

# Zhiyi Huang

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## Office

CB 423, Chow Yei Ching Building  
Department of Computer Science  
The University of Hong Kong

## Research Interests

Theoretical Computer Science  
Algorithmic Game Theory  
Differential Privacy  
Online Algorithms

## Education and Experiences

2014 – present *Assistant Professor*, Computer Science, the University of Hong Kong  
2013 – 2014 *Postdoctoral Research Fellow*, Computer Science, Stanford University  
Mentor: Tim Roughgarden  
2013 *Ph.D.*, Computer and Information Science, University of Pennsylvania  
Advisors: Sampath Kannan, Aaron Roth  
2011, 2012 *Research Intern*, Microsoft Research Redmond  
Mentor: Nikhil R. Devanur  
2008 *B.E.*, Computer Science and Technology, Tsinghua University (“Yao Class”)

## Selected Honors

2015 *Best Paper Award*, Symposium on Parallelism in Algorithms and Architectures  
2014 *Early Career Award*, Research Grant Council of Hong Kong  
2013 *Morris and Dorothy Rubinfeld Dissertation Award*, University of Pennsylvania  
2012 – 2013 *Simons Graduate Fellowship in Theoretical Computer Science*  
2004 *Gold Medal*, International Mathematical Olympiad, Athens, Greece  
2004 *Silver Medal*, Russian Mathematical Olympiad, Cheboksary, Russia  
2004 *Gold Medal*, Chinese Mathematical Olympiad, Macau, China

## Surveys

Zhiyi Huang

*Online primal dual: beyond linear programs*

ACM SIGACT News, Volume 45 Issue 4, December 2014

Zhiyi Huang

*Privacy preserving auctions*

Encyclopedia of Algorithms 2014

## Journal Publications

(Unless stated otherwise, authors are sorted in alphabetical order.)

Xiaoxi Zhang, Zhiyi Huang, Chuan Wu, Zongpeng Li, Francis C.M. Lau (by contribution)

*Dynamic VM scaling: provisioning and pricing through an online auction*

Transactions on Cloud Computing (**TCC**), forthcoming

Zhiyi Huang, and Anthony Kim

*Welfare maximization with production costs: a primal dual approach*

Games and Economic Behavior (**GEB**), forthcoming

Zhiyi Huang, Yishay Mansour, and Tim Roughgarden

*Making the most of your samples*

SIAM Journal on Computing (**SICOMP**), 47(3), 2018

Nikhil R. Devanur and Zhiyi Huang

*Primal dual gives optimal energy efficient online algorithms*

ACM Transactions on Algorithms (**TALG**), 14(1), 2017

Xiaoxi Zhang, Zhiyi Huang, Chuan Wu, Zongpeng Li, and Francis C.M. Lau (by contribution)

*An online stochastic buy-sell mechanism for VNF chains in the NFV market*

IEEE Journal on Selected Areas in Communications (**JSAC**), 35(2), 2017

Justin Hsu, Zhiyi Huang, Aaron Roth, Tim Roughgarden, and Zhiwei Steven Wu

*Private matchings and allocations*

SIAM Journal on Computing (**SICOMP**), 45(6), 2016

Xiaoxi Zhang, Zhiyi Huang, Chuan Wu, Zongpeng Li, and Francis C.M. Lau (by contribution)

*Online auctions in IaaS clouds: welfare and profit maximization with server costs*

IEEE/ACM Transactions on Networking (**ToN**), 2016

Ruiting Zhou, Zongpeng Li, Chuan Wu, and Zhiyi Huang (by contribution)

*An efficient cloud market mechanism for computing jobs with soft deadlines*

IEEE/ACM Transactions on Networking (**ToN**), 2016

Nikhil R. Devanur, Zhiyi Huang, Nitish Korula, Vahab Mirrokni, and Qiqi Yan

*Whole-page optimization and submodular welfare maximization with online bidders*

ACM Transactions on Economics and Computation (**TEAC**), 4(3), 2016

Deeparnab Chakrabarty and Zhiyi Huang  
*Recognizing coverage functions*  
SIAM Journal on Discrete Mathematics (**SIDMA**), 29(3), 2015

Tanmoy Chakraborty, Zhiyi Huang, and Sanjeev Khanna  
*Dynamic and non-uniform pricing strategies for revenue maximization*  
SIAM Journal on Computing (**SICOMP**), 42(6), 2013

## Conference Publications

(Unless stated otherwise, authors are sorted in alphabetical order.)

Zhiyi Huang, Zhihao Tang, Xiaowei Wu, Yuhao Zhang  
*Online vertex-weighted bipartite matching: beating  $1 - \frac{1}{e}$  with random arrivals*  
45th International Colloquium on Automata, Languages, and Programming (**ICALP 2018**)

Zhiyi Huang, Jinyan Liu  
*Optimal differentially private algorithms for  $k$ -means clustering*  
37th Symposium on Principles of Database Systems (**PODS 2018**)

Zhiyi Huang, Ning Kang, Zhihao Gavin Tang, Xiaowei Wu, Yuhao Zhang, Xue Zhu  
*How to match when all vertices arrive online*  
50th Annual Symposium on the Theory of Computing (**STOC 2018**)

Xiaoxi Zhang, Chuan Wu, Zhiyi Huang, Zongpeng Li (by contribution)  
*Occupation-oblivious pricing of cloud jobs via online learning*  
IEEE International Conference on Computer Communications (**INFOCOM 2018**)

Zhiyi Huang, Xue Zhu  
*Near optimal jointly private packing algorithms via dual multiplicative weight update*  
29th ACM-SIAM Symposium on Discrete Algorithms (**SODA 2018**)

Sébastien Bubeck, Nikhil Devanur, Zhiyi Huang, Rad Niazadeh  
*Online auctions and multi-scale online learning*  
18th ACM Conference on Economics and Computation (**EC 2017**)

T-H. Hubert Chan, Zhiyi Huang, Shaofeng H.-C. Jiang, Ning Kang, Zhihao Tang  
*Online submodular maximization with free disposal: randomization beats  $\frac{1}{4}$  for partition matroids*  
28th ACM-SIAM Symposium on Discrete Algorithms (**SODA 2017**)

Yossi Azar, Niv Buchbinder, T-H. Hubert Chan, Shahar Chen, Ilan Reuven Cohen, Anupam Gupta, Zhiyi Huang, Ning Kang, Viswanath Nagarajan, Joseph (Seffi) Naor, Debmalya Panigrahi  
*Online algorithms for covering and packing problems with convex objectives*  
57th Annual IEEE Symposium on Foundations of Computer Science (**FOCS 2016**)

Nikhil R. Devanur, Zhiyi Huang, Christos-Alexandros Psomas  
*The sample complexity of auctions with side information*  
48th Annual Symposium on the Theory of Computing (**STOC 2016**)

Justin Hsu, Zhiyi Huang, Aaron Roth, and Zhiwei Steven Wu  
*Jointly private convex programming*  
27th ACM-SIAM Symposium on Discrete Algorithms (**SODA 2016**)

Nikhil R. Devanur, Miro Dudik, Zhiyi Huang, and David Pennock  
*Budget constraints in prediction markets*  
31st Conference on Uncertainty in Artificial Intelligence (**UAI 2015**)

Zhiyi Huang, Yishay Mansour, and Tim Roughgarden  
*Making the most of your samples*  
16th ACM Conference on Economics and Computation (**EC 2015**)  
Invited to ACM Transactions on Economics and Computation (**TEAC**), special issue for EC 2015

Yossi Azar, Nikhil R. Devanur, Zhiyi Huang, and Debmalya Panigrahi  
*Non-clairvoyant online scheduling to minimize energy*  
27th ACM Symposium on Parallelism in Algorithms and Architectures (**SPAA 2015, Best Paper**)

Xiaoxi Zhang, Zhiyi Huang, Chuan Wu, Zongpeng Li, and Francis C.M. Lau (by contribution)  
*Online auctions in IaaS clouds: welfare and profit maximization with server costs*  
**ACM SIGMETRICS 2015**

Zhiyi Huang, and Anthony Kim  
*Welfare maximization with production costs: a primal dual approach*  
26th ACM-SIAM Symposium on Discrete Algorithms (**SODA 2015**)  
Invited to Games and Economic Behavior (**GEB**), special issue for algorithmic game theory papers from STOC/FOCS/SODA 2014 and 2015

Justin Hsu, Zhiyi Huang, Aaron Roth, Tim Roughgarden, and Zhiwei Steven Wu  
*Private matchings and allocations*  
46th Annual Symposium on the Theory of Computing (**STOC 2014**)  
Invited to Games and Economic Behavior (**GEB**), special issue for algorithmic game theory papers from STOC/FOCS/SODA 2014 and 2015

Zhiyi Huang and Aaron Roth  
*Exploiting metric structure for efficient private query release*  
25th ACM-SIAM Symposium on Discrete Algorithms (**SODA 2014**)

Nikhil R. Devanur and Zhiyi Huang  
*Primal dual gives optimal energy efficient online algorithms*  
25th ACM-SIAM Symposium on Discrete Algorithms (**SODA 2014**)

Nikhil R. Devanur, Zhiyi Huang, Nitish Korula, Vahab Mirrokni, and Qiqi Yan  
*Whole-page optimization and submodular welfare maximization with online bidders*  
14th ACM Conference on Electronic Commerce (**EC 2013**)  
Invited to ACM Transactions on Economics and Computation (**TEAC**), special issue for EC 2013

Yang Cai and Zhiyi Huang  
*Simple and nearly optimal multi-item auctions*  
24th ACM-SIAM Symposium on Discrete Algorithms (**SODA 2013**)

Zhiyi Huang and Sampath Kannan

*The exponential mechanism for social welfare: private, truthful, and nearly optimal*  
53rd Annual IEEE Symposium on Foundations of Computer Science (**FOCS 2012**)

Deeparnab Chakrabarty and Zhiyi Huang

*Testing coverage functions*  
39th International Colloquium on Automata, Languages and Programming (**ICALP 2012**)

Zhiyi Huang, Sampath Kannan, and Sanjeev Khanna

*Algorithms for the generalized sorting problem*  
52nd Annual IEEE Symposium on Foundations of Computer Science (**FOCS 2011**)

Xiaohui Bei and Zhiyi Huang

*Bayesian incentive compatibility via fractional assignments*  
22nd ACM-SIAM Symposium on Discrete Algorithms (**SODA 2011**)

Zhiyi Huang, Lei Wang, and Yuan Zhou

*Black-box reductions in mechanism design*  
14th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (**APPROX 2011**)

Zhiyi Huang and Sampath Kannan

*Sampling from constrained multivariate distribution*  
15th International Workshop on Randomization and Computation (**RANDOM 2011**)

Tanmoy Chakraborty, Zhiyi Huang, and Sanjeev Khanna

*Dynamic and non-uniform pricing strategies for revenue maximization*  
50th Annual IEEE Symposium on Foundations of Computer Science (**FOCS 2009**)  
Invited to SIAM Journal on Computing (**SICOMP**), special issue for FOCS 2009

Sudipto Guha and Zhiyi Huang

*Revisiting the direct sum theorem and space lower bounds in random order streams*  
36th International Colloquium on Automata, Languages and Programming (**ICALP 2009**)

Shiteng Chen, Zhiyi Huang, and Sampath Kannan

*Reconstructing numbers from pairwise function values*  
20th International Symposium on Algorithms and Computation (**ISAAC 2009**)  
Invited to Algorithmica, special issue for ISAAC 2009

## Theses

Zhiyi Huang

*New techniques for computation over private data*  
Doctoral dissertation, advised by Prof. Sampath Kannan and Prof. Aaron Roth, 2013

Zhiyi Huang

*On constructing web directory based on user behavior (in Chinese)*  
Bachelor thesis, advised by Prof. Yiqun Liu and Prof. Shaoping Ma, 2008

## External Grant (as PI)

2017 – 2020	<i>Understanding price of anarchy via the duality framework</i> HKU17203717E, Research Grant Council of Hong Kong	(700,000 HKD)
2016 – 2019	<i>The algorithmic and information theoretic foundations of Bayesian mechanism design</i> HKU17257516E, Research Grant Council of Hong Kong	(675,647 HKD)
2015 – 2018	<i>New frontiers of the online primal dual technique: convex programs and limitations of the canonical approach</i> HKU17202115E, Research Grant Council of Hong Kong	(496,028 HKD)
2014 – 2017	<i>Privacy-preserving mechanisms in economic markets</i> HKU27200214E, Research Grant Council of Hong Kong, Early Career Scheme	(931,737 HKD)

## Selected Talks

### Online Matching via Online Primal Dual

- Complexity & Algorithms Workshop, May, 2018

### Theoretical foundations of data-driven auction design

- Shanghai University of Finance and Economics, October, 2017
- Zhejiang University, March, 2017
- Shanghai Jiao Tong University, March, 2017
- University of Pennsylvania, January, 2016
- Microsoft Research, June, 2015
- Berkeley EconCS Seminar, March, 2014

### Online primal dual framework for problems with convex objectives

- NII Shonan Meeting on “Algorithms and Optimization under Uncertainty”, May, 2017
- Hong Kong Theory Day, January, 2015
- Stanford Theory Lunch, February, 2014

### Online submodular matroid maximization with free disposal

- Zhejiang University, Complexity & Algorithms Workshop, May, 2016

### Privacy-preserving auctions

- Dagstuhl Seminar on Electronic Markets and Auctions, November, 2013
- EC Workshop on Privacy and Economics, June, 2013
- UW-MSR Theory Center, August, 2012.
- Microsoft Research, Redmond, July, 2012.
- Hong Kong University of Science and Technology, May, 2012.
- The Chinese University of Hong Kong, April, 2012.
- University of Pennsylvania, December, 2011.

Whole-page optimization and submodular welfare maximization with online bidders

- MSR Asia, May, 2013
- Shanghai Jiaotong University, May, 2013

How to computer over private data?

- The University of Hong Kong, March, 2013
- The Hong Kong University of Science and Technology, March, 2013
- Microsoft Research, Redmond, Febuary, 2013
- Microsoft Research, Silicon Valley, January, 2013
- Microsoft Research, New England, January, 2013

Exploiting metric structure for efficient private query release

- DIMACS, October, 2012.

Bayesian incentive compatibility via fractional assignments

- China Theory Week, Tsinghua University, September, 2011
- University of Pennsylvania, May, 2010.

Dynamic and non-uniform pricing strategies for revenue maximization

- University of Pennsylvania, October, 2009.

## University and Departmental Services

Member of the Board of Faculty of Engineering (since 2014 Fall)

Member of Faculty Library Committee (since 2018 Summer)

Member of Departmental Research Postgraduate Committee (since 2016 Spring)

Member of Departmental Research Committee (since 2016 Spring)

Thesis Committee: Weijie Shi (Ph.D.), Haiyang Wu (M.Phil), Xiaoxi Zhang (Ph.D.), Shaofeng Jiang (Ph.D.), Chenzi Zhang (Ph.D.), Yuxiang Yang (Ph.D.)

Chair of Thesis Advisory Committee: Chaofeng Chen (Ph.D.), Bingqian Du (Ph.D.), Jingpu Duan (Ph.D.), Meiqi He (Ph.D.), Jiafeng Hu (Ph.D.), Jianyu Jiang (Ph.D.), Xiaoke Wang (M.Phil), Yijie Wu (Ph.D.), Kwai Keung Yau (Ph.D.), Hui Zhang (Ph.D.), Weixin Zhang (M.Phil), Huiquan Zhou (Ph.D.)

Member of Thesis Advisory Committee: Shuguang Hu (Ph.D.), Ning Kang (Ph.D.), Jinyan Liu (Ph.D.), Zhihao Tang (Ph.D.), Xiangning Wang (Ph.D.), Qiankun Zhang (Ph.D.), Yuhao Zhang (Ph.D.), Xue Zhu (Ph.D.)

## Professional Memberships and Services

Member, Institute of Electrical and Electronic Engineers (IEEE)

Member, Association for Computing Machinery (ACM)

Member, Society for Industrial and Applied Mathematics (SIAM)

Program Committee:

- ACM Conference on Economics and Computation (EC): 2018, 2017, 2016, 2015
- Conference on Web and Internet Economics (WINE): 2017, 2016
- European Symposia on Algorithms (ESA): 2018
- Innovations in Theoretical Computer Science (ITCS): 2018
- International Symposium on Algorithms and Computation (ISAAC): 2018, 2015
- Theory and Applications of Models of Computation (TAMC): 2016

Regular Reviewer for: Algorithmica, ACM Transactions on Economics and Computation (TEAC), Mathematics of Operations Research (MOR), SIAM Journal on Computing (SICOMP), Theoretical Computer Science (TCS), STOC, FOCS, SODA, ICALP, EC, WINE, ESA, MFCS, TAMC, ISAAC

## Patents

Energy-efficient job scheduling (US9766932 B2)

Real-time prediction market (US 2014/0379462 A1)

## Teaching

2018 Spring	COMP3250A Design and Analysis of Algorithms COMP3352 Algorithmic Game Theory
2017 Spring	COMP3250A Design and Analysis of Algorithms
2016 Fall	COMP9601 Theory of Computation and Algorithms Design
2016 Spring	CSIS0250/COMP3250A Design and Analysis of Algorithms COMP8601 Advance Topics in Theoretical Computer Science
2015 Spring	CSIS0250/COMP3250A Design and Analysis of Algorithms

## Advising

Ph.D. and M.Phil Students:

- KANG, Ning (2014 – present)
- LIU, Jinyan (2015 – present)
- ZHU, Xue (2015 – present)
- ZHANG, Yuhao (2016 – present)
- WANG, Xiangning (2016 – present)
- ZHANG, Qiankun (2017 – present)



Undergraduate Students:

- BIRLER, Ozgur Cem  
(from Koç University, 2017 Aug.)
- PENG, Binghui  
(from "Yao Class" of Tsinghua, 2017 Aug.)
- TAO, Runzhou  
(from "Yao Class" of Tsinghua, 2017 Aug.)
- GRELIER, Nicolas  
(from IMT Atlantique, 2017 Feb. – May)
- ZHANG, Jiarui  
(from "ACM Class" of SJTU, 2016 Aug. – 2017 Jan., admitted to Stony Brook as a Ph.D. student)
- ZHANG, Mengqiao  
(from HKU, 2016 Sep. – Dec., admitted to Columbia as an MSc. student)
- SUN, Yuxin  
(from NJU, 2016 Aug., admitted to Wisconsin-Madison as a Ph.D. student)
- WEI, Yadi  
(from NJU, 2016 Aug., admitted to Indiana, Bloomington as a Ph.D. student)
- GAN, Guo Liang  
(from HKU, 2015 Oct. – 2016 Jan., admitted to Simon Fraser as a Ph.D. student)
- JI, Ziwei  
(from "ACM Class" of SJTU, 2015 Aug. – 2016 Jan., admitted UIUC as a Ph.D. student)
- CHEN, Yu  
(from "ACM Class" of SJTU, 2015 Aug. – 2016 Jan., admitted to Penn as a Ph.D. student)
- FENG, Yiding  
(from "ACM Class" of SJTU, 2015 Aug. – 2016 Jan., admitted Northwestern as a Ph.D. student)
- LI, Zhulin  
(from "Yao Class" of Tsinghua, 2015 Aug., admitted to MIT as a Ph.D. student)
- ZHAN, Wei  
(from "Yao Class" of Tsinghua, 2015 Aug., admitted to Princeton as a Ph.D. student)
- SHI, Zhewei  
(from HKU, 2015 Sep. – Dec.)