

# Bundit Laekhanukit

## Personal Information

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Homepage <http://www.cs.mcgill.ca/~blaekh>

## Research Interests

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Approximation Algorithms, Hardness of Approximation,  
Network and Graph Algorithms, Fixed Parameter Tractability  
Subexponential-Time Algorithms, Algorithmic Game Theory,  
Combinatorial Optimization, Mathematical Programming

## Education

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*Max-Planck-Institut für Informatik, Saarbrücken, Germany*  
**Postdoctoral Fellow** Jan 2018 – present

*Weizmann Institute of Science, Rehovot, Israel*  
**Postdoctoral Fellow** Oct 2015 – Jul 2017

*The Swiss AI Lab IDSIA, Manno, Switzerland*  
**Postdoctoral Researcher** Jan 2015 – Sep 2015,  
Jun 2014 – Aug 2014

*Simons Institute for the Theory of Computing, Berkeley CA, USA*  
**Research Fellow** Aug 2014 - Dec 2014  
Aug 2017 – Dec 2017

*McGill University, Montreal QC, Canada*  
**Ph.D** (Computer Science) 2010 – 2014  
Thesis: *Inapproximability of combinatorial problems in subexponential-time*

*University of Waterloo, Waterloo ON, Canada*  
**M.Math** (Combinatorics & Optimization) 2008 – 2010  
Thesis: *Approximation algorithms for  $(S, T)$ -connectivity problems*

*Kasetsart University, Bangkok, Thailand*  
**M.Eng** (Computer Engineering) 2004 – 2006  
Thesis: *Faster algorithms for optimal semi-matching problems*

*Kasetsart University, Bangkok, Thailand*  
**B.Eng** (Computer Engineering) 1999 – 2003

## Academic Achievements and Awards

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- Dr. & Mrs. Milton Leong Doctoral Fellowship, McGill University 2013/2014
- Dr. & Mrs. Milton Leong Doctoral Fellowship, McGill University 2012/2013
- Harold H. Helm Fellowship, McGill University 2011/2012
- Provost Graduate Fellowship, McGill University 2010/2011
- Lorne Trottier Science Accelerator Fellowships, McGill University 2010/2011
- International Master Student Awards, University of Waterloo 2008 – 2010
- Bronze Medal in Thailand National Olympiad in Informatics 1998
- Bronze Medal in Thailand National Olympiad in Informatics 1997
- Silver Medal in Thailand National Olympiad in Informatics 1996

## Refereed Journal Publications

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1. B. Laekhanukit, *An Improved Approximation Algorithm for Minimum-cost Subset  $k$ -connectivity*, *Algorithmica* 72(3): 714-733 (2015) (20 pages).
2. B. Laekhanukit, A. Vetta and G. Wilfong, *Routing Regardless of Network Stability*, *Algorithmica* 70(3): 561-593 (2014) (ESA special issue) (33 pages).
3. J. Cheriyan, B. Laekhanukit, G. Naves and A. Vetta, *Approximating Rooted Steiner Networks*, *ACM Transactions on Algorithms* 11(2): 8:1-8:22 (2014) (22 pages).
4. J. Cheriyan and B. Laekhanukit, *Approximation Algorithms for Minimum Cost  $k$ -( $S, T$ ) Connected Digraphs*, *SIAM Journal on Discrete Mathematics*, 27-3: 1450–1481 (2012) (32 pages).
5. A. Aazami, J. Cheriyan and B. Laekhanukit, *A Bad Example for the Iterative Rounding Method for Mincost  $k$ -connected spanning subgraphs*, *Discrete Optimization*, 10-1: 25–41 (2013) (17 pages).
6. J. Fakcharoenphol, B. Laekhanukit and D. Nanongkai, *Faster Algorithms for Semi-matching Matchings Problems*, *ACM Transactions on Algorithms* 10(3): 14:1-14:23 (2014) (23 pages).
7. J. Fakcharoenphol and B. Laekhanukit, *An  $O(\log^2 k)$ -Approximation Algorithm for the  $k$ -Vertex Connected Subgraph Problem*, *SIAM Journal on Computing*, 41-5:1095–1109 (2012) (15 pages).

## Refereed Conference Publications

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1. Karthik C. S., B. Laekhanukit and P. Manurangsi, *On the Parameterized Complexity of Approximating Dominating Set*, To appear in **STOC 2018**. Invited to SICOMP Special Issue for STOC 2018 (regretfully declined).
2. R. David, Karthik C. S. and B. Laekhanukit, *On The Complexity of Closest Pair via Polar-Pair of Point-Sets*. To appear in **SoCG 2018**.

3. P. Chalermsook, M. Cygan, P. Manurangsi, G. Kortsarz, D. Nanongkai, B. Laekhanukit, L. Trevisan, *From Gap-ETH to FPT-Inapproximability: Clique, Dominating Set, and More*, In Proceedings of the 58th IEEE Annual Symposium on Foundations of Computer Science (**FOCS**), 2017, pp. 743-754 (12 pages).
4. F. Grandoni and B. Laekhanukit, *Surviving in Directed Graphs: A Polylogarithmic Approximation for Two-Connected Directed Steiner Tree*. In Proceedings of the 49th Annual ACM SIGACT Symposium on Theory of Computing (**STOC**), 2017, pp. 420–428 (9 pages).
5. C. Chalermsook, S. Das, B. Laekhanukit and D. Vaz, *Beyond Metric Embedding: Approximating Group Steiner Trees on Bounded Treewidth Graphs*, In Proceedings of the 28th Annual ACM-SIAM Symposium on Discrete Algorithms (**SODA**), 2017, pp. 737–751 (15 pages).
6. E. Chlamtac, M. Dinitz, G. Kortsarz and B. Laekhanukit, *Approximating Spanners and Directed Steiner Forest: Upper and Lower Bounds*, In Proceedings of the 28th Annual ACM-SIAM Symposium on Discrete Algorithms (**SODA**), 2017, pp. 534–553 (20 pages).
7. B. Laekhanukit, *Approximating Directed Steiner Problems via Tree Embedding*, In Proceedings of the 43rd International Colloquium on Automata, Languages, and Programming (**ICALP**), 2016, pp. 74:1–74:13 (13 pages).
8. P. Chalermsook, B. Laekhanukit and F. Grandoni, *On Survivable Set Connectivity*, In Proceedings of the 26th Annual ACM-SIAM Symposium on Discrete Algorithms (**SODA**), 2015, pp. 25–36 (12 pages).
9. P. Chalermsook, B. Laekhanukit and D. Nanongkai, *Pre-Reduction Graph Products: Hardnesses of Properly Learning DFAs and Approximating EDP on DAGs*, In Proceedings of the 55th Annual IEEE Symposium on Foundations of Computer Science (**FOCS**), 2014, pp. 444–453 (10 pages).
10. P. Chalermsook, B. Laekhanukit and D. Nanongkai, *Coloring Graph Powers: Graph Product Bounds and Hardness of Approximation*, In Proceedings of the 11th Latin American Theoretical Informatics Symposium (**LATIN**), 2014, pp. 409–420 (12 pages).
11. B. Laekhanukit, *Parameters of Two-Prover-One-Round Game and the Hardness of Connectivity Problems*, In Proceedings of the 25th Annual ACM-SIAM Symposium on Discrete Algorithms (**SODA**), 2014, pp. 1626–1643 (18 pages).
12. P. Chalermsook, B. Laekhanukit and D. Nanongkai, *Independent Set, Induced Matching, and Pricing: Connections and Tight (Subexponential Time) Approximation Hardnesses*, In Proceedings of the 54th Annual IEEE Symposium on Foundations of Computer Science (**FOCS**), 2013, pp. 370–379 (10 pages).
13. P. Chalermsook, B. Laekhanukit and D. Nanongkai, *Graph Products Revisited: Tight Approximation Hardness of Induced Matching, Poset Dimension, and More*, In Proceedings of the 24th Annual ACM-SIAM Symposium on Discrete Algorithms (**SODA**), 2013, pp.1557–1576 (20 pages).

14. B. Laekhanukit, G. Naves and A. Vetta *Non-Redistributive Second Welfare Theorems*, In Proceedings of the 8th Workshop on Internet and Network Economics (**WINE**), 2012, pp.227–243 (17 pages).
15. B. Laekhanukit, A. Vetta and G. Wilfong, *Routing Regardless of Network Stability*, In Proceedings of the 20th Annual European Symposium on Algorithms (**ESA**), 2012, pp.719–730 (12 pages). Invited to ESA special issue in Algorithmica.
16. B. Laekhanukit, S. Oveis Gharan and M. Singh *An Improved Approximation Algorithm for the Minimum Size  $k$ -Arc Connected Subgraph Problem*, In Proceedings of the 39th International Colloquium on Automata, Languages and Programming (**ICALP**), 2012, pp.606–616 (11 pages).
17. J. Cheriyan, B. Laekhanukit, G. Naves and A. Vetta, *Approximating Rooted Steiner Networks*, In Proceedings of the 23rd Annual ACM-SIAM Symposium on Discrete Algorithms (**SODA**), 2012, pp.1499–1511 (13 pages).
18. B. Laekhanukit, *An Improved Approximation Algorithm for Minimum-cost Subset  $k$ -Connectivity*, In Proceedings of the 38th International Colloquium on Automata, Languages and Programming (**ICALP**), 2011, pp.13–24 (12 pages).
19. P. Briest, P. Chalermsook, S. Khanna, B. Laekhanukit, D. Nanongkai, *Improved Hardness of Approximation for Stackelberg Shortest-Path Pricing*, In Proceedings of the 6th Workshop on Internet and Network Economics (**WINE**), 2010, pp.444–454, short paper (11 pages).
20. J. Fakcharoenphol, B. Laekhanukit and D. Nanongkai, *Faster Algorithms for Semi-matching Matchings Problems*, In Proceedings of the 37th International Colloquium on Automata, Languages and Programming (**ICALP**), 2010, pp.176–187 (10 pages).
21. J. Fakcharoenphol and B. Laekhanukit, *An  $O(\log^2 k)$ -Approximation Algorithm for the  $k$ -Vertex Connected Subgraph Problem*, In Proceedings of the 40th Annual ACM Symposium on Theory of Computing (**STOC**), 2008, pp.153-158 (6 pages).
22. J. Fakcharoenphol, B. Laekhanukit, D. Nanongkai and P. Yospanya, *Detecting and Cleaning Intruders in Sensor Network*. In Proceedings of the 8th National Computer Science and Engineering Conference (**NCSEC**), 2004 (8 pages).

## Manuscripts

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1. C. Chalmersook, S. Das, G. Even, B. Laekhanukit and D. Vaz, *Survivable Network Design in Low-Treewidth Graphs*. Preprint.
2. N. Bansal, P. Chalmersook, B. Laekhanukit, D. Nanongkai and J. Nederlof, *New Tools and Connections for Exponential-time Approximation*. Invited Algorithmica Special Issue for IPEC 2017.
3. J. Fakcharoenphol, B. Laekhanukit and P. Sukprasert, *Finding All Useless Arcs in Directed Planar Graphs*. Preprint.
4. M. Cygan, G. Kortsarz and B. Laekhanukit. *On Subexponential Running Times for Approximating Directed Steiner Tree and Related Problems*. Preprint.

## Talks (Selected)

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- *Approximating Spanners and Directed Steiner Forest: Upper and Lower Bounds*, Jan 2017  
SODA 2017, Barcelona, Spain.
- *Approximating Directed Steiner Problems via Tree Embedding*, ICALP 2016, Rome, July 2016  
Italy.
- *Parameters of Two-Prover-One-Round Game and the Hardness of Connectivity Problems*, Jan 2014  
SODA 2014, Portland, OR, USA.
- *Independent Set, Induced Matching, and Pricing: Connections and Tight (Subexponential Time) Approximation Hardnesses*, Oct 2013  
FOCS 2013, Berkeley, CA, USA.
- *Routing Regardless of Network Stability*, ESA 2012, Ljubljana, Slovenia. Sep 2012
- *An Improved Approximation Algorithm for the Minimum Size  $k$ -Arc Connected Subgraph Problem*, ICALP 2012, Coventry, United Kingdom. Apr 2012
- *Approximating Rooted Steiner Networks*, SODA 2012, Kyoto, Japan. Jan 2012
- *An Improved Approximation Algorithm for the Subset  $k$ -Connectivity*, ICALP 2011, Zurich, Switzerland. Jul 2011
- *An  $O(\log^2 k)$ -Approximation Algorithm for the  $k$ -Vertex Connected Spanning Subgraph Problem*, STOC 2008, Victoria, BC, Canada. May 2008

## Program Committee

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- The 12th International Frontiers of Algorithmics Workshop (FAW 2018)

## Refereeing

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### Journals:

- Mathematics Programming
- Discrete Optimization
- Information and Computation
- Information Processing Letters
- Networks
- Theoretical Computer Science
- Algorithmica
- ACM Transactions on Algorithms
- ACM Transactions on Computation Theory
- SIAM Journal on Discrete Mathematics
- SIAM Journal on Computing
- Theory of Computing Systems
- The Australasian Journal of Combinatorics

### Conferences:

- The 9th Workshop on Approximation and Online Algorithms (WAOA 2011)
- The 24th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA13)
- The 13th International Symposium on Algorithms & Data Structures Symposium (WADS 2013)
- The 41st International Colloquium on Automata, Languages, and Programming (ICALP 2014)
- The 14th Scandinavian Symposium and Workshops on Algorithm Theory (SWAT 2014)
- The 22nd Annual European Symposium on Algorithms (ESA 2014)
- The 25th International Symposium on Algorithms and Computation (ISAAC 2014)
- The 47th ACM Symposium on Theory of Computing (STOC 2015)
- The 18th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX 2015)
- The 27th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2016)
- The 22nd International Computing and Combinatorics Conference (COCOON 2016)
- The 57th IEEE Symposium on Foundations of Computer Science (FOCS 2016)
- The 24th Annual European Symposium on Algorithms (ESA 2016)
- The 14th Workshop on Approximation and Online Algorithms (WAOA 2016)
- The 49th Annual ACM Symposium on the Theory of Computing (STOC 2017)
- The 44th International Colloquium on Automata, Languages, and Programming (ICALP 2017)
- The 25th Annual European Symposium on Algorithms (ESA 2017)
- The 28th International Symposium on Algorithms and Computation (ISAAC 2017)
- The 29th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2018)
- The 12th International Conference and Workshops on Algorithms and Computation (WALCOM 2018)
- The 45th International Colloquium on Automata, Languages, and Programming (ICALP 2018)

### Administrative Duties

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2011 - 2014 Organizer: Discrete Mathematics Group (McGill University)

## Research Visits

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Mar 19 - Mar 30, 2018	Aalto University
Mar 29 - Apr 14, 2017	Aalto University
Mar 23 - Mar 28, 2017	Istituto Dalle Molle di Studi sull'Intelligenza Artificiale (IDSIA)
Jun 27 - Jul 1, 2016	Max Planck Institute for Informatics (MPI)
Jun 9 - Jun 15, 2016	Istituto Dalle Molle di Studi sull'Intelligenza Artificiale (IDSIA)
Jun 9 - Jun 12, 2015	McGill University
May 4 - May 8, 2015	Max Planck Institute for Informatics (MPI)
Jul 2 - Sep 28, 2012	Istituto Dalle Molle di Studi sull'Intelligenza Artificiale (IDSIA)
Feb 21-27, 2011	University of Waterloo
Dec 3-10, 2010	University of Waterloo
Oct 9-12, 2010	University of Waterloo
Sep 22-25, 2010	University of Waterloo

## Work Experience

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<i>Kasetsart University Kamphaeng Saen Campus, Chonburi, Thailand</i> <b>Lecturer</b> (full-time)	May 2007 – Apr 2008
<i>Kasetsart University Si Racha Campus, Nakhon Pathom, Thailand</i> <b>Adjunct lecturer</b> (part-time)	Nov 2005 – Mar 2007

## Teaching Experience

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### *McGill University*

<b>Teaching Assistant:</b> <i>COMP567 Discrete Optimization II</i>	Fall 2013
<i>Duties:</i> Marking assignments, Holding office hours	
<b>Teaching Assistant:</b> <i>MATH340 Discrete Structures II</i>	Winter 2012
<i>Duties:</i> Marking assignments, Holding office hours, Conducting Tutorials	
<b>Teaching Assistant:</b> <i>COMP360 Algorithm Design Techniques</i>	Fall 2011
<i>Duties:</i> Marking assignments and exams, Holding office hours	

### *University of Waterloo*

<b>Teaching Assistant:</b> <i>CO350 Linear Optimization</i>	Spring 2010
<i>Duties:</i> Marking assignments and exams, Holding office hours	
<b>Teaching Assistant:</b> <i>MATH136 Linear Algebra 1 for Honours Mathematics</i>	Winter 2010
<i>Duties:</i> Marking exams, Holding office hours	
<b>Teaching Assistant:</b> <i>MATH137 Calculus 1 for Honours Mathematics</i>	Fall 2009
<i>Duties:</i> Marking assignments and exams, Math Tutor: Help students working on assignments in tutorial rooms	
<b>Teaching Assistant:</b> <i>ECE103 Discrete Mathematics of Engineers</i>	Spring 2008
<i>Duties:</i> Marking assignments and exams, Holding office hours, Conducting tutorials	
<b>Teaching Assistant:</b> <i>CO350 Linear Optimization</i>	Winter 2008
<i>Duties:</i> Marking assignments and exams, Holding office hours, Conducting tutorials	

Kasetsart University Kamphaeng Saen Campus

**Instructor:** 204111 Computer and Programming (C#) 2<sup>nd</sup> term 2007

**Duties:** (head of the course instructures)

Designing syllabus, lectures and assignments for all sections,  
Conducting lectures and tutorials, Marking assignments and exams,  
Holding office hours

**Instructor:** 204112 Information Technologies for Engineers 2<sup>nd</sup> term 2007

**Duties:** Conducting lectures, Marking assignments and exams,  
Holding office hours

**Instructor:** 204111 Computer and Programming (C++) 1<sup>st</sup> term 2007

**Duties:** Conducting lectures and tutorials, Marking assignments and exams,  
Holding office hours

Kasetsart University Si Racha Campus

**Instructor:** 204112 Information Technologies for Engineers 2<sup>nd</sup> term 2006

**Duties:** Conducting lectures, Marking assignments and exams,  
Holding office hours

**Instructor:** 204112 Information Technologies for Engineers 1<sup>st</sup> term 2006

**Duties:** Conducting lectures, Marking assignments and exams,  
Holding office hours

**Instructor:** 204111 Computer and Programming (C) 2<sup>nd</sup> term 2005

**Duties:** Conducting lectures, Marking assignments and exams,  
Holding office hours

Kasetsart University Bang Khaen Campus (Main Campus)

**Teaching Assistant:** 204512 Design and Analysis of Computer Algorithms 1<sup>st</sup> term 2005

**Duties:** Marking assignments



## References

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- Adrian Vetta** Dept. of Mathematics & Statistics and School of Computer Science  
McGill University, Montreal QC, Canada  
Email: [vetta@math.mcgill.ca](mailto:vetta@math.mcgill.ca)
- Joseph Cheriyan** Dept. of Combinatorics & Optimization  
University of Waterloo, Waterloo ON, Canada  
Email: [jcheriyan@uwaterloo.ca](mailto:jcheriyan@uwaterloo.ca)
- Jittat Fakcharoenphol** Dept. of Computer Engineering  
Kasetsart University, Bangkok, Thailand  
Email: [jittat@gmail.com](mailto:jittat@gmail.com)
- Fabrizio Grandoni** Istituto Dalle Molle di Studi sull'Intelligenza Artificiale (IDSIA),  
Manno, Switzerland  
Email: [fabrizio@idsia.ch](mailto:fabrizio@idsia.ch)
- Uriel Feige** Dept. of Computer Science & Applied Mathematics  
Weizmann Institute of Science, Rehovot, Israel  
Email: [uriel.feige@weizmann.ac.il](mailto:uriel.feige@weizmann.ac.il)