan, Ruosong Wang, Hanrui Zhang, Tianyi Zhang.  
**SWAT 2018**.
- 10 On The Hardness of Approximate and Exact (Bichromatic) Maximum Inner Product.  
**Lijie Chen**.  
**CCC 2018**. (**Invited to the Toc Special Issue for CCC 2018**)
- 9 On The Power of Statistical Zero Knowledge.  
Adam Bouldan, **Lijie Chen**, Dhiraj Holden, Justin Thaler, Prashant Nalini Vasudevan.  
**FOCS 2017**. (**Invited to the SICOMP Special Issue for FOCS 2017**)
- 8 Nearly Optimal Sampling Algorithms for Combinatorial Pure Exploration.  
**Lijie Chen**, Anupam Gupta, Jian Li, Mingda Qiao and Ruosong Wang.  
**COLT 2017**.
- 7 Towards Instance Optimal Bounds for Best Arm Identification.  
**Lijie Chen**, Jian Li, Mingda Qiao.  
**COLT 2017**.

- 6 Complexity-Theoretic Foundations of Quantum Supremacy Experiments.  
Scott Aaronson, [Lijie Chen](#).  
[CCC 2017](#). (Invited to the Toc Special Issue for CCC 2017).
- 5 Nearly Instance Optimal Sample Complexity Bounds for Top-k Arm Selection.  
[Lijie Chen](#), Jian Li, Mingda Qiao.  
[AISTATS 2017](#).
- 4 K-Memory Strategies in Repeated Games.  
[Lijie Chen](#), Fangzhen Lin, Pingzhong Tang, Kangning Wang, Ruosong Wang, Shiheng Wang.  
[AAMAS 2017 \(extended abstract\)](#).
- 3 Bounded rationality of restricted Turing machines.  
[Lijie Chen](#), Pingzhong Tang, Ruosong Wang.  
[AAAI 2017](#).
- 2 Adaptivity vs Postselection, and Hardness Amplification in Polynomial Approximation.  
[Lijie Chen](#).  
[ISAAC 2016 \(Best Student Paper\)](#).
- 1 Pure Exploration of Multi-armed Bandit Under Matroid Constraints.  
[Lijie Chen](#), Anupum Gupta, Jian Li.  
[COLT 2016](#).

## Teaching Experiences

- 2019 Fall Advanced Complexity Theory  
Teaching Assistant, Massachusetts Institute of Technology
- 2017 Spring Introduction to Computational Complexity  
Teaching Assistant, Tsinghua University

## Academic Talks

- 2021 - June Hardness vs Randomness, Revised: Uniform, Non-Black-Box, and Instance-Wise.  
Oxford-Warwick Complexity Meetings, Online
- 2021 - Feb On Distributed Differential Privacy and Counting Distinct Elements.  
Boston Area Differential Privacy Seminar Series, Online
- 2021 - Jan On Distributed Differential Privacy and Counting Distinct Elements.  
[ITCS 2021](#), Online
- 2020 - Nov Almost Everywhere Circuit Lower Bounds from Non-Trivial Derandomization.  
[FOCS 2020](#), Online
- 2020 - Sep Simple and fast derandomization from very hard functions: Eliminating randomness at almost no cost.  
SIGMA ICT CAS, Online
- 2020 - July Sharp Threshold Results for Computational Complexity.  
Oxford-Warwick Complexity Meetings, Online
- 2020 - June Strong Average-Case Lower Bounds from Non-trivial Derandomization.  
[STOC 2020](#), Online
- 2020 - June Sharp threshold results for computational complexity.  
[STOC 2020](#), Online

- 2019 - 2020 Strong Average-Case Circuit Lower Bounds from Non-trivial Derandomization  
 Theory Seminar, University of Chicago  
 Lower Bounds in Computational Complexity Reunion, Simons Institute  
 Theory Seminar, Weizmann Institute of Science  
 Theory Seminar, Hebrew University of Jerusalem  
 Theory Seminar, Technion - Israel Institute of Technology  
 Theoretical Computer Science and Discrete Math Seminars, Institute for Advanced Study  
 DIMAP Seminar, University of Warwick
- 2019 Efficient Construction of Rigid Matrices Using an NP Oracle  
[FOCS 2019](#)
- 2019 Non-deterministic Quasi-Polynomial Time is Average-case Hard for ACC Circuits  
[FOCS 2019](#)
- 2019 On Algebraic and Number Theoretical Methods in Fine-Grained Complexity  
 Nanjing University
- 2019 Recent Developments on the Algorithmic Approach Towards Circuit Lower Bounds  
 Tsinghua University
- 2019 Recent Developments in Fine-Grained Complexity via Communication Complexity  
 Tsinghua University
- 2019 Stronger Connections Between Circuit Analysis and Circuit Lower Bounds, via PCPs of Proximity  
[CCC 2019](#)
- 2019 Bootstrapping Results for Threshold Circuits “Just Beyond” Known Lower Bounds  
[STOC 2019](#)
- 2019 Non-deterministic Quasi-Polynomial Time is Average-case Hard for ACC Circuits  
 Theory Seminar of UT Austin  
 Harvard TGINF  
 CMU Theory Lunch
- 2019 Classical Algorithms from Quantum and Arthur-Merlin Communication Protocols  
[ITCS 2019](#)
- 2019 An Equivalence Class for Orthogonal Vectors  
[SODA 2019](#)
- 2018 Recent Structure Lemmas for Depth-Two Threshold Circuits  
 Simons Institute for the Theory of Computing
- 2018 On The Hardness of Approximate and Exact (Bichromatic) Maximum Inner Product  
[CCC 2018](#)  
 Algorithms & Complexity Seminar, MIT
- 2017 On The Power of Statistical Zero Knowledge  
[FOCS 2017](#)  
 Algorithms & Complexity Seminar, MIT
- 2017 Complexity-Theoretic Foundations of Quantum Supremacy Experiments  
[CCC 2017](#)
- 2016 Adaptivity vs Postselection  
[ISAAC 2016](#)
- 2016 Pure Exploration of Multi-armed Bandit Under Matroid Constraints  
[COLT 2016](#)

## Service

Conference  
Reviewing [IPEC 2021](#), [ICALP 2021](#), [RANDOM 2021](#), [FOCS 2021](#), [STOC 2021](#), [ITCS 2021](#),  
[FOCS 2020](#), [SODA 2020](#), [ISAAC 2020](#), [TCC 2020](#), [CCC 2020](#), [STOC 2020](#), [ITCS 2020](#),  
[ESA 2019](#), [FOCS 2019](#), [ICALP 2019](#), [COLT 2019](#), [ITCS 2019](#), [CCC 2019](#),  
[ISAAC 2018](#), [RANDOM 2018](#), [COLT 2018](#)