

# Bundit Laekhanukit

## Personal Information

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Email `bundit@sufe.edu.cn, lbundit+sufe@gmail.com`  
Homepage `https://bundit-lae.me`  
Position Associate Professor  
Institute Institute for Theoretical Computer Science  
Shanghai University of Finance and Economics

## Research Interests

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Approximation Algorithms, Hardness of Approximation,  
Network and Graph Algorithms, Fine-Grained Complexity,  
Fixed Parameter Tractability, Subexponential-Time Algorithms,  
Combinatorial Optimization, Mathematical Programming,  
Computational Economics.

## Education

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*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

## More Education and Training

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<i>Max-Planck-Institut für Informatik, Saarbrücken, Germany</i> <b>Postdoctoral Fellow</b>	Jan 2018 – July 2019
<i>Weizmann Institute of Science, Rehovot, Israel</i> <b>Postdoctoral Fellow</b>	Oct 2015 – Jul 2017
<i>The Swiss AI Lab IDSIA, Manno, Switzerland</i> <b>Postdoctoral Researcher</b>	Jan 2015 – Sep 2015, Jun 2014 – Aug 2014
<i>Simons Institute for the Theory of Computing, Berkeley CA, USA</i> <b>Research Fellow</b>	Aug 2014 - Dec 2014 Aug 2017 – Dec 2017

## Academic Achievements and Awards

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- National Thousand-Talent
- 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

## Talks (Selected)

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- *On the parameterized complexity of approximating dominating set*, Highlights of Algorithms (HALG 2019). University of Copenhagen, Denmark (invited talk) June 2019
- *Approximating Spanners and Directed Steiner Forest: Upper and Lower Bounds*, SODA 2017, Barcelona, Spain. Jan 2017
- *Approximating Directed Steiner Problems via Tree Embedding*, ICALP 2016, Rome, Italy. July 2016
- *Parameters of Two-Prover-One-Round Game and the Hardness of Connectivity Problems*, SODA 2014, Portland, OR, USA. Jan 2014
- *Independent Set, Induced Matching, and Pricing: Connections and Tight (Subexponential Time) Approximation Hardnesses*, FOCS 2013, Berkeley, CA, USA. Oct 2013
- *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

## Academic Services

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- PC Chair: The 20th Workshop on Approximation and Online Algorithms (WAOA 2022)
- PC: The 1st International Joint Conference on Theoretical Computer Science – the 14th Frontier of Algorithmic Wisdom (IJTCS-FAW 2020)
- PC: The 30th International Symposium on Algorithms and Computation (ISAAC 2019)
- PC: The 27th Annual European Symposium on Algorithms (ESA 2019)
- PC: The 22nd International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX 2019)
- PC: The 12th International Frontiers of Algorithmics Workshop (FAW 2018)

## Work Experiences

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<i>The Shanghai University of Finance and Economics, Shanghai, China</i> <b>Associate Professor</b>	June 2018 – present
<i>Kasetsart University Kamphaeng Saen Campus, Chonburi, Thailand</i> <b>Full-Time Lecturer</b>	May 2007 – Apr 2008
<i>Kasetsart University Si Racha Campus, Nakhon Pathom, Thailand</i> <b>Part-Time Lecturer</b>	Nov 2005 – Mar 2007

## Teaching Experiences

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<i>Shanghai University of Finance and Economics</i>	
<b>Instructor:</b> <i>Programming for Scientific Computation with Applications</i> (Graduate Course)	Spring 2023
<b>Instructor:</b> <i>Algorithmic Design and Analysis</i> (Graduate Course)	Spring 2023
<b>Instructor:</b> <i>Algorithm Design and Complexity Analysis</i>	Spring 2023
<b>Instructor:</b> <i>Object-Oriented Program Design</i>	Summer 2022
<b>Instructor:</b> <i>Programming for Scientific Computation with Applications</i> (Graduate Course)	Spring 2022
<b>Instructor:</b> <i>Algorithmic Design and Analysis</i> (Graduate Course)	Spring 2022
<b>Instructor:</b> <i>The Principle of Database</i>	Fall 2021
<b>Instructor:</b> <i>Object-Oriented Program Design</i>	Summer 2021
<b>Head Instructor:</b> <i>Algorithm Design and Complexity Analysis</i>	Spring 2021
<b>Instructor:</b> <i>Advanced Algorithm Design</i> (Graduate Course)	Spring 2020
<b>Instructor:</b> <i>Algorithm and Complexity</i>	Spring 2020
<b>Instructor:</b> <i>Algorithm and Complexity</i>	Spring 2019

*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

# Publication List

## Refereed Journal Publications

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1. X. Guo, G. Kortsarz, B. Laekhanukit, S. Li, D. Vaz, J. Xian, *On Approximating Degree-Bounded Network Design Problems*, Algorithmica 84(5): 1252-1278 (2022) (27 pages).
2. E. Chlamtác, M. Dinitz, G. Kortsarz, B. Laekhanukit: *Approximating Spanners and Directed Steiner Forest: Upper and Lower Bounds*, ACM Trans. Algorithms 16(3): 33:1-33:31 (2020) (31 pages).
3. P. Chalermsook, M. Cygan, G. Kortsarz, B. Laekhanukit, P. Manurangsi, D. Nanongkai, and L. Trevisan *From Gap-Exponential Time Hypothesis to Fixed Parameter Tractable Inapproximability: Clique, Dominating Set, and More* SIAM J. Comput., 49(4), 772–810 (2020) (39 pages).
4. N. Bansal, P. Chalermsook, B. Laekhanukit, D. Nanongkai, J. Nederlof: *New Tools and Connections for Exponential-Time Approximation*, Algorithmica 81(10): 3993-4009 (2019) (19 pages).
5. Karthik C. S., B. Laekhanukit, P. Manurangsi: *On the Parameterized Complexity of Approximating Dominating Set*, J. ACM 66(5): 33:1-33:38 (2019) (38 pages).
6. R. David, Karthik C. S., B. Laekhanukit: *On the Complexity of Closest Pair via Polar-Pair of Point-Sets*, SIAM J. Discret. Math. 33(1): 509-527 (2019) (19 pages).
7. B. Laekhanukit, *An Improved Approximation Algorithm for Minimum-cost Subset  $k$ -connectivity*, Algorithmica 72(3): 714-733 (2015) (20 pages).
8. B. Laekhanukit, A. Vetta and G. Wilfong, *Routing Regardless of Network Stability*, Algorithmica 70(3): 561-593 (2014) (ESA special issue) (33 pages).
9. 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).
10. 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).
11. 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).
12. 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).
13. 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).

1. Q. Chen, B. Laekhanukit, C. Liao, Y. Zhang, *Survivable Network Design Revisited: Group-Connectivity*, In Proceedings of the 63rd IEEE Annual Symposium on Foundations of Computer Science (**FOCS**), 2022, pp: 278-289 (12 pages).
2. A. Antoniadis, S. Kisfaludi-Bak, B. Laekhanukit, D. Vaz, *On the Approximability of the Traveling Salesman Problem with Line Neighborhoods*, In Proceedings of the 18th Scandinavian Symposium and Workshops on Algorithm Theory (**SWAT**), 2022, pp. 10:1-10:21 (21 pages).
3. C. Liao, Q. Chen, B. Laekhanukit, Y. Zhang. *Almost Tight Approximation Hardness for Single-Source Directed  $k$ -Edge-Connectivity*, In Proceedings of the 49th International Colloquium on Automata, Languages, and Programming, (**ICALP**), 2022, pp. 89:1-89:17 (17 pages).
4. S. Li, B. Laekhanukit, *Polynomial Integrality Gap of Flow LP for Directed Steiner Tree*, In Proceedings of the 2022 ACM-SIAM Symposium on Discrete Algorithms, (**SODA**), 2022, pp. 3230-3236 (7 pages).
5. P. Chalermsook, S. Das, Y. Kook, B. Laekhanukit, Y.-P. Liu, R. Peng, M. Sellke, D. Vaz, *Vertex Sparsification for Edge Connectivity*, In Proceedings of the 2021 ACM-SIAM Symposium on Discrete Algorithms, (**SODA**), 2021, pp. 1206-1225 (20 pages).
6. X. Guo, G. Kortsarz, B. Laekhanukit, S. Li, D. Vaz, J. Xian, *On Approximating Degree-Bounded Network Design Problems*, In Proceedings of the 23rd International Conference on Approximation Algorithms for Combinatorial Optimization Problems, (**APPROX**), 2020, pp. 39:1-39:21 (21 pages).
7. C.-H. Chan, B. Laekhanukit, H.-T. Wei, Y. Zhang, *Polylogarithmic Approximation Algorithm for  $k$ -Connected Directed Steiner Tree on Quasi-Bipartite Graphs*, In Proceedings of the 23rd International Conference on Approximation Algorithms for Combinatorial Optimization Problems, (**APPROX**), 2020, pp. 63:1-63:20 (20 pages).
8. S. Yingchareonthawornchai, P. C. Roy, B. Laekhanukit, E. Torng, K. Deb: *Worst-case conditional hardness and fast algorithms with random inputs for non-dominated sorting*, In the Proceedings of GECCO '20: Genetic and Evolutionary Computation Conference (**GECCO Companion**), 2020: 185-186
9. F. Grandoni, B. Laekhanukit, S. Li:  *$O(\log^2 k / \log \log k)$ -approximation algorithm for directed Steiner tree: a tight quasi-polynomial-time algorithm*, In Proceedings of the 50th Annual ACM SIGACT Symposium on Theory of Computing (**STOC**), 2019, pp. 253-264 (12 pages).  
**Invited to STOC'19 special issue of SIAM J. Computing.**
10. P. Chalermsook, S. Das, G. Even, B. Laekhanukit, D. Vaz, *Survivable Network Design for Group Connectivity in Low-Treewidth Graphs*, In Proceedings of the 21st International Conference on Approximation Algorithms for Combinatorial Optimization Problems (**APPROX**), 2018, pp. 8:1-8:19 (19 pages).

11. R. David, Karthik C. S., B. Laekhanukit, *On the Complexity of Closest Pair via Polar-Pair of Point-Sets*, Symposium on Computational Geometry (**SoCG**), 2018, pp. 28:1-28:15 (15 pages).
12. Karthik C. S., B. Laekhanukit, P. Manurangsi, *On the parameterized complexity of approximating dominating set*, In Proceedings of the 50th Annual ACM SIGACT Symposium on Theory of Computing (**STOC**) 2018, pp. 1283–1296 (14 pages).  
**Invited to STOC'18 special issue of SIAM J. Computing but regretfully declined.**
13. P. Chalermsook, M. Cygan, G. Kortsarz, B. Laekhanukit, P. Manurangsi, D. Nanongkai, L. Trevisan: *From Gap-ETH to FPT-Inapproximability: Clique, Dominating Set, and More*, In the Proceedings of the 58th IEEE Annual Symposium on Foundations of Computer Science (**FOCS**), 2017, pp. 743-754 (20 pages).
14. 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 (17 pages).
15. 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).
16. 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).
17. 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).
18. 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).
19. 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).
20. 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).
21. 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).
22. 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).



23. 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).
24. 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).
25. 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 of Algorithmica.**
26. 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).
27. 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).
28. 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).
29. 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).
30. 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).
31. 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).
32. 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).