

Yixin Cao

Assistant Professor
of Computer Science



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Hong Kong Polytechnic University
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EDUCATION

Ph.D., Computer Science May 2012
Texas A&M University, College Station, Texas

M.S., Computer Science, March 2003
Beihang University, Beijing, China

B.E., Automation, July 2000
Harbin Engineering University, Harbin, China

PROFESSIONAL EXPERIENCE

Assistant Professor 11/2017–present
Department of Computing, Hong Kong Polytechnic University

Research Assistant Professor 06/2014–10/2017
Department of Computing, Hong Kong Polytechnic University

Postdoctoral Research Fellow 06/2012–05/2014
Institute for Computer Science and Control, Hungarian Academy of Sciences

Research Assistant 01/2009–05/2012
Department of Computer Science and Engineering, Texas A&M University

RESEARCH INTERESTS

Theoretical Computer Science, particularly

- algorithmic graph theory & graph classes,
- fine-grained complexity and algorithm design,
- combinatorial optimization, and
- their applications in social networks and bioinformatics.

GRANTS (PI ONLY)

1. Forbidden structures of circular-arc graphs and their algorithmic applications, *Hong Kong Polytechnic University (PolyU)*, 4-ZZEZ, HK\$328,000, 09/2015–08/2017.
2. Theoretical analysis of heuristics in big data, *National Laboratory of Software Development Environment (NLSDE)*, *Beihang University*, SKLSDE-2016KF-02, CN¥100,000, 07/2016–07/2018.
3. Efficient algorithms for graph modification problems, *Hong Kong Research Grants Council (RGC)*, 25202615, HK\$726,075 + HK\$345,215, 01/2016–12/2018.
4. Combinatorial and algorithmic studies on cycles, *National Natural Science Foundation of China (NSFC)*, 61572414, CN¥787,000 + HK\$333,231, 01/2016–12/2019.
5. Graph algorithms based on modular decomposition, *Hong Kong Research Grants Council (RGC)*, 15226116, HK\$675,647 + HK\$345,129, 01/2017–12/2019.
6. Super-polynomial approximation of graph problems, *Hong Kong Research Grants Council (RGC)*, 15201317, HK\$700,000 + HK\$120,000, 01/2018–12/2020.

Books

1. Yixin Cao and Jianer Chen, editors.
Computing and Combinatorics, Lecture Notes in Computer Science vol. 10392, Springer, 2017.
doi:10.1007/978-3-319-62389-4.

Journal articles

1. Yixin Cao and Jianer Chen.
Cluster editing: Kernelization based on edge cuts.
Algorithmica, 64(1):152–169, 2012. doi:10.1007/s00453-011-9595-1.
2. Yixin Cao, Jianer Chen, and Jia-Hao Fan.
An $O^*(1.84^k)$ parameterized algorithm for the multiterminal cut problem.
Information Processing Letters, 114(4):167–173, 2014. doi:10.1016/j.ipl.2013.12.001.
3. Yixin Cao and Dániel Marx.
Interval deletion is fixed-parameter tractable.
ACM Transactions on Algorithms, 11(3), Article 21, 2015. doi:10.1145/2629595.
4. Yunlong Liu, Jianxin Wang, Jie You, Jianer Chen, and Yixin Cao (✉).
Edge deletion problems: Branching facilitated by modular decomposition.
Theoretical Computer Science, 573:63–70, 2015. doi:10.1016/j.tcs.2015.01.049.
5. Yixin Cao, Jianer Chen, and Yang Liu.
On feedback vertex set: New measure and new structures.
Algorithmica, 73(1):63–86, 2015. doi:10.1007/s00453-014-9904-6.
6. Yixin Cao and Dániel Marx.
Chordal editing is fixed-parameter tractable.
Algorithmica, 75(1):118–137, 2016. doi:10.1007/s00453-015-0014-x.
7. Yixin Cao, Luciano N. Grippio, and Martín D. Safe.
Forbidden induced subgraphs of normal Helly circular-arc graphs: Characterization and detection.
Discrete Applied Mathematics, 216(1):67–83, 2017. doi:10.1016/j.dam.2015.08.023.
8. Wenjun Li, Yixin Cao, Jianer Chen, and Jianxin Wang.
Deeper local search for parameterized and approximation algorithms for maximum internal spanning tree.
Information and Computation, 252:187–200, 2017. doi:10.1016/j.ic.2016.11.003.
9. Jie You, Jianxin Wang, and Yixin Cao (✉).
Approximate association via dissociation.
Discrete Applied Mathematics, 219:202–209, 2017. doi:10.1016/j.dam.2016.11.007.
10. Yixin Cao.
Unit interval editing is fixed-parameter tractable.
Information and Computation, 253(1):109–126, 2017. doi:10.1016/j.ic.2017.01.008.
11. Yuping Ke, Yixin Cao (✉), Xiating Ouyang, Wenjun Li, and Jianxin Wang.
Unit interval vertex deletion: Fewer vertices are relevant.
Journal of Computer and System Sciences, 95:109–121, 2018. doi:10.1016/j.jcss.2018.01.001.
12. Yixin Cao, Yuping Ke, Yota Otachi, and Jie You.
Vertex deletion problems on chordal graphs.
Theoretical Computer Science, in press. doi:10.1016/j.tcs.2018.05.039.

Referred conference papers

1. Yixin Cao, Jianer Chen, and Yang Liu.
On feedback vertex set: New measure and new structures.
In *SWAT 2010*, pages 93–104. doi:10.1007/978-3-642-13731-0_10.

2. Yixin Cao and Jianer Chen.
Cluster editing: Kernelization based on edge cuts.
In *IPEC 2010*, pages 60–71. doi:10.1007/978-3-642-17493-3_8.
3. Yixin Cao and Jianer Chen.
On parameterized and kernelization algorithms for the hierarchical clustering problem.
In *TAMC 2013*, pages 319–330. doi:10.1007/978-3-642-38236-9_29.
4. Yixin Cao, Jianer Chen, and Jia-Hao Fan.
An $O^*(1.84^k)$ parameterized algorithm for the multiterminal cut problem.
In *FCT 2013*, pages 84–94. doi:10.1007/978-3-642-40164-0_11.
5. Yixin Cao and Dániel Marx.
Interval deletion is fixed-parameter tractable.
In *SODA 2014*, pages 122–141. doi:10.1137/1.9781611973402.9.
6. Yixin Cao and Dániel Marx.
Chordal editing is fixed-parameter tractable.
In *STACS 2014*, pages 214–225. doi:10.4230/LIPIcs.STACS.2014.214.
7. Xiaochun Cao, Xiao Wang, Di Jin, Yixin Cao, and Dongxiao He.
The (un)supervised detection of overlapping communities as well as hubs and outliers via (Bayesian) NMF.
In *WWW (companion) 2014*, pages 233–234. doi:10.1145/2567948.2577307.
8. Yixin Cao.
Direct and certifying recognition of normal Helly circular-arc graphs in linear time.
In *FAW 2014*, pages 13–24. doi:10.1007/978-3-319-08016-1_2.
9. Yixin Cao.
Unit interval editing is fixed-parameter tractable.
In *ICALP 2015*, pages 306–317. doi:10.1007/978-3-662-47672-7_25.
10. Wenjun Li, Jianxin Wang, Jianer Chen, and Yixin Cao (✉).
A $2k$ -vertex kernel for maximum internal spanning tree.
In *WADS 2015*, pages 495–505. doi:10.1007/978-3-319-21840-3_41.
11. Yixin Cao.
Linear recognition of almost interval graphs.
In *SODA 2016*, pages 1096–1115. doi:10.1137/1.9781611974331.ch77.
12. Jie You, Jianxin Wang, and Yixin Cao (✉).
Approximate association via dissociation.
In *WG 2016*, pages 13–24. doi:10.1007/978-3-662-53536-3_2.
13. Yixin Cao and R. B. Sandeep.
Minimum fill-in: Inapproximability and almost tight lower bounds.
In *SODA 2017*, pages 875–880. doi:10.1137/1.9781611974782.55.
14. Yixin Cao, Yuping Ke, Yota Otachi, and Jie You.
Vertex deletion problems on chordal graphs.
In *FSTTCS 2017*, pages 22:1–22:14. doi:10.4230/LIPIcs.FSTTCS.2017.22.
15. Yixin Cao.
A naive algorithm for feedback vertex set.
In *SOSA 2018*, pages 1:1–1:8. doi:10.4230/OASIcs.SOSA.2018.1.
16. Wenjun Li, Junjie Ye, and Yixin Cao (✉).
Kernelization for P_2 -packing: A Gerrymandering Approach
In *FAW 2018*, pages 140–153. doi:10.1007/978-3-319-78455-7_11.

Manuscripts under review

1. Yixin Cao, Ashutosh Rai, R. B. Sandeep, and Junjie Ye
A polynomial kernel for diamond-free editing
arXiv:1803.03358.

Other technical writings

1. Yixin Cao and Gabriel Dos Reis.
Computing with unknowns in computer algebra systems.
In *PLMMS 2008*, pages 2–15.
2. Yixin Cao.
Review of flows in networks by L. R. Ford Jr. and D. R. Fulkerson.
SIGACT News, 44(2):28–30, 2013. doi:10.1145/2491533.2491542.

TALKS

1. On feedback vertex set: New measure and new structures. The 12th Scandinavian Symposium and Workshops on Algorithm Theory (SWAT'10), Bergen, Norway, June, 2010.
2. On kernelization of clustering problems. School of Information Science and Engineering, Central South University, Changsha, China, July, 2010.
3. An $O^*(1.84^k)$ parameterized algorithm for the multiterminal cut problem. The 19th International Symposium on Fundamentals of Computation Theory (FCT'13), Liverpool, UK, August, 2013.
4. Chordal editing is fixed-parameter tractable. The 31st International Symposium on Theoretical Aspects of Computer Science (STACS'14), Lyon, France, March, 2014.
5. Direct and certifying recognition of normal helly circular-arc graphs in linear time. The 8th International Frontiers of Algorithms Workshop (FAW'14), Zhangjiajie, China, June, 2014.
6. Interval graphs and (normal Helly) circular-arc graphs. Workshop on Combinatorial and Continuous Optimization, Beijing, China, August, 2014.
7. Interval deletion is fixed-parameter tractable.
 - February, 2013, Algorithms Seminar, Department of Informatics, University of Bergen, Bergen, Norway.
 - December, 2013, School of Computer Science and Engineering, University of Electronic Science and Technology of China, Chengdu, China.
 - November, 2013, School of Information Science and Engineering, Central South University, Changsha, China.
 - December, 2013, School of Computer Science and Engineering, Beihang University, Beijing, China.
 - December, 2013, Institute for Interdisciplinary Information Sciences (IIIS), Tsinghua University, Beijing, China.
8. Graph modification problems and their parameterized complexity.
 - December 2014, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, Beijing, China.
 - April, 2015, School of Computer Science, Shandong University, Jinan, China.
 - June, 2016, School of Mathematical Sciences, Nanjing Normal University, Nanjing, China.
9. Unit interval editing is fixed-parameter tractable, the 42nd International Colloquium on Automata, Languages, and Programming (ICALP'15).
10. A $2k$ -vertex kernel for maximum internal spanning tree, the 14th International Symposium on Algorithms and Data Structures (WADS'15).
11. Linear recognition of almost interval graphs.

- February, 2014, Dagstuhl Seminar 14071: Graph Modification Problems, Schloss Dagstuhl, Germany.
 - May, 2014, the 7th Annual Meeting of Asian Association for Algorithms and Computation (AAAC'14), Hangzhou, China.
 - March, 2015, the ELC Workshop on Parameterized Algorithms Tokyo, Japan.
 - January 2016, the 27th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA'16), Arlington, Virginia.
12. Birds of a feather flock together: Modular decomposition and its algorithmic applications.
- January 2016, Central South University, Changsha, China.
 - January 2016, Georgia State University, Atlanta, Georgia.
 - February 2016, Hong Kong University of Science and Technology, Hong Kong, China.
 - February 2016, Hong Kong Polytechnic University. (For visiting undergraduate students from Nanjing University, China.)
 - April 2016, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, Beijing, China.
 - April 2016, Beijing University of Technology, Beijing, China.
 - June 2016, SIAM Conference on Discrete Mathematics, Atlanta, Georgia.
13. The hardness of minimum fill-in: A dark secret of the old Chinese art.
- August 2016, Institute of Computing Technology, Chinese Academy of Sciences, Beijing, China.
 - October 2016, Chinese University of Hong Kong, Hong Kong, China.
 - October 2016, Shanghai University of Finance and Economics, Shanghai, China.
 - February 2017, Hong Kong Polytechnic University. (For visiting undergraduate students from Nanjing University, China.)
14. The storage and computation of large sparse matrices: Algorithms and complexity
- May 2017, CCF Elite Forum, Beijing, China.
 - July 2017, Institute of Computational Mathematics and Scientific/Engineering Computing, Chinese Academy of Sciences, Beijing, China.
 - November 2017, Zhejiang Normal University, Zhejiang, China
 - January 2018, University of Science and Technology of China, Hefei, China.
15. A naive algorithm for feedback vertex set
- November 2017, Zhejiang University, Zhejiang, China
 - January 2018, the 1st Symposium on Simplicity in Algorithms (SOSA 2018), New Orleans, Louisiana.
 - March 2018, Hong Kong Polytechnic University. (For visiting undergraduate students from Nanjing University, China.)

PROFESSIONAL ACTIVITIES

Editorial Responsibilities:

- Guest co-editor, special issue of *Algorithmica*, 2017

Program (co-)chair:

- The 23rd Annual International Computing and Combinatorics Conference (COCOON'17).

Program committee:

- The 8th International Frontiers of Algorithmics Workshop (FAW'14).
- The 20th Annual International Computing and Combinatorics Conference (COCOON'14).
- The 9th International Frontiers of Algorithmics Workshop (FAW'15).
- The 21st Annual International Computing and Combinatorics Conference (COCOON'15).
- The 13th Annual Conference on Theory and Applications of Models of Computation (TAMC'16).
- The 10th International Frontiers of Algorithmics Workshop (FAW'16).
- The 22nd Annual International Computing and Combinatorics Conference (COCOON'16).
- The 11th International Symposium on Parameterized and Exact Computation (IPEC'16).
- The 28th International Symposium on Algorithms and Computation (ISAAC'17).

Referee for submissions to journals:

- ACM Transactions on Algorithms

- ACM Transactions on Computation Theory
- ACM Transactions on Sensor Networks
- Algorithmica
- Discrete Applied Mathematics
- IEEE/ACM Transactions on Computational Biology and Bioinformatics
- Information Processing Letters
- Journal of Combinatorial Optimization
- Journal of Computer and System Sciences
- Journal of Discrete Algorithms
- Optimization Letters
- SIAM Journal on Computing
- SIAM Journal on Discrete Mathematics
- Theoretical Computer Science
- Theory of Computing Systems

Reviewer for submissions to conferences:

- IPEC'10
- MFCS'11, IPEC'11
- SODA'13, IPEC'13, COCOA'13
- ICALP'14, ESA'14
- ICALP'15, ESA'15, IPEC'15
- STACS'16, LATIN'16, SWAT'16, ICALP'16, ESA'16, ISAAC'16
- SODA'17, ICALP'17, FOCS'17
- STACS'18, SWAT'18, ESA'18

Event organizer:

- January 2017, The Hong Kong Theory Day 2017.
- August 2017, The 23rd Annual International Computing and Combinatorics Conference (COCOON'17).
- June 2018, Minisymposium on Modification Problems to Discrete Structures at 2018 SIAM Conference on Discrete Mathematics (Part I, Part II).

Membership:

- Association for Computing Machinery (ACM)
- China Computer Federation (CCF, 中国计算机学会)
- Operations Research Society of China (中国运筹学会)
- Society for Industrial and Applied Mathematics (SIAM)

SUPERVISING AND MENTORING EXPERIENCE

Hong Kong Polytechnic University

- Rémi Watrigant, Postdoc, 10/2014–08/2015.
- Shaohua Li, Research assistant, 09/2015–01/2016.
- Jie You, Research assistant, 09/2015–03/2018.
- Jinshan Gu, Undergraduate research assistant, 10/2015–.
- Xiating Ouyang, Undergraduate research assistant, 10/2015–.
- Yuping Ke, Research assistant, 11/2015–.
- Balakrishnan B. Sandeep, Research assistant, 02/2016–04/2016.
- Zhenyuan Ma, Undergraduate research assistant, 06/2016–04/2018.
- Junjie Ye, Postdoc, 07/2016–.
- Nanqing Huang, Research assistant, 10/2016–12/2016.
- Ashutosh Rai, Postdoc, 10/2016–.
- Ying Jiao, Undergraduate research assistant, 02/2017–01/2018.
- Ziyi Wen, Undergraduate research assistant, 02/2017–.
- Yufei Zheng, Undergraduate research assistant, 02/2017–01/2018.
- Xiaowei Wu, Postdoc, 01/2018–.
- Mingrui Cheng, Undergraduate research assistant, 01/2018–04/2018.
- Yiu Chau Tam, Undergraduate research assistant, 01/2018–.
- Xi Wen, Undergraduate research assistant, 01/2018–.

Mentees at other universities

- Wenjun Li, Ph.D. student, Central South University, 2012–2014.
- Jie You, Ph.D. student, Central South University, 06/2014–09/2015.
- Shaohua Li, Master student, Central South University, 06/2015–09/2015.
- Yuping Ke, Master student, Central South University, 06/2015–11/2015.

TEACHING EXPERIENCE

Hong Kong Polytechnic University

- Principles of programming, Fall 2014, Fall 2015.
- Data structures, Fall 2015, Fall 2016, Fall 2017.
- Database systems, Fall 2017.
- Design and analysis of algorithms, Spring 2017.
- Advanced topics in optimization, Spring 2015, Spring 2016.
- Advanced topics in computer algorithms, Fall 2016, Spring 2018.

Central South University

- Advanced algorithms, Summer 2010. (guest lecturer)
- Algorithms and theory of complexity, Summer 2018.

Texas A&M University (teaching assistant)

- Operating system, Fall 2007 & Spring 2008.
- Data structures and algorithms, Fall 2011 & Spring 2012.

WORK EXPERIENCE

Lianchuang Technology Inc., Nanjing, China

04/2003–07/2007