

# Yan Gu

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## Employment

### University of California, Riverside | Jan. 2020 – present

- Assistant Professor, Dept. of Computer Science and Engineering

### Massachusetts Institute of Technology | Jan. 2019 – Dec. 2019

- Postdoctoral associate at CSAIL, supervisor: Julian Shun

### Carnegie Mellon University | Oct. 2019 – Dec. 2019

- Postdoctoral associate at CSD, supervisor: Guy Blelloch

## Education

### Ph.D. in Computer Science | Aug. 2012 – Sep. 2018 | Carnegie Mellon University

- Advisor: Professor Guy Blelloch
- Thesis title: *Write-Efficient Algorithms*

### Bachelor's in Computer Science | Aug. 2008 – Jul. 2012 | Tsinghua University

- Outstanding Bachelor Thesis Award / Outstanding Graduates Award

## Selected Publications

For the full publication list including surveys, short papers, and workshop papers, please visit my [\[dblp\]](#) or [\[Google Scholar\]](#) page.

### 32. Analysis of Work-Stealing and Parallel Cache Complexity

Yan Gu, Zachary Napier, and Yihan Sun.  
ACM-SIAM Algorithmic Principles of Computer Systems (APoCS), 2022.

### 31. ParChain: A Framework for Parallel Hierarchical Agglomerative Clustering using Nearest-Neighbor Chain

Shangdi Yu, Yiqiu Wang, Yan Gu, Laxman Dhulipala, and Julian Shun.  
Processing of the VLDB Endowment 14(12), 2021.

### 30. GeoGraph: A Framework for Graph Processing on Geometric Data

Yiqiu Wang, Shangdi Yu, Laxman Dhulipala, Yan Gu, and Julian Shun.  
ACM SIGOPS Operating Systems Review, Vol. 55 Issue 1, pp. 38-46, 2021.

### 29. The Processing-in-Memory Model

Hongbo Kang, Phillip B. Gibbons, Guy E. Blelloch, Laxman Dhulipala, Yan Gu, and Charles McGuffey.  
ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), 2021.

### 28. Efficient Stepping Algorithms and Implementations for Parallel Shortest Paths

Xiaojun Dong, **Yan Gu**, and Yihan Sun, Yunming Zhang.  
ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), 2021.  
arXiv:2105.06145 [cs.DS]

**27. Fast Parallel Algorithms for Euclidean Minimum Spanning Tree and Hierarchical Spatial Clustering**

Yiqiu Wang, Shangdi Yu, **Yan Gu** and Julian Shun.  
ACM International Conference on Management of Data (SIGMOD), 2021.  
arXiv:2010.02379 [cs.DS]

**26. An Experimental Study of a New Parallel Batch-Dynamic Closest Pair Data Structure**

Yiqiu Wang, Shangdi Yu, **Yan Gu** and Julian Shun.  
ACM Symposium on Computational Geometry (SOCG), 2021.  
arXiv:2010.02379 [cs.DS]

**25. Parallel In-Place Algorithms: Theory and Practice**

**Yan Gu**, Omar Obeya, and Julian Shun.  
ACM-SIAM Algorithmic Principles of Computer Systems (APoCS), 2021  
arXiv:2103.01216 [cs.DC]

**24. The Read-Only Semi-External Model**

Guy E. Blelloch, Laxman Dhulipala, Phillip B. Gibbons, **Yan Gu**, Charlie McGuffey, and Julian Shun.  
ACM-SIAM Algorithmic Principles of Computer Systems (APoCS), 2021.

**23. Optimal Parallel Algorithms in the Binary-Forking Model**

Guy E. Blelloch, Jeremy T. Fineman, **Yan Gu**, and Yihan Sun.  
ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), 2020.  
arXiv: 1903.04650 [cs.DS]

**22. Randomized Incremental Convex Hull is Highly Parallel**

Guy E. Blelloch, **Yan Gu**, Julian Shun, and Yihan Sun.  
ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), 2020.

**21. Sage: Parallel Semi-Asymmetric Graph Algorithms for NVRAMs**

Laxman Dhulipala, Charlie McGuffey, Hongbo Kang, **Yan Gu**, Guy E. Blelloch, Phillip B. Gibbons, Julian Shun.  
Processing of the VLDB Endowment 13(9), 2020.  
arXiv: 1910.12310 [cs.DS]

**20. Theoretically-Efficient and Practical Parallel DBSCAN**

Yiqiu Wang, **Yan Gu**, Julian Shun  
ACM International Conference on Management of Data (SIGMOD), 2020.  
arXiv: 1912.06255 [cs.DS]

**19. Improved Parallel Cache-Oblivious Algorithms for Dynamic Programming and Linear Algebra**

Guy E. Blelloch, and **Yan Gu**  
ACM-SIAM Algorithmic Principles of Computer Systems (APoCS), 2020.

arXiv: 1809.09330 [cs.DS]

## 18. **Algorithmic Building Blocks for Asymmetric Memories**

**Yan Gu**, Yihan Sun and Guy E. Blelloch  
European Symposium on Algorithms (ESA), 2018.  
Also, arXiv:1806.10370 [cs.DS]

## 17. **Parallel Write-efficient Algorithms and Data Structures for Computational Geometry**

Guy E. Blelloch, **Yan Gu**, Julian Shun and Yihan Sun  
ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), 2018.  
Also, arXiv:1805.05592 [cs.DS]

## 16. **The Parallel Persistent Memory Model**

Guy E. Blelloch, Phillip B. Gibbons, **Yan Gu**, Charles McGuffey and Julian Shun  
ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), 2018.  
Also, arXiv:1805.05580 [cs.DS]

## 15. **Implicit Decomposition for Write-Efficient Connectivity Algorithms**

Guy E. Blelloch, Jeremy T. Fineman, Phillip B. Gibbons, **Yan Gu**, Charles McGuffey and Julian Shun  
IEEE International Parallel & Distributed Processing Symposium (IPDPS), 2018.  
arXiv:1710.02637 [cs.DS]

## 14. **Efficient Construction of Probabilistic Tree Embeddings**

Guy E. Blelloch, **Yan Gu** and Yihan Sun  
International Colloquium on Automata, Languages, and Programming (ICALP), 2017.  
arXiv:1605.04651 [cs.DS]

## 13. **Parallel Algorithms with Asymmetric Read and Write Costs**

Naama Ben-David, Guy E. Blelloch, Jeremy T. Fineman, Phillip B. Gibbons, **Yan Gu**, Charles McGuffey and Julian Shun  
ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), 2016.

## 12. **Parallel Shortest-paths Using Radius Stepping**

Guy E. Blelloch, **Yan Gu**, Yihan Sun and Kanat Tangwongsan  
ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), 2016.  
arXiv:1602.03881 [cs.DS]

## 11. **Parallelism in Randomized Incremental Algorithms**

Guy E. Blelloch, **Yan Gu**, Julian Shun and Yihan Sun  
ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), 2016.

## 10. **Efficient Algorithms with Asymmetric Read and Write Costs**

Guy E. Blelloch, Jeremy T. Fineman, Phillip B. Gibbons, **Yan Gu** and Julian Shun  
European Symposium on Algorithms (ESA), 2016.  
Also, arXiv:1511.01038 [cs.DS]

## 9. **A Top-Down Parallel Semisort**

**Yan Gu**, Julian Shun, Yihan Sun and Guy E. Blelloch  
ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), 2015.

## 8. **Sorting with Asymmetric Read and Write Costs**

Guy E. Blelloch, Jeremy T. Fineman, Phillip B. Gibbons, **Yan Gu** and Julian Shun  
ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), 2015.  
Also, arXiv:1603.03505 [cs.DS]

## 7. **Sequential Random Permutation, List Contraction and Tree Contraction are Highly Parallel**

Julian Shun, **Yan Gu**, Guy E. Blelloch, Jeremy T. Fineman, Phillip B. Gibbons  
ACM-SIAM Symposium on Discrete Algorithms (SODA), 2015.

## 6. **Ray Specialized BVH Contraction**

**Yan Gu**, Yong He and Guy E. Blelloch  
Pacific Graphics 2015. Computer Graphics Forum 34(7), 309-318.

## 5. **Extending the Graphics Pipeline with Adaptive, Multi-Rate Shading**

Yong He, **Yan Gu** and Kayvon Fatahalian  
SIGGRAPH 2014. ACM Trans. Graph. 33, 4, Article 142 (2014)

## 4. **Efficient BVH Construction via Approximate Agglomerative Clustering**

**Yan Gu**, Yong He, Kayvon Fatahalian and Guy E. Blelloch  
High Performance Graphics 2013.

## 3. **Mixed-Domain Edge-Aware Image Manipulation**

Xian-Ying Li, **Yan Gu** and Shi-Min Hu  
IEEE Trans. on Image Processing (TIP), 2013, 22(5), pp. 1915-1925.

## 2. **Algorithms on Moving Sensors for Barrier Coverage of a Line Segment and a Simple Circle**

Danny Z. Chen, **Yan Gu**, Jian Li and Haitao Wang  
SWAT 2012. Discrete & Computational Geometry, 2013, 50(2), pp. 374-408.

## 1. **A Geometric Study of V-style Pop-ups: Theories and Algorithms**

Xian-Ying Li, Tao Ju, **Yan Gu**, and Shi-Min Hu  
SIGGRAPH 2011. ACM Trans. on Graph. 30, 4, Article 98 (2011).

## **Talks**

### **“Introduction to Parallel Algorithms”**

Tsinghua University, (online) Jan 2022

UESTC, (online) Jan 2022

### **“Analysis of Work-Stealing and Parallel Cache Complexity”**

ACM-SIAM Algorithmic Principles of Computer Systems (APoCS), online (Jan 2022)

### **“Parallel In-Place Algorithms: Theory and Practice”**

ACM-SIAM Algorithmic Principles of Computer Systems (APoCS), online (Jan 2021)

### **“Building Efficient Graph Databases on NVRAMs”**

UCR Colloquium in Computer Science, online (Nov 2020)

### **“Optimal Parallel Algorithms in the Binary-Forking Model”**

Symposium on Parallelism in Algorithms and Architectures (SPAA), Online (July 2020)

### **“Abstractions and Algorithms for Efficiently Programming NVRAMs”**

ACM Principles and Practice of Parallel Programming (PPoPP) tutorial, San Diego, CA (Feb 2020)

### **“Improved Parallel Cache-Oblivious Algorithms for Dynamic Programming and Linear Algebra”**

ACM-SIAM Algorithmic Principles of Computer Systems (APoCS), Salk Lake City, UT (Jan 2020)

### **“Non-Volatile Main Memories (NVRAMs): Challenges and Opportunities”**

University of California, Riverside, CA (September 2019)

### **“Efficient Algorithms for Modern and Future Architecture”**

University of California, Riverside, CA (March 2019)

Lehigh University, PA (March 2019)

University of Connecticut, CT (February 2019)

Missouri University of Science and Technology, MI (February 2019)

### **“Write-efficient Algorithms” Series**

#### **Conference Talks**

“Algorithmic Building Blocks for Asymmetric Memories”, ESA, August 2018 (Helsinki, Finland).

“Parallel Write-efficient Algorithms and Data Structures for Computational Geometry”, SPAA, July 2018 (Vienna, Austria)

“Implicit Decomposition for Write-Efficient Connectivity Algorithms”, IPDPS, May 2018 (Vancouver, Canada)

“Efficient Algorithms with Asymmetric Read and Write Costs”, ESA, August 2016 (Aarhus, Denmark)

“Sorting with Asymmetric Read and Write Costs”, SPAA, June 2015, (Portland, OR)

#### **Invited Talks**

Algorithms & Complexity Seminar at MIT, Cambridge, MA (October 2018)

Annual Parlay Meeting at MIT, Cambridge, MA (October 2017)

Fudan University, Shanghai, China (June 2017)

Google Research, Mountain View, CA (July 2016)

Chinese Academy of Sciences, Beijing, China (June 2016)

Tsinghua University, Beijing, China (October 2015)

#### **Workshop and Seminar Talks**

Workshop on Advances in Parallel and Distributed Computational Models, Vancouver, Canada (May 2018)

Annual Parlay Meeting at CMU, Pittsburgh, PA (April 2016)

Samsung, San Jose, CA (March 2016)

NVM Workshop, San Diego, CA (March 2016)

CMU SpeakersClub, Pittsburgh, PA (September 2015)

### **“Practical Algorithms Can Benefit from Theoretical Improvements”**

Programming Languages and Software Engineering Seminar at MIT, Cambridge, MA (September 2018)

## **“Efficient Construction of Probabilistic Tree Embeddings”**

International Colloquium on Automata, Languages, and Programming (ICALP), Warsaw, Poland (July 2017)

CMU Theory lunch, Pittsburgh, PA (May 2017)

## **“Parallel Shortest-Paths Using Radius Stepping”**

Goethe University Frankfurt, Germany (March 2018)

Symposium on Parallelism in Algorithms and Architectures (SPAA), Pacific Grove, CA (July 2016)

Annual Parlay Meeting at CMU, Pittsburgh, PA (April 2016)

## **“A Top-Down Parallel Semisort”**

Annual Parlay Meeting at MIT, Cambridge, MA (April 2015)

## **“Ray Specialized BVH Contraction”**

Pacific Graphics, Beijing, China (October 2015)

CMU Graphics Lab Meeting, Pittsburgh, PA (November 2013)

## **“Efficient BVH Construction” Series**

Tsinghua University, Beijing, China (June 2016, titled “Efficient graphics data structures”)

High Performance Graphics, Anaheim, CA (July 2013)

CMU Graphics Lab Meeting, Pittsburgh, PA (June 2013)

CMU 15-750: Graduate Algorithms, 20-min short lecture (April 2013)

## **“Parallelism in Graphics Applications”**

CMU Graphics Lab Meeting, Pittsburgh, PA (March 2014)

Annual Parlay Meeting at CMU, Pittsburgh, PA (February 2014)

## **“V-style Pop-ups”**

CMU Graphics Lab Meeting, Pittsburgh, PA (October 2012)

Tsinghua University, Beijing, China (May 2012)

## **Professional Services**

**Publicity Chair** for ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), from July 2019

**Workshop/Tutorial Chair** for ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), from July 2019

### **Program Committee:**

- ACM Symposium on Parallelism in Algorithms and Architectures (SPAA) 2022
- ACM-SIAM Algorithmic Principles of Computer Systems (APoCS) 2022
- ACM Principles and Practice of Parallel Programming, External (PPoPP) 2022
- ACM Symposium on Parallelism in Algorithms and Architectures (SPAA) 2020
- IEEE International Parallel & Distributed Processing Symposium (IPDPS) 2020
- ACM-SIAM Algorithmic Principles of Computer Systems (APoCS) 2020
- ACM Symposium on Parallelism in Algorithms and Architectures (SPAA) 2019
- IEEE International Parallel & Distributed Processing Symposium (IPDPS) 2019
- Workshop on Advances in Parallel and Distributed Computational Models (APDCM) in IPDPS 2019
- Big Graph Processing (BGP) in ICDCS 2017

### **Conference reviewer:**

SPAA, SODA, FOCS, STOC, ICALP, ESA, IPDPS, SIGMETRIC, ALENEX, PACT, SIGGRAPH, Eurographics, Pacific Graphics, High performance Graphics, Fun with algorithms

### **Journal reviewer:**

- TOPC (ACM Transactions on Parallel Computing)
- Parallel Computing
- IJNC (International Journal of Networking and Computing)
- TVCG (IEEE Transactions on Visualization and Computer Graphics)
- Journal of Experimental Algorithmics (JEA)
- Information Processing Letters (IPL)
- PeerJ Computer Science Journal
- CAG (Computers & Graphics)
- JCGT (Journal of Computer Graphics Techniques)
- The Visual Computer
- JOCO (Journal of Combinatorial Optimization)
- Astronomy and Computing
- Transactions on Computers
- International Journal of Parallel Programming

## **Teaching and Coaching**

CS 141: Intermediate Data Structures and Algorithms (Fall 2020, Fall 2021)

CS 142: Algorithm Engineering (Winter 2021, Winter 2022)

CS 218: Design and Analysis of Algorithms (Spring 2021)

CS 219: Advanced Algorithms (Spring 2022)

CS 260: Algorithm Engineering (aka. How to Write Fast Code) (Spring 2020)

**Coach for UCR programming team since 2021, assistant Coach for CMU programming team (Jul. 2013 – Aug. 2015), and programming team of Beijing Institute of Technology (Jan. 2010 – Aug. 2010)**

#### **Highlights of the coached teams:**

- Carnegie Mellon University 2013 – 2015:
  - 3 teams in top 5 at 2014 East Central North America (ECNA) regional
  - Champion, and 5 teams in top 10 at 2013 East Central North America (ECNA) regional (ECNA regionals are highly-competitive. These are CMU's only presence in top 4 places in ECNA regionals during the last six years.)
  - 15<sup>th</sup> at 2015 World Final
- Beijing Institute of Technology 2010:
  - 7<sup>th</sup> place (Gold Medal) at 2010 Asia Regional at Hangzhou, first Gold Medal in school history