

# MAKRAND SINHA

## Contact Information

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## Research Interests

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- Communication Complexity
- Linear and Semidefinite Programs for Combinatorial Optimization
- Convex Geometry and Optimization

## Employment

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NOV 2019-PRESENT **CWI**, Amsterdam  
Postdoctoral Researcher in the *Networks & Optimization* group  
Advisors: Ronald de Wolf, Monique Laurent, Nikhil Bansal

## Education

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AUG 2018 **University of Washington**, Seattle  
Ph.D. in *Computer Science and Engineering*  
Advisor: Anup Rao  
Dissertation: Lower Bounds for Interactive Compression and Linear Programs

MAY 2011 **ETH Zürich**, Switzerland  
M. Sc. in *Computer Science (Theory of Computing)* | GPA: 5.8/6.0  
Advisor: Thomas Holenstein

MAY 2009 **Indian Institute of Technology Kanpur**, India  
Bachelor of Technology in *Computer Science and Engineering* | GPA: 9.1/10

## Publications

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1. **Simplified Separation of Information and Communication** [[ECCC](#)]  
*Anup Rao and Makrand Sinha*  
Accepted for publication in **Theory of Computing**
2. **Edge Estimation with Independent Set Oracles** [[arXiv](#)]  
*Paul Beame, Sarel Har-Peled, Sivaramakrishnan Natarajan Ramamoorthy, Cyrus Rashtchian and Makrand Sinha*  
In proceedings of the 9th Innovations in Theoretical Computer Science (**ITCS '18**), p. 38:1-38:21, 2018
3. **Lower Bounds for Approximating the Matching Polytope** [[arXiv](#)][[ECCC](#)]  
*Makrand Sinha*  
In proceedings of the 29th Annual ACM-SIAM Symposium on Discrete Algorithms (**SODA '18**), p. 1585-1604, 2018
4. **A Direct-sum Theorem for Read-Once Branching Programs** [[pdf](#)]  
*Anup Rao and Makrand Sinha*  
In proceedings of the 20th International Workshop on Randomization and Computation (**RANDOM '16**), p. 44:1-44:15, 2016

5. **Fooling Pairs in Randomized Communication Complexity** [ECCC]  
*Shay Moran, Makrand Sinha and Amir Yehudayoff*  
 In proceedings of the 23rd International Colloquium on Structural Information and Communication Complexity (**SIROCCO '16**), p. 49-59, 2016
6. **On the Communication Complexity of Greater-Than** [pdf]  
*Sivaramakrishnan Natarajan Ramamoorthy and Makrand Sinha*  
 In proceedings of the 53rd Annual Allerton Conference on Communication, Control and Computing (**Allerton '15**), p. 442-444, 2015
7. **Constructing a Pseudorandom Generator Requires an Almost Linear Number of Calls** [arXiv]  
*Thomas Holenstein and Makrand Sinha*  
 In proceedings of IEEE 53rd Annual Symposium on Foundations of Computer Science (**FOCS' 12**), p. 698-707, 2012
8. **Vertices of Degree  $k$  in Random Unlabeled Trees** [pdf]  
*Konstantinos Panagiotou and Makrand Sinha*  
 Preliminary version appeared in proceedings of **EuroComb '09**, Electronic Notes in Discrete Mathematics, Volume 34, p. 41-45. Full version appeared in **Journal of Graph Theory**, Volume 69, Issue 2, p. 114-130, February 2012

#### Research Visits

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|---------------|---|
| SEP 14-OCT 14 | <b>Technion-Israel Institute of Technology</b><br>Visiting Researcher |
| JUL 13-OCT 13 | <b>Microsoft Research India</b><br>Research Internship                |
| JUN 13-JUL 13 | <b>Technion-Israel Institute of Technology</b><br>Visiting Researcher |
| MAY 08-JUL 08 | <b>ETH Zürich</b><br>Research Internship                              |

#### Talks

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|          | <b>Lower Bounds for Approximating the Matching Polytope</b>                                    |
| JUL 2018 | ISMP 2018, <i>Bordeaux, France</i>   |
| MAR 2018 | Seminar, <i>CWI Amsterdam</i>  |
| JAN 2018 | SODA 2018, <i>New Orleans</i>  |
| NOV 2017 | UW Theory Seminar, <i>University of Washington</i>   |
|          | <b>A Direct-sum Theorem for Read-Once Branching Programs</b>                                   |
| SEP 2016 | APPROX-RANDOM 2016, <i>IHP Paris</i>   |
|          | <b>Simplified Separation of Information and Communication</b>                                  |
| MAR 2018 | Theory Seminar, <i>KTH Stockholm</i>   |
| DEC 2015 | UW Theory Seminar, <i>University of Washington</i>   |
|          | <b>On Parallelizing Streaming Computation</b>  |
| APR 2015 | Workshop on Information Theory in Complexity Theory and Combinatorics, <i>Simons Institute</i> |
|          | <b>Direct Sums and Compression for Parallel Streaming Computation</b>                          |
| FEB 2014 | UW Theory Seminar, <i>University of Washington</i>   |
|          | <b>Constructing a Pseudorandom Generator Requires an Almost Linear Number of Calls</b>         |
| OCT 2012 | FOCS 2012, <i>New Brunswick</i>  |
| APR 2012 | UW Theory Seminar, <i>University of Washington</i>   |

## Teaching Experience

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### University of Washington

- Guest lecturer for several lectures in a graduate course on *Communication Complexity* (Autumn 2015).
- Teaching Assistant for graduate *Randomized Algorithms* (Winter 2015), undergraduate *Algorithms* (Summer 2014, Spring 2014), undergraduate *Complexity Theory* (Spring 2013).
- Organized and lectured in student reading groups: *Fourier Analysis* (Summer 2012, Organizer), *Recent developments in Theory* (Spring 2013, Organizer), *Incidence Geometry* (Winter 2014), *Recent developments in Theory* (Winter 2015), *Additive Combinatorics* (Spring 2016).
- Gave a popular science talk at Town Hall Seattle:  
**P vs NP: The Limits of Computers** (May 2013), UW Science Now, *Town Hall Seattle*.

### Academic Awards

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- *Computer Science and Engineering Research Fellowship* at University of Washington for the year 2011-2012
- *Excellence Scholarship* at ETH Zürich from 2009-2011
- *Academic Excellence Award* for the year 2005-06 at IIT Kanpur
- *All India Rank 82* (among top 0.05% candidates) in IIT-Joint Entrance Examination 2005

### Other Professional Activities

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1. Conference Reviewer for RANDOM, STOC, FOCS, CCC, ITCS, ICALP
2. Journal Reviewer for Random Structures & Algorithms, Theoretical Computer Science, JACM