

# Tianhao Wang

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## Research Interests

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My research focuses on differential privacy (DP). I take a holistic approach and investigate different aspects of DP, all the way from theoretical understanding to end-to-end applications, data-driven optimizations, system building, and user perception, with an emphasis on creating solid foundations for practical solutions. Besides DP, I also work in machine learning privacy and applied cryptography.

## Education

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**Department of Computer Science, Purdue University**

*PhD in Computer Science, GPA 4.00/4.00*

**Advisor: Ninghui Li**

*Aug 2015–May 2021*

**Software School, Fudan University**

*BS in Software Engineering, GPA 3.79/4.00 (Rank 1/79)*

**Advisor: Yunlei Zhao**

*Sep 2011–July 2015*

## Professional Experience

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**University of Virginia**

*Assistant Professor*

*Jan 2022–*

**Carnegie Mellon University**

*Post Doctoral Fellow*

**Mentor: Elaine Shi**

*May 2021–Dec 2021*

**Tumult Labs**

*Research Intern*

**Mentor: Ashwin Machanavajjhala**

*May 2020–Aug 2020*

**Alibaba**

*Research Intern*

**Mentor: Bolin Ding**

*Aug 2018–Jan 2019*

## Awards

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**NIST Challenge for a Better Meter Stick for Differential Privacy:** 1st place 2021

**NIST Differential Privacy Temporal Map Challenge:** 2nd, 4th, and 3rd places in three phases 2021

**iDASH Secure Genome Analysis Competition (Track III):** 2nd place 2020

**Bilsland Dissertation Fellowship:** 1 of 3 in Department 2019

**NIST Differential Privacy Synthetic Data Challenge:** 2nd place in all three phases 2019

**Symantec Research Labs Graduate Fellowship:** Finalist 2019

**NIST Unlinkable Data Challenge:** Runner-up and People's choice 2018

**Emil Stefanov Memorial Fellowship:** Only One in Department 2018

**Excellent Graduation Thesis:** Only One in School 2015

**Graduate Star:** 1 of 20 in University 2015

**Google Excellence Scholarship:** 1 of 58 nationwide (undergrads and grads combined) 2014

**Outstanding Student:** 1 of 10 in University 2014

**National Scholarship:** Only One in School 2012

## Publications

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Conference Papers.....

**1. Locally Differentially Private Sparse Vector Aggregation (SP'22)**

Zhou, Mingxun, Tianhao Wang, Hubert Chan, Giulia Fanti, and Elaine Shi

**2. Continuous Release of Data Streams under both Centralized and Local Differential Privacy (CCS'21)**

Tianhao Wang, Joann Chen, Zhikun Zhang, Dong Su, Yueqiang Cheng, Zhou Li, Ninghui Li, Somesh Jha

**3. When Machine Unlearning Jeopardizes Privacy (CCS'21)**

Min Chen, Zhikun Zhang, Tianhao Wang, Michael Backes, Mathias Humbert, Yang Zhang

**4. PrivSyn: Differentially Private Data Synthesis (USENIX'21)**

Zhikun Zhang, Tianhao Wang, Jean Honorio, Ninghui Li, Michael Backes, Shibo He, Jiming Chen, Yang Zhang

**5. Answering Multi-Dimensional Range Queries under Local Differential Privacy (VLDB'21)**

Jianyu Yang, Tianhao Wang, Ninghui Li, Xiang Cheng, Sen Su

**6. Differential Privacy for Text Analytics via Natural Text Sanitization (ACL'21 Findings)**

Xiang Yue, Minxin Du, Tianhao Wang, Yaliang Li, Huan Sun, Sherman Chow

**7. Improving Utility and Security of the Shuffler-based Differential Privacy (VLDB'20)**

Tianhao Wang, Bolin Ding, Min Xu, Zhicong Huang, Cheng Hong, Jingren Zhou, Ninghui Li, Somesh Jha

**8. Collecting and analyzing data jointly from multiple services under local differential privacy (VLDB'20)**

Min Xu, Bolin Ding, Tianhao Wang, Jingren Zhou

**9. Towards Effective Differential Privacy Communication for User Data Sharing Decision and Comprehension (SP'20)**

Aiping Xiong, Tianhao Wang, Ninghui Li, Somesh Jha

**10. Recovering Distributions under Local Differential Privacy (SIGMOD'20)**

Zitao Li, Tianhao Wang, Milan Lopuhaä-Zwakenberg, Ninghui Li, Boris Skoric

**11. Consistent and Accurate Frequency Oracles under Local Differential Privacy (NDSS'20)**

Tianhao Wang, Milan Lopuhaä-Zwakenberg, Zitao Li, Ninghui Li, Boris Skoric

**12. Koinonia: Verifiable E-Voting with Long-term Privacy (ACSAC'19)**

Huangyi Ge, Sze Yiu Chau, Victor E Gonsalves, Huian Li, Tianhao Wang, Xukai Zou, Ninghui Li

**13. Answering Multi-Dimensional Analytical Queries under Local Differential Privacy (SIGMOD'19)**

Tianhao Wang, Bolin Ding, Jingren Zhou, Cheng Hong, Zhicong Huang, Ninghui Li, Somesh Jha

**14. Locally Differentially Private Frequent Itemset Mining (SP'18)**

Tianhao Wang, Ninghui Li, Somesh Jha

**15. Marginal Release via Local Differential Privacy (CCS'18)**

Zhikun Zhang, Tianhao Wang (co-first author), Ninghui Li, Shebo He, Jiming Chen

**16. Locally Differentially Private Protocols for Frequency Estimation (USENIX'17)**

Tianhao Wang, Jeremiah Blocki, Ninghui Li, Somesh Jha

17. **On the Security and Usability of Segment-based Visual Cryptographic Authentication Protocols (CCS'16)**  
Tianhao Wang, Huangyi Ge, Omar Chowdhury, Hemanta Maji, Ninghui Li

18. **Secure Dynamic SSE via Access Indistinguishable Storage (AsiaCCS'16)**  
Tianhao Wang, Yunlei Zhao

19. **Weight Balancing on Boundaries and Skeletons (SoCG'14)**  
..., Tianhao Wang, ... (alphabetical order)

Journal Articles.....

20. **Locally Differentially Private Heavy Hitters Identification (TDSC'21)**  
Tianhao Wang, Ninghui Li, Somesh Jha

21. **PURE: A Framework for Analyzing Proximity-based Contact Tracing Protocols (CSUR'21)**  
Fabrizio Cicala, Weicheng Wang, Tianhao Wang, Ninghui Li, Elisa Bertino, Faming Liang, Yang Yang

22. **DPSyn: Experiences in the NIST Differential Privacy Data Synthesis Challenges (JPC'21)**  
Ninghui Li, Zhikun Zhang, Tianhao Wang

23. **A Simple Algorithm for Finding All  $k$ -edge-connected Components (PLOS ONE'15)**  
Tianhao Wang, Yong Zhang, Francis Y. L. Chin, Hing-Fung Ting, Yung H. Tsin, Sheung-Hung Poon

Tutorials.....

24. **Privacy at Scale: Local Differential Privacy in Practice (SIGMOD'18)**  
Graham Cormode, Somesh Jha, Tejas Kulkarni, Ninghui Li, Divesh Srivastava, Tianhao Wang (alphabetical order)

## Student Mentorship

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<b>Xuhui Kang:</b> PhD student from UVA, working on DP ML	2022-now
<b>Joann Chen (female):</b> PhD student from UC Irvine, working on DP side channels	2020-now
<b>Rui Wen:</b> PhD student from CISPA, working on shuffler DP	2020-now
<b>Min Chen (female):</b> PhD student from CISPA, working on machine learning privacy	2020-now
<b>Jianyu Yang:</b> Visiting Student from BUPT, worked on LDP range queries	2018-2020
<b>Zhikun Zhang:</b> Visiting Student from Zhejiang University, worked on LDP marginals	2017-2018

## Teaching

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Fall 2022: CS 4501 Data Privacy  
Spring 2022: CS 6501 Data Privacy

## Services

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### PC Member:

2022: ACM CCS, PETS, AsiaCCS, ESORICS, EUROSP, AAI (Senior PC), ICML, VLDB, ICDE, DLS  
2021: ACM CCS, PETS, AsiaCCS, ESORICS, AISec, TDP