

# Jakob Nordström

## Curriculum Vitae

School of Computer Science and Communication  
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### Research Interests

Computational complexity, proof complexity, SAT solving

### Education

- 2008 PhD in Computer Science at KTH Royal Institute of Technology, Stockholm, Sweden, under the supervision of Professor Johan Håstad
- 2001 MSc in Computer Science and Mathematics at Stockholm University, Sweden
- 1999-2003 Russian studies up to finished C-level (equivalent of one and a half year's full-time studies) at Uppsala University and Stockholm University, Sweden
- Summer 1993 Karolinska Institute Biomedical Research School, Stockholm, Sweden
- 1993 Higher Certificate from the Natural Sciences Programme with extended music education at Stockholm Music Upper Secondary School, Sweden
- 1992 Diploma in Choir Conducting with extended Music Theory from Tallinn Music Upper Secondary School and the Tallinn Conservatory, Estonia

### Positions Held

- 2011-present Assistant Professor at KTH Royal Institute of Technology
- 2008-2010 Postdoctoral researcher at the Massachusetts Institute of Technology hosted by Professor Madhu Sudan
- 2002-2008 Research assistant position sponsored by the President of KTH (one of 5-7 "Excellence PhD positions" awarded yearly based on undergraduate record)
- 2000/2001 Master's thesis project at Prover Technology ([www.prover.com](http://www.prover.com))
- 1996-1999 Teaching assistant at the Department of Mathematics, Stockholm University

### Teaching

Lecturer on the following courses at KTH:

- Complexity Theory, 2nd level course 2013/14 (*planned*)
- Current Research in Proof Complexity, 2nd/3rd level course 2011/12
- Seminars on TCS: Communication Complexity, 2nd/3rd level course 2012/13

Lecturer on other courses:

- Estonian Winter School in Computer Science (EWSCS '12), Palmse, Estonia, 2012

Teaching assistant on the following courses at KTH:

- Advanced Algorithms, 2nd level course 2005/06
- Algorithms, Data Structures and Complexity, 1st level course 2002/03, 2003/04, 2004/05, 2005/06
- Complexity Theory, 2nd level course 2003/04
- Fundamentals of Computer Science, 1st level course 2002/03, 2003/04, 2004/05

Teaching assistant on the following courses at Stockholm University:

- Algebra and Geometry part 1, 1st level course 1998/99
- Introductory Course in Mathematics 1996/97
- Mathematical Analysis parts 1 and 2, 1st level courses 1996/97
- Using Computers in Mathematics, 2nd level course 1998/99

### **Professional Service**

Workshops:

- Main organizer of the workshop “Theoretical Foundations of Applied SAT Solving” at the Banff International Research Station, Jan 2014 (*planned*)

Conference committees:

- Conference on Current Trends in Theory and Practice of Computer Science (SOFSEM) 2013
- Conference on Theory and Applications of Satisfiability Testing (SAT) 2013
- IEEE Conference on Computational Complexity (CCC) 2013

Conference review assignments:

- ACM Symposium on Theory of Computing (STOC)
- Conference on Innovations in Theoretical Computer Science (ITCS)
- IEEE Conference on Computational Complexity (CCC)
- IEEE Symposium on Foundations of Computer Science (FOCS)
- International Colloquium on Automata, Languages and Programming (ICALP)
- International Symposium on Fundamentals of Computation Theory (FCT)
- International Symposium on Mathematical Foundations of Computer Science (MFCS)

Journal review assignments:

- ACM Transactions on Computational Logic
- ACM Transactions on Computation Theory
- Computational Complexity
- Information Processing Letters
- Journal of Artificial Intelligence Research
- SIAM Journal on Computing
- Theory of Computing

Evaluation of PhD theses:

- External reviewer for PhD thesis of Bangsheng Tang, Tsinghua University, Beijing

### **Commission of Trust**

2004-2007     President of the Graduate Students’ Council and PhD student representative in the Board and the Executive Group at the School of Computer Science and Communication, KTH

### **Awards**

2009     Ackermann Award for outstanding dissertation in Logic in Computer Science from the European Association for Computer Science Logic

2006     Danny Lewin Best Student Paper Award at the 38th ACM Symposium on Theory of Computing (STOC ‘06)

2006     The 2006 Meritorious Achievement Award at the School of Computer Science and Communication, KTH

1992     4th place in the Swedish Upper Secondary School Mathematics Competition

## Grants

2013-2016	Breakthrough Research Grant from the Swedish Research Council
2012-2017	Starting Independent Researcher Grant from the European Research Council
2011-2014	Junior Researcher Position Grant (forskarassistenttjänst) from the Swedish Research Council

## Invited Presentations

May 2013	1st Symposium on Structure in Hard Combinatorial Problems, Vienna, Austria
Nov 2012	SAT Interactions, Dagstuhl, Germany
Sep 2012	Limits of Theorem Proving, Rome, Italy
Nov 2011	Mathematical Logic: Proof Theory, Constructive Mathematics, Oberwolfach, Germany
Oct 2011	Proof complexity workshop, Banff International Research Station, Banff, Canada
Jun 2011	Synergies in Lower Bounds, Aarhus, Denmark
Jun 2011	Complexity and Finite Models (CMF '11), Paris, France
Mar 2011	Computational Complexity of Discrete Problems, Dagstuhl, Germany
Jul 2010	Propositional Proof Complexity: Theory and Practice, workshop at the Federated Logic Conference (FLoC '10), Edinburgh, UK
Jul 2010	International Workshop on Tractability, Microsoft Research, Cambridge, UK
Sep 2009	18th EACSL Conference on Computer Science Logic (CSL '09), Coimbra, Portugal
Aug 2009	Barriers in Computational Complexity, Princeton, USA
Sep 2008	Computational Complexity of Discrete Problems, Dagstuhl, Germany
May 2008	Physics of distributed information systems (PhysDIS), Stockholm, Sweden
Sep 2007	Fall School of Logic and Complexity, Třešť, Czech Republic
Apr 2006	New Directions in Proof Complexity, Isaac Newton Institute, Cambridge, UK
Mar 2006	Complexity of Boolean Functions, Dagstuhl, Germany

## Peer-Reviewed Conference Publications

*In computer science, the most important publication venues are conferences and not journals.*

- Yuval Filmus, Massimo Lauria, Mladen Mikša, Jakob Nordström, and Marc Vinyals. **Towards an Understanding of Polynomial Calculus: New Separations and Lower Bounds (Extended Abstract)**. To appear in *Proceedings of the 40th International Colloquium on Automata, Languages and Programming (ICALP '13)*, July 2013.
- Chris Beck, Jakob Nordström, and Bansheng Tang. **Some Trade-off Results for Polynomial Calculus (Extended Abstract)**. In *Proceedings of the 45th Annual ACM Symposium on Theory of Computing (STOC '13)*, pages 813-822, June 2013.
- Matti Järvisalo, Arie Matsliah, Jakob Nordström, and Stanislav Živný. **Relating Proof Complexity Measures and Practical Hardness of SAT**. In *Proceedings of the 18th International Conference on Principles and Practice of Constraint Programming (CP '12)*, pages 316-331, October 2012.
- Yuval Filmus, Massimo Lauria, Jakob Nordström, Neil Thapen, and Noga Ron-Zewi. **Space Complexity in Polynomial Calculus (Extended Abstract)**. In *Proceedings of the 27th Annual IEEE Conference on Computational Complexity (CCC '12)*, pages 334-344, June 2012.
- Trinh Huynh and Jakob Nordström. **On the Virtue of Succinct Proofs: Amplifying Communication Complexity Hardness to Time-Space Trade-offs in Proof Complexity (Extended Abstract)**. In *Proceedings of the 44th Annual ACM Symposium on Theory of Computing (STOC '12)*, pages 233-248, May 2012.
- Jakob Nordström and Alexander Razborov. **On Minimal Unsatisfiability and Time-Space Trade-offs for  $k$ -DNF Resolution**. In *Proceedings of the 38th International Colloquium on Automata, Languages and Programming (ICALP '11)*, pages 642-653, July 2011.

- Eli Ben-Sasson and Jakob Nordström. **Understanding Space in Proof Complexity: Separations and Trade-offs via Substitutions (Extended Abstract)**. In *Proceedings of the 2nd Symposium on Innovations in Computer Science (ICS '11)*, pages 401–416, January 2011.
- Jakob Nordström. **On the Relative Strength of Pebbling and Resolution (Extended Abstract)**. In *Proceedings of the 25th Annual IEEE Conference on Computational Complexity (CCC '10)*, pages 151–162, June 2010.
- Eli Ben-Sasson and Jakob Nordström. **Short Proofs May Be Spacious: An Optimal Separation of Space and Length in Resolution (Extended Abstract)**. In *Proceedings of the 49th Annual IEEE Symposium on Foundations of Computer Science (FOCS '08)*, pages 709–718, October 2008.
- Jakob Nordström and Johan Håstad. **Towards an Optimal Separation of Space and Length in Resolution (Extended Abstract)**. In *Proceedings of the 40th Annual ACM Symposium on Theory of Computing (STOC '08)*, pages 701–710, May 2008.
- Jakob Nordström. **Narrow Proofs May Be Spacious: Separating Space and Width in Resolution (Extended Abstract)**. In *Proceedings of the 38th Annual ACM Symposium on Theory of Computing (STOC '06)*, pages 507–516, May 2006.

### Journal Publications

- Jakob Nordström. **Pebble Games, Proof Complexity, and Time-Space Trade-offs**. To appear in *Logical Methods in Computer Science*, 2013.
- Jakob Nordström and Johan Håstad. **Towards an Optimal Separation of Space and Length in Resolution**. *Theory of Computing*, volume 9, article 14, pages 471–557, May 2013.
- Jakob Nordström. **On the Relative Strength of Pebbling and Resolution**. *ACM Transactions on Computational Logic*, volume 13, issue 2, article 16, April 2012.
- Jakob Nordström. **A Simplified Way of Proving Trade-off Results for Resolution**. *Information Processing Letters*, volume 109, number 18, pages 1030–1035, August 2009.
- Jakob Nordström. **Narrow Proofs May Be Spacious: Separating Space and Width in Resolution**. *SIAM Journal on Computing*, volume 39, issue 1, pages 59–121, May 2009. (Special issue on *STOC '06*.)

### Manuscripts

- Jakob Nordström. **New Wine into Old Wineskins: A Survey of Some Pebbling Classics with Supplemental Results**. To appear in *Foundations and Trends in Theoretical Computer Science*. Manuscript in preparation, 2012.
- Arnab Bhattacharyya, Elena Grigorescu, Jakob Nordström, and Ning Xie. **On the Semantics of Local Characterizations for Linear-Invariant Properties**. Manuscript, 2011.

### Other Experience

1998-present	Interpreter and translator between Russian and Swedish/English. Engaged as interpreter for among others HM the King of Sweden, the Prime Minister, and the Speaker of the Swedish Parliament
2002-2005	President of the Swedish Association of Military Interpreters (Befälsföreningen Militärtolkar, <a href="http://www.militartolkar.org">www.militartolkar.org</a> )
2001-2002	Secretary of the Swedish Association of Military Interpreters
1994-1999	Artistic director of the vocal ensemble Collegium Vocale Stockholm
1997/98	Compulsory national service as military interpreter at the Swedish Armed Forces Language Institute (Försvarets tolkskola). Graduated as the best student of the 1998 class