

## Short CV of Yuan YAO

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### ACADEMIC QUALIFICATIONS

#### University of California at Berkeley, USA

Ph.D. Mathematics, December 2006

- Dissertation: A dynamic theory of learning: online learning and stochastic algorithms in Reproducing Kernel Hilbert Spaces
- Committee: Stephen Smale (chair), Peter Bartlett, and Steve Evans.

#### City University of Hong Kong, Hong Kong SAR, China

M.Phil. Mathematics, June 2002

#### Harbin Institute of Technology, Harbin, China

M.S. Control Engineering, July 1998

B.S. Control Engineering, July 1996

### ACADEMIC POSITIONS

#### Hong Kong University of Science and Technology, China

*Department of Mathematics*

*Department of Chemical and Biological Engineering*

*(by courtesy) Department of Computer Science and Engineering*

*Associate Professor*

Aug 2016 - present

#### Peking (Beijing) University, China

*School of Mathematical Sciences*

*Department of Probability and Statistics*

*Associate Professor with Tenure*

*Professor of Statistics in the Hundred Talents Program<sup>1</sup>*

July 2015 - present

July 2009 - present

#### Stanford University, USA

*Department of Mathematics and Computer Science*

*Postdoctoral Fellow*

August 2006 – August 2009

### AWARDS AND GRANTS

#### Hong Kong RGC General Research Fund, award 16303817

*Principal investigator*

Aug 2017 - Jul 2020

Social Choice, Crowdsourced Ranking, and Hodge Theory

#### Microsoft Research Asia, collaborative research award

*Principal investigator*

2015 - 2017

Active Sampling Strategy (Optimal Budget Plan) for Crowdsourced Pairwise Ranking Aggregation

#### Baidu, collaborative research award

*Principal investigator* (with Tong Zhang)

2015 - 2017

Statistical Machine Learning Algorithms and Applications for Internet Technology

#### National Science Foundation of China, award 61370004

*Principal investigator*

2014 - 2017

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<sup>1</sup>The Program was introduced 10 years ago by Peking University to attract overseas talents, in which I was appointed as Professor in the traditional Chinese academic ranking system. Recently Peking University introduced tenure-track and tenured positions following the US practice. After an international wide evaluation, I was recently appointed as Associate Professor with tenure.

Applied Geometric and Topological Methods in Multimedia Data Analysis

**National Science Foundation of China**, award 61071157

*Principal investigator*

2011 - 2013

Statistical Theory and Algorithms in Information Fusion for Multimodal Molecular Imaging

**National Science Foundation of China** (joint China-Japan-Korea (A3)), award 11421110001

*co-PI*

2014 - 2017

Modeling and Simulation of Hierarchical and Heterogeneous Flow Systems with Applications to Materials Science

**National Basic Research Program of China**, 973 Program 2015CB856000

*co-PI*

2015 - 2019

Statistical Learning of Unstructured Data: Mathematical Foundation and Algorithms

**National Basic Research Program of China**, 973 Program 2012CB825501

*co-PI*

2012 - 2016

Fundamental Units of Cognition

**National Basic Research Program of China**, 973 Program 2011CB809105

*co-PI*

2011 - 2013

Studies of Frontiers and Key Technology in Dynamic Cellular Signaling

**Peking University**, Beijing, China

*Professorship in the Hundred Talents Program*

2009 -

**NCSA**, USA

*co-PI*

2009 - 2010

Computational Studies to Elucidate the Fundamental Mechanism of Transcription

## PUBLICATIONS

### Monographs:

1. **Yao, Yuan**, *A Dynamic Theory of Learning – Online Learning and Stochastic Algorithms in Reproducing Kernel Hilbert Spaces*, Verlag Dr. Müller, ISBN: 978-3-639-09390-2. 2008.
2. **Yao, Yuan**, *A Mathematical Introduction to Data Analysis*, Lecture Notes at Peking University, AMS, preprint.

### Journal publications:

1. Chendi Huang, Xinwei Sun, Jiechao Xiong, and **Yuan Yao**, *Boosting with Structural Sparsity: A Differential Inclusion Approach*, Applied and Computational Harmonic Analysis, 2017, <https://doi.org/10.1016/j.acha.2017.12.004>, [arXiv:1704.04833](#)
2. Jiechao Xiong, Feng Ruan, and **Yuan Yao**, A Tutorial on Libra: R package for the Linearized Bregman Algorithm in High Dimensional Statistics, invited to *Handbook of Big Data Analytics*, ed. by Wolfgang Härdle, Henry Horng-Shing Lu, and Xiaotong Shen, Springer, [arXiv:1604.05910](#).
3. Ting Hu and **Yuan Yao**, *Learning Rates of Regression with Q-norm Loss and Thresholds*, Analysis and Applications, Volume 14, Issue 06, November 2016, DOI: <http://dx.doi.org/10.1142/S0219530516400030>, [arXiv:1701.01956](#).
4. Braxton Osting, Jiechao Xiong, Qianqian Xu, and **Yuan Yao**, Analysis of crowdsourced sampling strategies for hodgerank with sparse random graphs, *Applied and Computational Harmonic Analysis*, 2016, <http://dx.doi.org/10.1016/j.acha.2016.03.007>, [arXiv:1503.00164](#).
5. Stanley Osher, Feng Ruan, Jiechao Xiong, **Yuan Yao**, and Wotao Yin, Sparse Recovery via Differential Inclusions, *Applied and Computational Harmonic Analysis*, 2016, DOI: <http://>

[dx.doi.org/10.1016/j.acha.2016.01.002](https://doi.org/10.1016/j.acha.2016.01.002). [arXiv:1406.7728](https://arxiv.org/abs/1406.7728), with cran R-package <https://cran.r-project.org/web/packages/Libra/>.

6. Liu, Haixia, Raymond H. Chan, and **Yuan Yao**, *Geometric Tight Frame based Stylometry for Art Authentication of van Gogh Paintings*, *Applied and Computational Harmonic Analysis*, 2015, doi:10.1016/j.acha.2015.11.005, [arXiv:1407.0439](https://arxiv.org/abs/1407.0439).
7. Yanwei Fu, Timothy M. Hospedales, Tao Xiang, Jiechao Xiong, Shaogang Gong, Yizhou Wang, and **Yuan Yao**, Robust subjective visual property prediction from crowdsourced pairwise labels, *IEEE Transactions on Pattern Analysis and Machine Intelligence*, preprint, [arXiv:1501.06202](https://arxiv.org/abs/1501.06202).
8. Eriksson, Nick and **Yuan Yao**. *Metric Learning for Phylogenetic Invariants: An Algebraic Approach to Topology Inference in Evolutionary Trees*. *Journal of Chinese Linguistics*, invited paper to special issue on Conference in Evolutionary Linguistics, 2015, in press. [arxiv.org/abs/q-bio/0703034](https://arxiv.org/abs/q-bio/0703034).
9. Jiang, Xiaoye, **Yuan Yao**, Han Liu, and Leonidas Guibas. *Compressive Network Analysis*, *IEEE Transactions on Automatic Control*, special issue on Convex Relaxation Methods, 59(11): 2946 - 2961, 2014. [arXiv:1104.4605](https://arxiv.org/abs/1104.4605).
10. Tarrès, Pierre and **Yuan Yao**. *Online Learning as Stochastic Approximations of Regularization Paths: Optimality and Almost-sure Convergence*. *IEEE Transactions on Information Theory*, 60(9):5716-5735, 2014. [arXiv.org:1103.5538](https://arxiv.org/abs/1103.5538).
11. Qianqian Xu, Jiechao Xiong, Qingming Huang, and **Yuan Yao**, *Online HodgeRank on Random Graphs for Crowdsourcable QoE Evaluation*. *IEEE Transactions on Multimedia*, 16(2): 373-386, Feb 2014.
12. Weinan E, Jianfeng Lu, and **Yuan Yao**, *The Landscape of Complex Networks*, *Methods and Applications of Analysis*, special issue in honor of Professor Stanley Osher on his 70th birthday, 20(4):383-404, 2013. [arXiv:1204.6376](https://arxiv.org/abs/1204.6376).
13. Jiang, Xiaoye, Mo Li, **Yuan Yao**, and Leonidas Guibas, *Property Management in Wireless Sensor Networks with Overcomplete Radon Bases*. *ACM Transactions on Sensor Networks*, 9(3):36, May 2013.
14. **Yuan Yao**, Raymond Z. Cui, Gregory R. Bowman, Daniel Silva, Jian Sun, and Xuhui Huang, *Hierarchical Nystrom method for Markov Models in Biomolecular Folding*. *Journal of Chemical Physics*. 138 (17):174106, 2013. [arXiv:1301.0974](https://arxiv.org/abs/1301.0974).
15. Qianqian Xu, Qingming Huang, Tingting Jiang, Bowei Yan, **Yuan Yao**, and Weisi Lin, *HodgeRank on Random Graphs for Subjective Video Quality Assessment*, *IEEE Transactions on Multimedia*, 14(3): 844-857, 2012.
16. Jiang, Xiaoye, Lek-Heng. Lim, Yinyu Ye and **Yuan Yao**. *Statistical Ranking and Combinatorial Hodge Theory*. *Mathematical Programming, Ser. B*, Volume 127, Number 1, Pages 203-244, 2011, (online first) 27 November, 2010. [arXiv:0811.1067](https://arxiv.org/abs/0811.1067).
17. **Yuan Yao**. *On Complexity Issue of Online Learning Algorithms*. *IEEE Transactions on Information Theory*, 56 (12): 6470-6481, 2010.
18. Caponnetto, Andrea and **Yuan Yao**. *Adaption for Regularization Operators in Learning Theory*, CBCL Paper #265/AI Technical Report #063, Massachusetts Institute of Technology, Cambridge, MA, September, 2006. *Analysis and Applications*, 8(2): 185-197, 2010.
19. **Yuan Yao**, Jian Sun, Xuhui Huang, Gregory Bowman, Vijay Pande, Leonidas Guibas and Gunnar Carlsson. *Topological Methods for Exploring Low-density States in Biomolecular Folding Pathways*. *J. Chem. Phys.* 130, 144115, 2009.
20. Bowman, Gregory, Xuhui Huang, **Yuan Yao**, Jian Sun, Gunnar Carlsson, Leonidas Guibas and Vijay Pande. *Structural insight into RNA hairpin folding intermediates*. *Journal of American Chemistry Society*, 130(30): 9676-8, 2008.

21. **Yuan Yao**, Lorenzo Rosasco and Andrea Caponnetto. *On Early Stopping in Gradient Descent Learning*. *Constructive Approximation, Special Issue: Learning Theory*, 26(2): 289-315, 2007.
22. Smale, S. and **Yuan Yao**. *Online Learning Algorithms*. *Foundation of Computational Mathematics*, 6(2): 145-170, 2006.
23. **Yuan Yao**, Gian Luca Marcialis, Massimiliano Pontil, Paolo Frasconi, and Fabio Roli. *Combining Flat and Structured Representations for Fingerprint Classification with Recursive Neural Networks and Support Vector Machines*. *Pattern Recognition*, 36(2): 397-406, 2003.
24. Li, Lian-Feng, Guang-Xiong Wang and **Yuan Yao**. *Global Optimal Robust Controller Design*. *Journal of Control Theory and Applications (in Chinese)*, 18(2): 266-269, 2001.
25. **Yuan Yao**, Guang-Xiong Wang and Tian-Wen Zhang. *Morphological Reconstruction for Color Images Implemented by Fuzzy Cellular Neural Networks*. *Chinese Journal of Computers (in Chinese)*, 22(7): 727-732, 1999.
26. **Yuan Yao**, Guang-Xiong Wang and Tian-Wen Zhang. *Application of Fuzzy Cellular Neural Networks to Stone Inscription Reconstruction in Chinese Calligraphy*. *Journal of Computer Research and Development (in Chinese)*, 36(3): 282-286, 1999.
27. **Yuan Yao**, Lian-Feng Li and Ge-Jun Bao. *On the Application Problem of the Gap Metric for SISO Systems*. *Journal of Harbin Institute of Technology (in Chinese)*, 31(6): 19-21, 1999.
28. **Yuan Yao** and Jing Luo. *FEM-Based Modeling in Servo Design*. *Electric Machine and Control (in Chinese)*, 2(2): 108-111, 1998.

Conference publications:

1. Ke Ma, Jinshan ZENG, Jiechao Xiong, Qianqian Xu, Xiaochun Cao, Wei Liu, and **Yuan Yao**. *Stochastic Non-Convex Ordinal Embedding with Stabilized Barzilai-Borwein Step Size*. *The Thirty-Second AAAI Conference on Artificial Intelligence (AAAI-18)*, New Orleans, Louisiana, Feb 2-7, 2018. [arXiv:1711.06446](#)
2. Qianqian Xu, Jiechao Xiong, xi Chen, Qingming Huang, and **Yuan Yao**. *HodgeRank with Information Maximization for Crowdsourced Pairwise Ranking Aggregation*. *The Thirty-Second AAAI Conference on Artificial Intelligence (AAAI-18)*, New Orleans, Louisiana, Feb 2-7, 2018. [arXiv:1711.05957](#).
3. Tsz Kit Lau and **Yuan Yao**. *Accelerated Block Coordinate Proximal Gradients with Applications in High Dimensional Statistics*. *The 10th NIPS Workshop on Optimization for Machine Learning (NIPS 2017)*, Long Beach, California, Dec 3-8, 2017. [arXiv:1710.05338](#).
4. Qianqian Xu, Ming Yan, Chendi Huang, Jiechao Xiong, Qingming Huang, and **Yuan Yao**. *Exploring Outliers in Crowdsourced Ranking for QoE*. *ACM Multimedia 2017* (Oral presentation), Mountain View, California, Oct 23-27, 2017. [arXiv:1707.07539](#).
5. Xinwei Sun, Lingjing Hu, **Yuan Yao**, and Yizhou Wang. *GSplit LBI: Taming the Procedural Bias in Neuroimaging for Disease Prediction*. *Medical Image Computing and Computer Assisted Interventions Conference (MICCAI)*, Quebec City, Canada, Sept 10-14, 2017. [arXiv:1705.09249](#).
6. Lijing Wang, Yangzhong Tang, Stevan Djakovic, Julie Rice, Tony Wu, Daniel J. Anderson, and **Yuan Yao**. *A Statistical Learning Approach for Drug Sensitivity Prediction with Cancer Cell Line Data*, *Dahshu 2017: Data Science and Computational Precision Health*, San Francisco, Feb 20-22, 2017.
7. Chendi Huang, Xinwei Sun, Jiechao Xiong, and **Yuan Yao**, *Split LBI: an Iterative Regularization Path with Structural Sparsity*, *Advances in Neural Information Processing Systems 29 (NIPS)*, Barcelona, Spain, December 5-10, 2016.
8. Qianqian Xu, Jiechao Xiong, and **Yuan Yao**, *Parsimonious Mixed-Effects HodgeRank for Crowdsourced Preference Aggregation*, *ACM Conference on Multimedia (MM)*, Netherland, Oct 2016.

9. Qianqian Xu, Jiechao Xiong, Xiaochun Cao, and **Yuan Yao**, False Discovery Rate Control and Statistical Quality Assessment of Annotators in Crowdsourced Ranking, *International Conference on Machine Learning (ICML)*, New York, June 18- 25, 2016, [arXiv:1605.05860](#).
10. Qing Wang, Hengshu Zhu, Wei Hu, Zhiyong Shen, and **Yuan Yao**, *Discerning Tactical Patterns for Professional Soccer Teams: An Enhanced Topic Model with Applications*, KDD, Sydney, Australia, Aug 10-13, 2015.
11. Yanwei Fu, Timothy M. Hospedales, Tao Xiang, Shaogang Gong, and **Yuan Yao**. Interestingness Prediction by Robust Learning to Rank. *13th European Conference on Computer Vision (ECCV)*, Zurich, Switzerland, Sep 8-12, 2014.
12. Qianqian Xu, Jiechao Xiong, Qingming Huang, and **Yuan Yao**. Robust Evaluation for Quality of Experience in Crowdsourcing. *ACM Conference on Multimedia (MM)*, Barcelona, Catalunya, Spain, 2013.
13. Qianqian Xu, Qingming Huang, and **Yuan Yao**, Online Crowdsourcing Subjective Image Quality Assessment. *ACM Conference on Multimedia (MM)*, Nara, Japan, 2012.
14. Xiuyuan Cheng, Jiechao Xiong, and **Yuan Yao**, Phase Transitions in Robust Ranking, preprint, short version appeared in Challenges in Geometry, Analysis and Computation: High Dimensional Synthesis. *A Conference in Honor of Ronald R. Coifman, Peter W. Jones and Vladimir Rokhlin, Yale University*, June 4- 6, 2012.
15. Jiang, Xiaoye, **Yuan Yao**, Han Liu and Leonidas Guibas, Detecting Network Cliques with Radon Basis Pursuit, *The Fifteenth International Conference on Artificial Intelligence and Statistics (AISTATS)*. La Palma, Canary Islands, Spain, April 2012.
16. Wei Wang, Cheng Chen, Yizhou Wang, Tingting Jiang, Fang Fang, and **Yuan Yao**. Simulating Human Saccadic Scanpaths on Natural Images. *IEEE Computer Vision and Pattern Recognition (CVPR)*, 2011.
17. Qianqian Xu, Tingting Jiang, **Yuan Yao**, Qingming Huang, Bowei Yan, Weisi Lin. Random Partial Paired Comparison for Subjective Video Quality Assessment via HodgeRank. *ACM Conference on Multimedia (MM)*, Scottsdale, Arizona, USA, 2011.
18. Jiang, Xiaoye, Mo Li, **Yuan Yao**, and Leonidas Guibas, Overcomplete Radon Bases for Target Property Management in Sensor Networks, *ACM/IEEE IPSN*, 2011.
19. Zhanglong Ji, Yang An, Ying Chen, **Yuan Yao**, Jun Xu, and Hang Li, Hodge Decomposition of Paired Comparison Flows in Click-through Data. Oral presentation, in *6th Joint Workshop on Machine Perception and Robotics (MPR)*, Fukuoka, Japan, 2010.
20. Huang, Xuhui, **Yuan Yao**, Jian Sun, Leonidas Guibas, Gunnar Carlsson and Vijay Pande. Constructing Multi-Resolution Markov State Models (MSMS) to Elucidate RNA Hairpin Folding Mechanisms. in *Proceedings of the Pacific Symposium on Biocomputing*, 15, 228-239, 2010.
21. Sun, Jian, **Yuan Yao**, Xuhui Huang, Vijay Pande, Gunnar Carlsson, and Leonidas Guibas. A Fast Geometric Clustering Method on Conformation Space of Biomolecules. *Technical report, Stanford University*, 2009
22. **Yuan Yao**, Jian Sun, Xuhui Huang, Vijay Pande, Leonidas Guibas and Gunnar Carlsson. Topological Methods for Exploring Biomolecular Folding Pathways. *Biomedical Computation at Stanford (BCATS)*, spotlight poster presentation, October 26, 2008, Stanford, CA.
23. Sun, Jian, Xuhui Huang, **Yuan Yao**, Gunnar Carlsson, Vijay Pande and Leonidas Guibas. A Well-controlled Fast Clustering Method on Conformation Space of Biomolecules. *Biomedical Computation at Stanford (BCATS)*, poster presentation, October 26, 2008, Stanford, CA.
24. Bowman, Gregory, Xuhui Huang, **Yuan Yao**, Jian Sun and Vijay Pande. Adaptive Seeding: A New Method for Simulating Biologically Relevant Timescales. *Biomedical Computation at Stanford (BCATS)*, poster presentation, October 26, 2008, Stanford, CA.
25. Scheler, G. and **Yuan Yao**. Equilibria in neuroadaptive pathways. *RECOMB Systems Biology*, poster presentation, Dec 1-2, 2007, La Jolla, CA.



26. Minh, Ha Quang, Partha Niyogi and **Yuan Yao**. Mercer's Theorem, Feature Maps, and Smoothing. In: *Proc. of Computational Learning Theory (COLT)*, 2006.
27. **Yuan Yao**, Gian Luca Marcialis, Massimiliano Pontil, Paolo Frasconi, and Fabio Roli. A New Machine Learning Approach to Fingerprint Classification. *AI\*IA 2001: Advances in Artificial Intelligence*, LNCS, vol.2175: pp. 57-63, 2001.
28. **Yuan Yao**, Massimiliano Pontil and Fabio Roli. Fingerprint Classification with Combinations of Support Vector Machines. In: *Proceedings of Audio- and Video-Based Biometric Person Authentication, Third International Conference, AVBPA 2001*: Halmstad, Sweden, 2001.
29. **Yuan Yao** and Jin-Yun Ke (2000). Exploring Semantic Complexity by Computational Learning Theory. *Evolutionary Computation and Cognitive Science Workshop (ECCS)*, poster presentation, January, 2000, Melbourne, Australia, 2000.
30. **Yuan Yao**, Xiao-Feng Zhang, Tian-Wen Zhang and Guang-Xiong Wang. Multiscale Morphology for Color Images Implemented by Fuzzy Cellular Neural Network. In: *Proceedings of IEEE Hong Kong Symposium on Robotics and Control*, July 1999, Hong Kong, pp. 459-462.
31. **Yuan Yao**, Jing-Bo Wang, Lian-Feng Li and Guang-Xiong Wang. Optimal Robust Performance in Constantly Scaled  $\mathcal{H}_\infty$  control. *Korea-China Process System Engineering Workshop*. Korea, August 1999.
32. **Yuan Yao**, Lian-Feng Li, Guang-Xiong Wang and Jing-Bo Wang. Robust Gain-scheduled  $\mathcal{H}_\infty$  control with Constant Diagonal Scaling. In: *Proceedings of IEEE Hong Kong Symposium on Robotics and Control*, July 1999, Hong Kong, pp. 628-632, 1999.
33. Xiao-Feng Wang, **Yuan Yao**, Guang-Xiong Wang and Jing-Bo Wang. Application of Quadratic Stabilization, Constantly Scaled  $\mathcal{H}_\infty$  control and  $\mu$ -Synthesis. In: *Proceedings of IEEE Hong Kong Symposium on Robotics and Control*, July 1999, Hong Kong, pp. 633-637, 1999.
34. J.-B. Wang, J. Jiya, T.-Y. Chai, **Yuan Yao**, Guang-Xiong Wang and Shi-Jie Xu. Identifying Noise Model in Closed-Loop Using Subspace Method. In: *Proceedings of the IEEE International Vehicle Electronics Conference (IVEC '99)*, pp. 349-351, September 6-9, 1999, Changchun, China,

Preprints:

1. Xiao Li, Jinzhu Jia, and **Yuan Yao**, *Mixed and missing data: a unified treatment with latent graphical models*, [arXiv:1511.04656](#).
2. Qianqian Xu, Jiechao Xiong, Qingming Huang, and **Yuan Yao**, *Robust Statistical Ranking: Theory and Algorithms*, [arXiv: 1408. 3467](#).
3. Xu, Qianqian, Ming Yan, and **Yuan Yao**, *Fast Adaptive Least Trimmed Square for Outlier Detection in Crowdsourcable QoE Evaluation*. [arXiv: 1407. 7636](#).

TALKS

- *L<sub>1</sub>-Boost? A Dynamic Approach to Variable Selection and Sparse Recovery with R*, Keynote speech at ICIAM satellite conference, the 1st International Conference on Data Science: Foundation and Applications, Nov. 21-22, Shanghai, China.
- *Libra: a new R package for Linearized Bregman Algorithms in High Dimensional Statistics*, Keynote speech at China R-language Conference, Shanghai, Nov 21 - 22, 2015.
- *New Methods in Learning Graphical Models with Applications in Immunology*, Bioengineering seminar, jointly by HKUST and MIT, Oct 26, 2015.
- *A Dynamic Approach to Variable Selection in High Dimensional Statistics – with R package Libra*, Keynote speech at China R-language Conference, Nanchang, Oct 24 - 25, 2015.
- *A Dynamic Approach to Variable Selection and Sparse Recovery*, Mathematical and Computational Foundations of Learning Theory, Dagstuhl, Germany, Aug 30 - Sep 4, 2015.

- *Critical Points of Networks*, ICIAM Minisymposium on Computational Social Sciences, Beijing, Aug 10-14, 2015.
- *Social Choice Theory and Hodge Decomposition*, ICIAM Minisymposium on Topological Data Analysis and Dynamics, Beijing, Aug 10-14, 2015.
- *A Dynamic Approach to Sparse Recovery*, ICIAM Minisymposium on Numerical Linear Algebra Techniques in Massive Data Analysis, Beijing, Aug 10-14, 2015.
- *Possible from impossibilities – Social Choice Theory and Hodge Decomposition*, LIDS seminar, MIT, July 24, 2015.
- *Social Choice Theory and Hodge Decomposition*, IPAM, University of California at Los Angeles, February 24, 2015.
- *Geometric and Topological Methods in Data Analysis*, University of California at San Diego, February 19, 2015.
- *Geometric Tight Frame Based Stylometry for Art Authentication of van Gogh Paintings*, Tsinghua International Mathematical Forum, Sanya, China, January 23, 2015.
- *Applied Hodge Theory in Data Analysis*, Keynote speech at the workshop of Statistics and Computational Interface to Big Data, Institute of Advanced Studies, HKUST, January 4-16, 2015.
- *A Dynamic Approach to Variable Selection and Sparse Recovery*, Tsinghua International Mathematical Forum, Sanya, China, December 29, 2014.
- *Applied Hodge Theory*, Simons Institute Workshop on Spectral Algorithms: From Theory to Applications, University of California at Berkeley, October 23-30, 2014.
- *Applied Hodge Theory: from Statistical Ranking to Game Theory*, NIMS Workshop on Algebraic Statistics, Daejeon, Korea, July 14-17, 2014.
- *Critical Points and Hierarchical Decomposition of Complex Networks*, HKUST Jockey Club Institute for Advanced Studies, May 15, 2014.
- *Consistency of Early Stopping Regularization in Linearized Bregman Algorithms*, SIAM Conference on Imaging Science, Hong Kong, May 14, 2014.
- *On Statistical Consistency of Early Stopping Regularization in Bregman Iterative Algorithms*, ICSA, Hong Kong, Dec 22, 2013.
- *On Early Stopping and Path Consistency of Bregman Iteration*, International Conference on Learning Theory, Shaoxing, China, Sep 13, 2013.
- *Hodge Theory and Applications in Data Analysis*, IPAM, University of California at Los Angeles, Aug 6, 2013.
- *Hodge Theory and Applications in Data Analysis*, SIAM Conference on Applied Algebraic Geometry, Colorado State University, Aug 1, 2013.
- *Robust Ranking with Hodge Decomposition*, International Conference on Approximation Theory and Applications, Hong Kong, May 27, 2013.
- *Ranking in Crowdsourcing and Hodge Decomposition*, MIT, Apr 24, 2013.
- *The Landscape of Complex Networks: A Topological Approach*, Yale University, Apr 19, 2013
- *Topological Landscape of Complex Networks: Critical Nodes and Hierarchical Decomposition*, INRIA, Saclay, France, Jan 22, 2013.
- *From Graphs to Complexes? A Topological & Geometric Perspective to Data Analysis*, Forum on Data Science and Information Technology, BICMR, Beijing China, Nov 19, 2012.
- *Phylogenetic Trees via Algebraic Invariants*, Conference in Evolutionary Linguistics, Beijing China, Nov 10, 2012.

- *Online Crowdsourcing Subjective Image Quality Assessment*, ACM Conference on Multimedia, Nara, Japan, Oct 31, 2012.
- *Topological Landscape of Complex Networks*, CSIAM, Hefei, China, Aug 21, 2012.
- *Combinatorial Hodge Theory and Applications*, Compiègne, France, Jul 10, 2012.
- *Learning Theory and Approximation*, Oberwolfach, German, Jun 24-30, 2012.
- *Challenges of Data Analysis in Biomolecular Dynamics*, Courant Institute, New York University, Apr 5, 2012.
- *Topological Landscape of Complex Networks*, Duke University, Mar 16, 2012.
- *Topological Landscape of Complex Networks*, PACM Princeton University, Mar 5, 2012.
- *Combinatorial Hodge Theory and Applications*, Toyota Technological Institute at University of Chicago, Feb 20, 2012.
- *Random Partial Paired Comparison for Subjective Video Quality Assessment via HodgeRank*, ACM Conference on Multimedia, Scottsdale, Arizona, USA, Nov 28 - Dec 1, 2011.
- *Landscape of Networks*, Frontiers of Computational and Applied Mathematics, Beijing International Center for Mathematical Researches (BICMR), Beijing, China, Oct 21-25, 2011.
- *A Geometric Approach to Social Choice: Combinatorial Hodge Theory*. Perspective in Mathematics, Beijing International Center for Mathematical Researches (BICMR), Beijing, China, Oct 17-19, 2011.
- *A Geometric Approach to Social Choice: Combinatorial Hodge Theory*. Fields Institute, Canada, September 22, 2011.
- *Landscape of Networks*, International Workshop on Recent Advances in Biomedical Imaging, Shanghai Jiaotong University, Shanghai, China, August 15-18, 2011.
- *Geometric and Topological Methods for Data Science*, Joint Statistical Meetings (JSM), Miami, FL, USA, July 30 - August 4, 2011.
- *Geometric and Topological Methods for Data Science*, Department of Statistics, University of Chicago, July 25, 2011.
- *HodgeRank on Random Graphs*, Minisymposium on Applied Hodge Theory, ICIAM, Vancouver, BC, Canada, July 18-19, 2011.
- *Mathematics of Data*, Summer School on Data Sciences, Fudan University, Shanghai, China, July 11-15, 2011.
- *Progress in Geometric and Topological Data Analysis*, IMS-China International Conference on Statistics and Probability, Xi'an, China, July 8-11, 2011.
- *HodgeRank on Random Graphs*, The Fourth International Conference on Computational Harmonic Analysis, City University of Hong Kong, May 23-27, 2011.
- *HodgeRank on Random Graphs*, SIAM Conference on Optimization, Darmstadt, Germany, May 16-19, 2011.
- *Topological and Geometric Methods in Data Analysis*, IDeAS, Princeton University, Feb 10, 2011.
- *Hodge Theory and Statistical Ranking*, Key Lab of Mathematics and Applied Mathematics (Ministry of Education), Peking University, Dec 18, 2010.
- *Hodge Decomposition of Pairwise Comparison Flows in Click Data*, The 6<sup>th</sup> Joint Workshop on Machine Perception and Robotics (MPR2010), Fukuoka, Japan, October 8-9, 2010.
- *Combinatorial Hodge Theory and Statistical Ranking*, Workshop on Mathematics of Ranking, American Institute of Mathematics (AIM), Palo Alto, August 16-20, 2010.
- *Combinatorial Hodge Theory and Statistical Ranking*, The 2<sup>nd</sup> Pao-lu Hsu Conference on Machine Learning, Xi'an, China, June, 2010.



- *Statistical Ranking Problem and Hodge Decomposition of Network Flows*, Microsoft Research-Asia, Beijing, Jan 20, 2009.
- *Perspectives on Topological and Geometric Methods for High Dimensional Data Analysis*, CityUHK, Jan 8; HKUST, Jan 13; IMS-CUHK, Jan 15, 2009.
- *Topological Methods for Exploring Low-density States in RNA-hairpin Folding*, HKUST, Hong Kong, Jan 12, 2009.
- *Perspectives on Topological and Geometric Methods for Statistics*, Peking University, Beijing, China, Dec 30, 2008.
- *Topological Methods for Exploring Biomolecular Folding Pathways*, spotlight presentation, Biomedical Computation at Stanford (BCATS), Stanford, October 26, 2008.
- *Combinatorial Hodge Theory and A Geometric Approach to Ranking*, SIAM Annual Meeting, minisymposium: Mathematical Methods in Data Mining, San Diego, July 7-11, 2008.
- *Topological Methods for Exploring Low-density States in Biomolecular Folding Pathways*, Modern Massive Data Sets (MMDS), Stanford, June 25-29, 2008.
- *Hodge Decomposition, Spectral Embedding, and the Netflix Dataset*, Bay Area Scientific Computing Day: honoring Professors Kahan and Parlett, MSRI, Berkeley, March 29-30, 2008.
- *Hodge Theory and Rank Aggregation*, Computational Applications of Algebraic Topology, I, AMS sectional meeting, Albuquerque, New Mexico, October 13, 2007.
- *Combinatorial Hodge Theory and Societal Rank Aggregation*, Chern Institute of Mathematics, Nankai University, Tianjin, China, August 20-25, 2007.
- *Combinatorial Laplacians and Rank Aggregation*, the 6<sup>th</sup> International Congress of Industrial and Applied Mathematics (ICIAM), minisymposium: Novel Matrix Methods for Internet Data Mining. Zurich, Switzerland, July 16-20, 2007.
- *Topology Learning of High Dimensional Probability Density Functions*, the 1<sup>st</sup> International Congress of IPIA, Conference on Applied Inverse Problems, minisymposium: Learning from Examples as an Inverse Problem. PIMS, University of British Columbia, Vancouver, Canada, June 25-29, 2007.
- *Metric Learning for Phylogenetic Invariants*, Algebraic Statistics Seminar, University of California at Berkeley, Feb. 5, 2007.

STUDENTS  
SUPERVISED

Postdoc:

- Zhen Li, Department of Mathematics, Hong Kong University of Science and Technology, 2016-present
- Qianqian Xu, BICMR Peking University, PhD in Computer Science and Engineering, Chinese Academy of Sciences (CAS), 2013-2015, now at CAS

Ph.D. students:

- Weizhi Zhu, Department of Probability and Statistics, Peking University, 2014-2017; Department of Mathematics, HKUST, 2017-present
- Min Fan, Department of Mathematics, HKUST, 2017-present
- Hanlin Gu, Department of Mathematics, HKUST, 2017-present
- Jiechao Xiong, BICMR, Peking University, 2012-2017
- Chendi Huang, Department of Probability and Statistics, Peking University, 2012-2017
- Xinwei Sun, Department of Probability and Statistics, Peking University, 2013-2018
- Zhen Li, Department of Probability and Statistics, Peking University, 2015-present

M.S. students:

- Ying Chen, M.S., Statistics, Peking University, 2012, now at Baidu Inc.
- Bowei Yan, M.S., Statistics, Peking University, 2014, now at University of Texas at Austin
- Qing Wang, M.S., Statistics, Peking University, 2015, now at Baidu Inc.

- Yuan Lv, M.S., Statistics, Peking University, 2015, now at Shanghai bank

Undergraduate (selected) / Visiting students:

- Xiuyuan Cheng, PhD in PACM, Princeton University, 2013, now at Yale University
- Yanwei Fu, PhD in EECS, University of London, Queen Mary, 2013, now at Disney Research
- Xiaoye Jiang, PhD in ICME, Stanford University, 2010, now at 2-Sigma Co. Ltd.
- Jingshu Wang, B.S. Statistics, Peking University 2010, now at Stanford University
- An Yang, B.S. Statistics, Peking University 2010, now at Chinese University of Hong Kong
- Yu Lu, B.S. Statistics, Peking University, 2013, now at Yale University
- Feng Ruan, B.S. Statistics, Peking University 2014, now at Stanford University
- Jiyue Wang, B.S. Math, Shanghai Jiaotong University, 2014, now at Stanford University
- Tian Wang, B.S. Math, Shanghai Jiaotong University, 2014, now at NYU Courant Institute
- Kaizheng Wang, B.S. Statistics, Peking University, 2015, now at Princeton University

## COURSES

Taught graduate courses and undergraduate courses. Most course materials are published online in English ([www.math.pku.edu.cn/teachers/yaoy/teaching.html](http://www.math.pku.edu.cn/teachers/yaoy/teaching.html); or [math.stanford.edu/~yuany/course/](http://math.stanford.edu/~yuany/course/)).

- A Mathematical Introduction to Data Science with R, Spring 2015 (planned)
- A Mathematical Introduction to Data Science, Fall 2011, Fall 2012, Fall 2013, Fall 2014
- Statistical Learning, Spring 2013, Spring 2014, Fall 2015
- Probability and Statistics, Spring 2015
- Stochastic Dynamical Models in Life Sciences, Spring 2011
- Calculus for undergraduates in Economics and Yuan-Pei College, Fall 2010
- B.S. Statistics Thesis Seminar, Spring 2010
- Selected Topics in Advanced Statistics, Fall 2009

## PROFESSIONAL SERVICE

Journal or conference referee:

- ICML 2013, 2015, 2016, 2017
- NIPS 2003, 2005, 2014, 2016, and Area Chair 2011
- AISTATS 2011
- Annals of Statistics
- Applied and Computational Harmonic Analysis
- Frontiers in Applied Mathematics and Statistics (EPFL, Switzerland), Associate Editor
- Foundations of Computational Mathematics
- IEEE Transactions on Information Theory
- Journal of Approximation Theory
- Journal of Machine Learning Research
- Neural Computation
- PLOS One

Conference or workshop organizer:

- ICML, workshop on Topological Methods for Machine Learning, 2014
- IMA, workshop on Modern Applications of Homology and Cohomology, 2013
- ICIAM, Minisymposium of Applied Hodge Theory, 2011