Department of Combinatorics & Optimization
Faculty of Mathematics, University of Waterloo
200 University Ave West
Waterloo, ON N2L 3G1
jochen@uwaterloo.ca
http://www.math.uwaterloo.ca/~jochen

Jochen Könemann

Personal Data

Degrees

Ph.D. in Algorithms, Combinatorics, and Optimization Aug 1998 – May 2003
Carnegie Mellon University, Pittsburgh, USA
Dissertation title: *Approximation Algorithms for Minimum-Cost Low-Degree Subgraphs*
Thesis advisor: Prof. R. Ravi

M.Sc. in Computer Science Sep 1993 – Jul 1998
University of Saarbrücken, Saarbrücken, Germany
Thesis title: *Fast Combinatorial Algorithms for Packing and Covering Problems*
Thesis advisors: Prof. Naveen Garg, Prof. K. Mehlhorn

Employment

Amazon Inc., Canada Aug 2019 – present
GDS-Modeling and Optimiation
Scholar

University of Waterloo, Waterloo, Canada Jul 2013 – present
Department of Combinatorics & Optimization
Professor

University of Waterloo, Waterloo, Canada Jul 2008 – Jun 2013
Department of Combinatorics & Optimization
Associate Professor

University of Waterloo, Waterloo, Canada Jul 2003 – Jun 2008
Department of Combinatorics & Optimization
Assistant Professor

Università di Roma "La Sapienza", Rome, Italy Sep 2003 – Jul 2004
Dipartimento di Informatica e Sistemistica
Visiting Researcher

AT&T Research, Florham Park, USA May 2001- Aug 2001
Summer Intern

Lucent Technologies (Bell Laboratories), Murray Hill, USA May 2000-Aug 2000
Summer Intern

Awards and Honours

Best Paper Award 2020
Symposium on Algorithmic Game Theory

Discovery Accelerator Supplement 2012
Natural Sciences and Engineering Research Council of Canada

Outstanding Performance Award 2006,2008,2012,2015
University of Waterloo, Waterloo, Canada

Early Research Award 2007–2012
Ministry of Research & Innovation, Ontario, Canada

Gambrinus Fellowship 2007
Universität Dortmund, Dortmund, Germany

IBM Corporation Faculty Award 2005
IBM Corp., Yorktown Heights, USA

William Larimer Mellon Fellowship 1998–2001
Carnegie Mellon University, Pittsburgh, USA

Research and Scholarship

Areas of Interest

Combinatorial Optimization, Approximation Algorithms, Graph and Network Algorithms, Algorithmic Game Theory, Efficient Implementations

Publications

Refereed Journal Publications & Books

[1] Y. Disser, A. E. Feldmann, M. Klimm, and J. Könemann. Travelling on graphs with small highway dimension. *Algorithmica*, 83(5):1352–1370, 2021

[2] J. Könemann, K. Pashkovich, and J. Toth. Computing the nucleolus of weighted cooperative matching games in polynomial time. *Math. Program.*, 183(1):555–581, 2020

[3] K. Chandrasekaran, C. Gottschalk, J. Könemann, B. Peis, D. Schmand, and A. Wierz. Additive stabilizers for unstable graphs. *Discrete Optimization*, 31:56–78, 2019

[4] S. Held, J. Könemann, and J. Vygen. Vehicle routing with subtours. *Discrete Optimization*, 33:87–100, 2019

[5] A. Smith and J. Könemann. Special section on the forty-sixth annual ACM symposium on theory of computing (STOC 2014). *SIAM J. Comput.*, 47(5):1807–1808, 2018

[6] F. Eisenbrand and J. Könemann, editors. *Integer Programming and Combinatorial Optimization - 19th International Conference, IPCO 2017, Waterloo, ON, Canada, June 26-28, 2017, Proceedings*, volume 10328 of *Lecture Notes in Computer Science*. Springer, 2017

[7] A. E. Feldmann, J. Könemann, N. Olver, and L. Sanità. On the equivalence of the bidirected and hypergraphic relaxations for steiner tree. *Math. Program.*, 160(1-2):379–406, 2016

[8] Linda Farczadi, Konstantinos Georgiou, and Jochen Könemann. Stable marriage with general preferences. *Theory Comput. Syst.*, 59(4):683–699, 2016

[9] J. Könemann, K. Pashkovich, and J. Toth. An elementary integrality proof of rothblum's stable matching formulation. *Oper. Res. Lett.*, 44(6):754–756, 2016

[10] A. Abdi, A. E. Feldmann, B. Guenin, J. Könemann, and L. Sanità. Lehman's theorem and the directed steiner tree problem. *SIAM J. Discrete Math.*, 30(1):141–153, 2016

[11] J. Könemann, K. Larson, and D. Steiner. Network bargaining: Using approximate blocking sets to stabilize unstable instances. *Theory Comput. Syst.*, 57(3):655–672, 2015

[12] A. Bock, K. Chandrasekaran, J. Könemann, B. Peis, and L. Sanità. Finding small stabilizers for unstable graphs. *Math. Program.*, 154(1-2):173–196, 2015

[13] A. Gupta, J. Könemann, S. Leonardi, R. Ravi, and G. Schäfer. Efficient cost-sharing mechanisms for prize-collecting problems. *Math. Program.*, 152(1-2):147–188, 2015

[14] B. Guenin, J. Könemann, and L. Tunçel. *A Gentle Introduction to Optimization*. Cambridge University Press, 2014

[15] K. Georgiou, G. Karakostas, J. Könemann, and Z. Stamirowska. Social exchange networks with distant bargaining. *Theoret. Comput. Sci.*, 554:263–274, 2014

[16] J. Könemann, O. Parekh, and D. Pritchard. Multicommodity flow in trees: Packing via covering and iterated relaxation. *Algorithmica*, 68(3):776–804, 2014

[17] D. Chakrabarty, J. Könemann, and D. Pritchard. Hypergraphic LP relaxations for Steiner trees. *SIAM J. Discrete Math.*, 27(1):507–533, 2013

[18] N. Bansal, R. Khandekar, J. Könemann, V. Nagarajan, and B. Peis. On generalizations of network design problems with degree bounds. *Math. Programming*, 141(1-2):479–506, 2013

[19] A. Bock, E. Grant, J. Könemann, and L. Sanità. The school bus problem on trees. *Algorithmica*, 67(1):49–64, 2013

[20] J. Könemann, D. Pritchard, and K. Tan. A partition-based relaxation for Steiner trees. *Math. Programming, Series A*, 127(2):345–370, 2011

[21] J. Könemann, O. Parekh, and D. Segev. A unified approach to approximating partial covering problems. *Algorithmica*, 59(4):489–509, 2011

[22] Deeparnab Chakrabarty, Jochen Könemann, and David Pritchard. Integrality gap of the hypergraphic relaxation of Steiner trees: A short proof of a 1.55 upper bound. *Operations Research Letters*, 38(6):567–570, 2010

[23] L. Fleischer, J. Könemann, S. Leonardi, and G. Schäfer. Strict cost sharing schemes for Steiner forest. *SIAM Journal on Computing*, 39(8):3616–3632, 2010

[24] F. Grandoni, J. Könemann, and A. Panconesi. Distributed weighted vertex cover via maximal matchings. *ACM Trans. Alg.*, 5(1), 2008

[25] F. Grandoni, J. Könemann, A. Panconesi, and M. Sozio. Primal-dual based distributed algorithms for vertex cover with semi-hard capacities. *SIAM J. Comput.*, 38(3):825–840, 2008

[26] J. Cheriyan, H. Karloff, R. Khandekar, and J. Könemann. On the integrality ratio for tree augmentation. *Operations Research Letters*, 36(4):399–401, 2008

[27] J. Könemann, S. Leonardi, G. Schäfer, and S. H. M. van Zwam. A group-strategyproof cost sharing mechanism for the Steiner forest game. *SIAM J. Comput.*, 37(5):1319–1341, 2008

[28] L. Becchetti, J. Könemann, S. Leonardi, and M. Pál. Sharing the cost more efficiently: Improved approximation for multicommodity rent-or-buy. *ACM Trans. Alg.*, 3(2), 2007

[29] N. Garg and J. Könemann. Faster and simpler algorithms for multicommodity flow and other fractional packing problems. *SIAM J. Comput.*, 37(2):630–652, 2007

[30] R. Engelberg, J. Könemann, S. Leonardi, and J. Naor. Cut problems in graphs with a budget constraint. *J. Discrete Algorithms*, 5(2):262–279, 2007

[31] E. Althaus, S. Funke, S. Har-Peled, J. Könemann, E. Ramos, and M. Skutella. Approximating k-hop minimum-spanning trees. *Operations Research Letters*, 33(2):115–120, 2005

[32] J. Könemann and R. Ravi. Primal-dual meets local search: Approximating MST's with nonuniform degree bounds. *SIAM J. Comput.*, 34(3):763–773, 2005

[33] J. Könemann, Asaf Levin, and Amitabh Sinha. Approximating the degree-bounded minimum diameter spanning tree problem. *Algorithmica*, 41(2):117–129, 2004

[34] J. Könemann, Y. Li, O. Parekh, and A. Sinha. Approximation algorithms for edge-dilation k-center problems. *Operations Research Letters*, 32(5):491–495, 2004

[35] G. Even, N. Garg, J. Könemann, R. Ravi, and A. Sinha. Min-max tree covers of graphs. *Operations Research Letters*, 32(4):309–315, 2004

[36] N. Bansal, K. Damdhere, J. Könemann, and A. Sinha. Non-clairvoyant scheduling for mean slowdown. *Algorithmica*, 40(4):305–318, 2004

[37] J. Könemann, G. Konjevod, O. Parekh, and A. Sinha. Improved approximations for tour and tree covers. *Algorithmica*, 38(3):441–449, 2003

[38] J. Könemann and R. Ravi. A matter of degree: Improved approximation algorithms for degree-bounded minimum spanning trees. *SIAM J. Comput.*, 31(6):1783–1793, 2002

Refereed Conference Publications

[39] A. Göke, J. Könemann, M. Mnich, and H. Sun. Hitting weighted even cycles in planar graphs. In Mary Wootters and Laura Sanità, editors, *Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques, APPROX/RANDOM 2021, August 16-18, 2021, University of Washington, Seattle, Washington, USA (Virtual Conference)*, volume 207 of *LIPIcs*, pages 25:1–25:23. Schloss Dagstuhl - Leibniz-Zentrum für Informatik, 2021

[40] J. Könemann, J. Toth, and F. Zhou. On the complexity of nucleolus computation for bipartite b-matching games. In Ioannis Caragiannis and Kristoffer Arnsfelt Hansen, editors, *Algorithmic Game Theory - 14th International Symposium, SAGT 2021, Aarhus, Denmark, September 21-24, 2021, Proceedings*, volume 12885 of *Lecture Notes in Computer Science*, pages 171–185. Springer, 2021

[41] J. Könemann and J. Toth. A general framework for computing the nucleolus via dynamic programming. In *Proceedings, Symposium on Algorithmic Game Theory*, 2020

[42] J. Könemann, K. Pashkovich, and N. Tofigzade. On the approximability of the stable matching problem with ties of constant size up to the integrality gap. In *Proceedings, Symposium on Algorithmic Game Theory*, 2020. Awarded SAGT'20 Best paper prize.

[43] J. Könemann, K. Pashkovich, and J. Toth. Computing the nucleolus of weighted cooperative matching games in polynomial time. In *Integer Programming and Combinatorial Optimization - 20th International Conference, IPCO 2019, Ann Arbor, MI, USA, May 22-24, 2019, Proceedings*, pages 413–426, 2019

[44] S. Fiorini, M. Groß, J. Könemann, and L. Sanità. Approximating weighted tree augmentation via chvátal-gomory cuts. In *Proceedings of the Twenty-Ninth Annual ACM-SIAM Symposium on Discrete Algorithms, SODA 2018, New Orleans, LA, USA, January 7-10, 2018*, pages 817–831, 2018

[45] J. Könemann, N. Olver, K. Pashkovich, R. Ravi, C. Swamy, and J. Vygen. On the integrality gap of the prize-collecting steiner forest LP. In *Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques, APPROX/RANDOM 2017, August 16-18, 2017, Berkeley, CA, USA*, pages 17:1–17:13, 2017

[46] A. E. Feldmann, J. Könemann, K. Pashkovich, and L. Sanità. Fast approximation algorithms for the generalized survivable network design problem. In *27th International Symposium on Algorithms and Computation, ISAAC 2016, December 12-14, 2016, Sydney, Australia*, pages 33:1–33:12, 2016

[47] Z. Friggstad, J. Könemann, and M. Shadravan. A logarithmic integrality gap bound for directed steiner tree in quasi-bipartite graphs. In *15th Scandinavian Symposium and Workshops on Algorithm Theory, SWAT 2016, June 22-24, 2016, Reykjavik, Iceland*, pages 3:1–3:11, 2016

[48] H. Efsandiari, M. T. Hajiaghayi, J. Könemann, H. Mahini, D. L. Malec, and L. Sanità. Approximate deadline-scheduling with precedence constraints. In *Algorithms - ESA 2015 - 23rd Annual European Symposium, Patras, Greece, September 14-16, 2015, Proceedings*, pages 483–495, 2015

[49] Andreas Emil Feldmann, Wai Shing Fung, Jochen Könemann, and Ian Post. A (1+{\ varepsilon})-embedding of low highway dimension graphs into bounded treewidth graphs. In *In Proc., International Colloquium on Automata, Languages, and Programming*, pages 469–480, 2015

[50] A. Bock, K. Chandrasekaran, J. Könemann, B. Peis, and L. Sanità. Finding small stabilizers for unstable graphs. In *Proceedings, MPS Conference on Integer Programming and Combinatorial Optimization*, pages 150–161, 2014

[51] Z. Friggstad, J. Könemann, Y. Kun-Ko, A. Louis, M. Shadravan, and M. Tulsiani. Linear programming hierarchies suffice for directed Steiner tree. In *Proceedings, MPS Conference on Integer Programming and Combinatorial Optimization*, pages 285–296, 2014

[52] A. Feldmann, J. Könemann, N. Olver, and L. Sanità. On the equivalence of the bidirected and hypergraphic relaxations for Steiner tree. In *Proceedings, Int. Workshop on Approx. Alg. for Comb. Opt. Problems*, 2014

[53] L. Farczadi, C. Georgiou, and J. Könemann. Stable marriage with general preferences. In *Proceedings, Symposium on Algorithmic Game Theory*, 2014

[54] J. Könemann, S. Sadeghian Sadeghabad, and L. Sanità. An lmp o(log n)-approximation algorithm for node weighted prize collecting Steiner tree. In *Proceedings, IEEE Symposium on Foundations of Computer Science*, 2013

[55] L. Farczadi, K. Georgiou, and J. Könemann. Network bargaining with general capacities. In *Proceedings, European Symposium on Algorithms*, pages 433–444, 2013

[56] J. Könemann, S. Sadeghian Sadeghabad, and L. Sanità. Better approximation algorithms for technology diffusion. In *Proceedings, European Symposium on Algorithms*, pages 637–646, 2013

[57] K. Georgiou, G. Karakostas, J. Könemann, and Z. Stamirowska. Social exchange networks with distant bargaining. In *Proceedings, Int. Computing & Combinatorics Conf.*, pages 29–40, 2013

[58] J. Könemann, K. Larson, and D. Steiner. Network bargaining: Using approximate blocking sets to stabilize unstable instances. In *Proceedings, Symposium on Algorithmic Game Theory*, 2012

[59] T. Chan, E. Grant, J. Könemann, and M. Sharpe. Weighted capacitated, priority, and geometric set cover via improved quasi-uniform sampling. In *Proceedings, ACM-SIAM Symposium on Discrete Algorithms*, pages 1576–1585, 2012

[60] A. Bock, E. Grant, J. Könemann, and L. Sanità. The school bus problem in trees. In *Proceedings, Int. Symp. on Algorithms and Computation*, pages 10–19, 2011

[61] N. Bansal, R. Khandekar, J. Könemann, V. Nagarajan, and B. Peis. On generalizations of network design problems with degree bounds. In *Proceedings, MPS Conference on Integer Programming and Combinatorial Optimization*, pages 110–123, 2010

[62] D. Chakrabarty, E. Grant, and J. Könemann. On column-restricted and priority covering integer programs (extended abstract). In *Proceedings, MPS Conference on Integer Programming and Combinatorial Optimization*, pages 355–368, 2010

[63] D. Chakrabarty, J. Könemann, and D. Pritchard. Hypergraphic lp relaxations for Steiner trees. In *Proceedings, MPS Conference on Integer Programming and Combinatorial Optimization*, pages 383–396, 2010

[64] J. Könemann, O. Parekh, and D. Pritchard. Max-weight integral multicommodity flow in spiders and high-capacity trees. In *Proceedings, Workshop on Approx. and Online Alg.*, pages 1–14, 2008

[65] A. Gupta, J. Könemann, S. Leonardi, R. Ravi, and G. Schäfer. An efficient cost-sharing mechanism for the prize-collecting Steiner forest problem. In *Proceedings, ACM-SIAM Symposium on Discrete Algorithms*, pages 1153–1162, 2007

[66] J. Könemann, O. Parekh, and D. Segev. A unified approach to approximating partial covering problems. In *Proceedings, European Symposium on Algorithms*, pages 468–479, 2006

[67] L. Fleischer, J. Könemann, S. Leonardi, and G. Schäfer. Simple cost sharing schemes for multicommodity rent-or-buy and stochastic Steiner tree. In *Proceedings, ACM Symp. on Theory of Computing*, pages 663–670, 2006

[68] R. Engelberg, J. Könemann, S. Leonardi, and J. Naor. Cut problems in graphs with a budget constraint. In *Proceedings, Latin American Th. Informatics Symp.*, pages 435–446, 2006

[69] J. Könemann, S. Leonardi, G. Schäfer, and S. van Zwam. From primal-dual to cost shares and back: A stronger LP relaxation for the Steiner forest problem. In *Proceedings, International Colloquium on Automata, Languages and Processing*, pages 930–942, 2005

[70] F. Grandoni, J. Könemann, A. Panconesi, and M. Sozio. Primal-dual based distributed algorithms for vertex cover with semi-hard capacities. In *Proceedings, ACM Symposium on Principles of Distributed Computing*, pages 118–125, 2005

[71] F. Grandoni, J. Könemann, and A. Panconesi. Distributed weighted vertex cover via maximal matchings. In *Proceedings, Int. Computing & Combinatorics Conf.*, pages 839–848, 2005

[72] J. Könemann, S. Leonardi, and G. Schäfer. A group-strategyproof mechanism for Steiner forests. In *Proceedings, ACM-SIAM Symposium on Discrete Algorithms*, pages 612 – 619, 2005

[73] L. Becchetti, J. Könemann, S. Leonardi, and M. Pál. Sharing the cost more efficiently: Improved approximation for multicommodity rent-or-buy. In *Proceedings, ACM-SIAM Symposium on Discrete Algorithms*, pages 375–384, 2005

[74] J. Könemann and R. Ravi. Quasi-polynomial time approximation algorithm for low-degree minimum-cost Steiner trees. In *Proceedings, Found. of Software Tech. and Theoretical CS*, 2003

[75] G. Even, N. Garg, J. Könemann, R. Ravi, and A. Sinha. Covering graphs using trees and stars. In *Proceedings, Int. Workshop on Approx. Alg. for Comb. Opt. Problems*, 2003

[76] J. Könemann, A. Levin, and A. Sinha. Approximating the degree-bounded minimum-diameter spanning tree problem. In *Proceedings, Int. Workshop on Approx. Alg. for Comb. Opt. Problems*, 2003

[77] J. Könemann and R. Ravi. Primal-dual meets local search: Approximating MST's with nonuniform degree bounds. In *Proceedings, ACM Symp. on Theory of Computing*, pages 389–395, 2003

[78] N. Bansal, K. Damdhere, J. Könemann, and A. Sinha. Non-clairvoyant scheduling for mean slowdown. In *In Proceedings, International Symposium on Theoretical Aspects of Computer Science*, 2003

[79] F. Eisenbrand, S. Funke, N. Garg, and J. Könemann. A combinatorial algorithm for computing a maximum independent set in a t-perfect graph. In *Proceedings, ACM-SIAM Symposium on Discrete Algorithms*, pages 517–522, 2003

[80] J. Könemann, Y. Li, O. Parekh, and A. Sinha. Approximation algorithms for edge-dilation k-center problems. In *Proceedings, Scandinavian Workshop on Algorithm Theory*, 2002

[81] J. Könemann and R. Ravi. A matter of degree: Improved approximation algorithms for degree-bounded minimum spanning trees. In *Proceedings, ACM Symp. on Theory of Computing*, pages 537–546, 2000

[82] N. Garg and J. Könemann. Faster and simpler algorithms for multicommodity flow and other fractional packing problems. In *Proceedings, IEEE Symposium on Foundations of Computer Science*, pages 300–309, 1998

[83] C. Burnikel, J. Könemann, K. Mehlhorn, S. Näher, S. Schirra, and C. Uhrig. Exact geometric computation in LEDA. In *Proceedings, Symposium on Computational Geometry*, pages C18–C19, 1995

Invited Lectures (since 2010)

Jan, 2019 Approximate Network Design via Mathematical Programming. *Invited Talk at Amazon Research, Seattle, USA*

Jan, 2019 *Matching Games: From Bargaining to the Nucleolus.* Invited plenary talk at Aussois Combinatorial Optimization Workshop, Aussois, France

July, 2018 Improved Approximation for Tree Augmentation via Chvatal Gomory Cuts. *Invited talk at 23rd International Symposium on Mathematical Programming, Bordeaux, France*

May, 2018 *Improved Approximation for Tree Augmentation via Chvatal Gomory Cuts.* Invited talk at 9th Workshop for Flexible Network Design, University of Maryland, Maryland, USA

June, 2017 Improved Approximation for Tree Augmentation via Chvatal Gomory Cuts. *Invited plenary talk at 13th Workshop on Models and Algorithms for Planning and Scheduling Problems, Seeon-Seebruck, Germany*

July, 2016 *Aproximate Price Collecting Network Design.* Invited plenary talk Symposium for Discrete Mathematics, Berlin, Germany

May, 2016 *Network Bargaining – Where Bargaining & Matching Theory Meet. Invited main talk at Lond School of Economics, London, United Kingdom*

Apr, 2016 *Approximate Deadline Scheduling with Precedence Constraints. Invited main talk at Colloquium of Research Area KL "Algorithms & Complexity" of the Hausdorff Center for Mathematics, Bonn, Germany*

Mar, 2016 *Network Bargaining – Where Bargaining & Matching Theory Meet. Invited talk in CWI, Amsterdam, The Netherlands*

Jan, 2016 *Network Bargaining – Where Bargaining & Matching Theory Meet. Invited talk in Graduate Colloqium at TU Berlin, Germany*

Nov, 2015 *Aproximate Price Collecting Network Design. Talk at the Hausdorff Institute, Bonn, Germany*

Sep, 2015 *Approximate Deadline Scheduling with Precedence Constraints. Invited Talk at workshop "Efficient algorithms in game theory, optimization and data science", Aachen, Germany*

Sep, 2015 *Approximate Deadline Scheduling with Precedence Constraints. Invited Talk at ESA'15, Patras, Greece*

Sep, 2015 *Recent News for an old Steiner Tree Formulation. Invited* **Plenary Talk** *at Algo'15 Meeting, Patras, Greece*

Jul, 2015 Approximate Deadline Scheduling with Precedence Constraints. *Invited Talk at ISMP'15, Pittsburgh, Greece*

Sep, 2015 *Recent News for an old Steiner Tree Formulation. Invited Talk at University of Michigan, Michigan, USA*

Apr, 2015 *Approximate Deadline Scheduling with Precedence Constraints. Invited Talk at workshop "Discrepancy and Modern Roundings", Holetown, Barbados*

Apr, 2013 Diffusion and Node-Weighted Steiner Trees. *Talk at University of Maryland, Maryland, USA*

Apr, 2013 Diffusion and Node-Weighted Steiner Trees. *Talk at Workshop on Combinatorial Optimization, Bellairs Research Centre, Barbados.*

Apr, 2012 Stabilizing Unstable Instances of Network Bargaining. *Talk at Workshop on Algorithmic Game Theory, Bellairs Research Centre, Barbados.*

Jan, 2012 Structured Set-Cover via Geometric Sampling. *Talk at Technical University Berlin, Berlin, Germany.*

Nov, 2011 Structured Set-Cover via Geometric Sampling. *Talk at Workshop on Approximation Algorithms, Banff Research Centre, Banff, Canada.*

Oct, 2011 LP Relaxations for Steiner Trees. *Talk at McMaster University, Hamilton, Canada.*

Mar, 2011 LP Relaxations for Steiner Trees. *Talk at University of Miami, Miami, USA.*

Jul, 2010 LP Relaxations for Steiner Trees. *Talk at ETH, Zurich, Switzerland.*

Jun, 2010 Approximating Prize-Collecting Steiner Forests. *Talk at EPFL, Lausanne, Switzerland.*

Feb, 2010 On Column Restricted and Priority Integer Covering Programs. *Talk at University of Alberta, Edmonton, Canada.*

Grant Record

Grants held as a principal investigator

Efficient Algorithms for Comb. Opt. Problems in Networks and Beyond 2017–2022
CAD 210000 Discovery Grant, NSERC

Flexible and Effective Techniques for the Design of Approximation Algorithms 2012–2017
CAD 210000 Discovery Grant + CAD 120000 Accelerator Supplement, NSERC

Algorithmic Game Theory and Approximate Network Design 2007–2012
CAD 140000, Early Researcher Award, Province of Ontario

Algorithmic Game Theory and Approximate Network Design 2007–2011
CAD 125000, Discovery Grant, NSERC

Gambrinus Fellowship 2007
EUR 5000, Universität Dortmund, Germany

Approximation Algorithms and Algorithmic Game Theory 2005
USD 20000, IBM Corporation Faculty Award, IBM Corp

Approximation Algorithms for Constrained Network Design Problems 2004–2006
CAD 60000, Discovery Grant, NSERC

Other grants

Infrastructure Grant for Mathematical Excellence 2004-2008
CAD 630000, New Opportunities Award, held as one of eleven principal researchers, CFI

Infrastructure Grant for Mathematical Excellence 2004-2008
CAD 630000, matching funds for above grant, Ontario Research Fund

Teaching Activities

Courses taught

Introduction to Combinatorics (Math 239) S12
Number of students: 64

Introduction to Optimization (CO 250) F11,S12,W13,S14,W15
Number of students: 97 (F11), 184 (S12), 104 (W13), 111 (S14), 77 (W15)

Introduction to Optimization Online (CO 250 Online) W15
Number of students: 68

Network Flows (CO 351) W07,S08
Number of students: 55 (W07), 33 (S08)

Deterministic OR Models (CO 370) W07,F12,W20
Number of students: 21 (W07), 70 (F12), 110 (W20)

Game Theory (CO 456) F09,F14
Number of students: 42 (F09), 56 (F14)

Combinatorial Optimization (CO 450/650) F08,F09,F10
Number of students: 18 (F08), 27 (F09), 8 (F10)

Algorithmic Game Theory (CO 759) F12, F16, F18
Number of students: 14 (F12), 56 (F14), 80 (F18)

Sel. Topics in CO: Modern Roundings in Approximation Algorithms S16
(University of Bonn, Germany) Number of students: 10

Thesis supervision

Mathieu Rundstrom F20 – present
M.Math, C&O

Madison Van Dyk S20–present
Ph.D., C&O

Marina Drygala F19–F20
M.Math, C&O
Thesis Title: *Craniosynostosis Surgery: A Study of Rearrangement*

Ishan Bansal F19–S20
M.Math, C&O
Thesis Title: *The Merge Algorithm for Capacitated Network Design*

Hao Sun F16–present
Ph.D., C&O

Justin Toth F15–S21
M.Math, C&O
Theis Title: *Computing the Nucleolus of Matching and b-Matching Games*

Natig Tofigzadeh F18–S20
M.Math, C&O
Thesis Title: *An Algorithm for Stable Matching with Approximation up to the Integrality Gap*

Sina Rezazadeh S16–W17
Ph.D., C&O

Linda Farczadi S12–S15
Ph.D., C&O
Thesis Title: *Matchings and Games on Networks*

Isaac Fung S11–F15
Ph.D., C&O

Mohammad Shadravan S12–S14
M.Math, C&O
Thesis Title: *On the Integrality Gap of Directed Steiner Tree Problem*

Sina Sadeghian S12–S13
M.Math, C&O, joint with L. Sanità
Thesis Title: *Node-Weighted Prize Collecting Steiner Tree and Applications*

Devanshu Pandey F11–W13
M.Math, C&O
Thesis title: *Vehicle Routing: A Survey of Approximation Algorithm Techniques*

Malcolm Sharpe W11–S12
M.Math, C&O

Elyot Grant F10–S11
M.Math, C&O, joint with T. Chan
Thesis title: *Covering Problems via Structural Approaches*

David Steiner F09–W12
M.Math (CS), joint with K. Larson
Thesis title: *Network Bargaining: Creating Stability using Blocking Sets*

Marcus Sheah F08–W10
M.Math, C&O
Thesis title: *Iterative Rounding Approximation Algorithms in Network Design*

James Pearson S08–W09
M.Math, C&O
Thesis title: *Exact, Approximate, and Online Algorithms for Optimization Problems Arising in DVD Assignment*

David Pritchard F06–W09
Ph.D., C&O, joint with L. Tuncel
Thesis title: *Linear Programming Tools and Approximation Algorithms for Combinatorial Optimization*

Patrick Roh F05–F06
M.Math, C&O
Thesis title: *Minimum Crossing Problems on Graphs*

Kunlun Tan F04–W06
M.Math, C&O
Thesis title: *On the Role of Partition Inequalities in Classical Algorithms for Steiner Problems in Graphs*

David Wheatley S06–S07
M.Math, C&O
Thesis title: *Crossmonotonic Cost-Sharing Methods for Network Design Games*

Other student supervision

Haripriya Pulyassary S20
Undergraduate Research Assistant, C&O
Project: *Algorithms for generalized multicommodity flows over time*

Madison van Dyk F18
Undergraduate Research Assistant, C&O
Project: *Improved Approximations for Precedence-Constrained Deadline Scheduling*

Simon Huang S18
Undergraduate Research Assistant, C&O
Project: *Improved Approximation Algorithms for Tree Augmentation in Bounded Compressed Height Instances*

Erlang Wiratama Surya S18
Undergraduate Research Assistant, C&O
Project: *Improved Approximation Algorithms for Tree Augmentation in Bounded Compressed Height Instances*

Deon Nicholas W15
Undergrad Research Assistant
Project: *Optimization in Cranofacial Surgery – Joint with Sick Kids, Toronto*

Jason Lin S14
Undergrad Research Assistant
Project: *Directed Multicuts in Planar Graphs*

Alexander Remorov S11
Undergrad Research Assistant, joint with L. Tuncel
Project: *Combinatorial Algorithms for solving Convex Programs*

Elyot Grant S09
Undergrad Research Assistant
Project: *Approximating Capacitated Covering Problems*

James Pearson S08
Undergrad Research Assistant
Project: *Optimization Problems in the Mail-Order DVD Rental Industry*

Jonathan Dietrich S05
Undergraduate Research Assistant
Project: *On the Integrality Gap of an LP Relaxation for the VPN Problem*

Maurice Cheung S06
Undergraduate Research Assistant
Project: *Efficient Implementation of a Fast Packing LP Solver*

Siddharth Rajaram F06–S07
M.Math (essay), C&O
Essay title: *The Lifted-Cut Relaxation of the Steiner Forest Problem*

Thesis examination

Vishnu Narayan W17
M.Math (C&O), University of Waterloo
Thesis title: *Approximating Minimum-Size 2-Edge-Connected and 2-Vertex-Connected Spanning Subgraphs*

Vinayak Pathak W15
Ph.D. (CS), University of Waterloo
Thesis title: *Reconfiguring Triangulations*

Shahin Kamali F14
Ph.D. (CS), University of Waterloo
Thesis title: *Alternative Measures for Finer Analysis of Bin Packing, List Update, and Other Online Problems*

Bundit Laekhanukit S14
Ph.D. (CS), McGill University
Thesis Title: *Inapproximability of Combinatorial Problems in Subexponential Time*

Hadi Minnoei S13
Ph.D. (C&O), University of Waterloo
Thesis Title:*Mechanism Design for Covering Problems*

Nima Mousavi S13
Ph.D. (ECE), University of Waterloo
Thesis title:*Algorithmic Problems in Access Control*

Narges Simjour S13
Ph.D. (CS), University of Waterloo
Thesis title: *Parameterized Enumeration of Neighbour Strings and Kemeny Aggregations*

Babak Behsaz F12
Ph.D. (CS), University of Alberta, Edmonton
Thesis title: *Approximation Algorithms for Clustering Problems*

Beth-Ann Austin S11
M.Math (C&O), University of Waterloo
Thesis title: 2*-Crossing Critical Graphs with a* $V8$ *Minor*

Isabel Urrutia-Schroeder S11
M.Math (C&O), University of Waterloo
Thesis title: *Finding* 3*-Connected* 2*-Crossing-Critical Graphs with* $V8$ *Minors and no* $V10$ *Minors.*

Shubham Gupta S11
M.Math (C&O), University of Waterloo

Thesis title: *Building Networks in Uncertainty*

Andy Curtis F11–W12
Ph.D. (CS), University of Waterloo
Thesis title: *Reducing the Cost of Operating a Datacenter Network*

Nicolas Sonnerat S10
Ph.D. (Math), McGill University
Thesis title: *Galaxy Cutsets and Graph Connectivity: Variations on a Theme*

Weibei Li S10
M.Math (Computational Math), University of Waterloo
Thesis title: *The Prize-collecting Steiner Tree Problem and Underground Mine Planning*

Bundit Laekhanukit S10
M.Math (C&O), University of Waterloo
Thesis title: *Approximation Algorithms for (S, T)-Connectivity Problems*

Peruvemba Ravi S10
M.Math (Math), University of Waterloo
Thesis title: *A Study of Worst-Case Performance Bounds for Fast and Simple Approximation Algorithms for the Minimization of Makespan of Flowtime-Optimal Schedules in the Basic Parallel Identical Machine Model*

Piyashat Sripratak W10
M.Math (C&O), University of Waterloo
Thesis title: *On the Number of Edges in a Quasi-planar Graph*

Aaron Dos Remedios W10
M.Math (C&O), University of Waterloo
Thesis title: *Approximation Algorithms For Multi-Unit Online Auctions With Unknown Supply*

Jane Gao W09
Ph.D. (C&O), University of Waterloo
Thesis title: *Generation and Properties of Random Graphs and Analysis of Randomized Algorithms*

Wai-Shing Fung S09
M.Sc., Chinese University of Hong Kong
Thesis title: *Degree Bounded Vertex Connectivity Network Design with Metric Cost*

Mina Razaghpour F08
M.CS, University of Waterloo
Thesis title: *The Steiner Ratio for the Obstacle-Avoiding Steiner Tree Problem*

Ashkan Aazami F07–F08
Ph.D. (C&O), University of Waterloo
Thesis title: *Hardness Results and Approximation Algorithms for some Problems on Graphs*

Ehsan Chiniforooshan F07
Ph.D. (CS), University of Waterloo
Thesis title: *Intersperse Coloring*

Narges Simjour S06
M.Math. (CS), University of Waterloo
Thesis title: *A Different Optimality Measure for the d-Domatic Number Problem*

Michael J. Spriggs F06
Ph.D. (CS), University of Waterloo
Thesis title: *Morphing Parallel Graph Drawings*

Post-doctoral fellows

Martin Groß F16–present
Joint with L. Sanità & C. Swamy

Kanstantsin Pashkovich F14–present
Joint with L. Sanità

Umang Bhaskar F14–S15
Joint with C. Swamy

Andreas Feldmann F12–S15
Joint with C. Swamy & L. Sanità

Ian Post F12–W15
Joint with C. Swamy

Zachary Friggstad F11–W14
Joint with C. Swamy

Konstantinos Georgiou F10–F12
Joint with B. Guenin and C. Swamy

Y. Sharma F10–W11
Joint with C. Swamy

Deeparnab Chakrabarty F08–W10

Rohit Khandekar F05–S06
Joint with J. Cheriyan and J. Geelen

Service

Committees

Masters for Mathematics Teachers Steering Committee 2017–present
C&O Representative

Computational Mathematics Steering Committee 2014–2017
C&O Representative

Faculty of Math Dean Search Committee 2014–2015
C&O Representative

Faculty of Math Research Advisory Committee 2013–2014
C&O Representative

Computational Mathematics Colloquium 2009–2014
C&O Representative

Dept. Tenure & Promotions Committee 2009

Computational Mathematics Colloquium 2009
Chair

Dept. Advisory Committee on Appointments 2007

Computational Mathematics Colloquium 2006–2007
Chair

Computational Mathematics Program Committee 2006

Tutte Seminar Series, C&O 2005-2006
Chair

Dept. Advisory Committee on Appointments, C&O 2005

Administrative appointments

Department Chair, C&O 2010–2011, 09/2016–08/2019, 07/2020 – present

Associate Chair for Undergraduate Affairs 2006–2007,2008–2010

Professional Activities

Society memberships and positions

Association for Computing Machinery (ACM)
Member

Mathematical Optimization Society (MOS)
Member

Editorial position

Mathematical Programming, Series A 2018–2020
Co-Editor

SIAM Journal on Computing
Guest editor, Best papers of STOC'14

Journal of Computer and System Sciences (Elsevier) 2015–2018
Associate Editor

Surveys in Operations Research (Elsevier) 2014–2015
Associate Editor

Conference & workshop organization

Workshop on Approximation and Online Algorithms 2021
Program Committee Chair (w. Britta Peis)

Hausdorff Workshopl on Combinatorial Optimization 2018
Co-Organizer

Hausdorff Summer School on Combinatorial Optimization 2018
Co-Organizer

European Symposium on Algorithms (ESA) 2017
Member of Program Committee

International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX) 2017
Member of Program Committee

Integer Programming and Combinatorial Optimization (IPCO) 2017
Local arrangements chair

Symposium on Discrete Algorithms (SODA) 2017
Member of program committee

Workshop on Approximation and Online Algorithms (WAOA) 2016
Member of Program Committee

Integer Programming and Combinatorial Optimization (IPCO) 2016
Member of Program Committee

Hausdorff Trimester on Combinatorial Optimization 2015
Co-Organizer

International Symposium on Algorithmic Game Theory (SAGT) 2015
Member of Program Committee

International Symposium on Mathematical Programming (ISMP) 2015
Session Organizer

ACM EC 2014
Member of program committee

International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX) 2014
Member of Program Committee

Symposium on Theory of Computing (STOC) 2014
Member of program committee

Symposium on Discrete Algorithms (SODA) 2014
Member of program committee

Workshop on Flexible Network Design 2013
Co-Organizer

Conference on Web and Internet Economics (WINE) 2013
Member of program committee

International Symposium on Algorithmic Game Theory (SAGT) 2013
Member of program committee

International Symposium on Mathematical Programming (ISMP) 2012
Cluster Chair (Combinatorial Optimization)

International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX) 2012
Member of Program Committee

International Symposium on Combinatorial Optimization (ISCO) 2012
Member of Program Committee

European Symposium on Algorithms (ESA) 2012
Member of Program Committee

Workshop on Approximation and Online Algorithms (WAOA) 2011
Member of Program Committee

Workshop on Approximation and Online Algorithms (WAOA) 2010
Member of Program Committee

CORS-INFORMS Annual Meeting 2010
Session Chair

Workshop on Approximation and Online Algorithms, Zurich, Switzerland 2006
Member of program committee

European Symposium on Algorithms, Mallorca, Spain 2005
Member of program committee

Workshop on Comb. & Alg. Aspects of Networking, Waterloo, Canada 2005
Member of program committee

Refereeing and reviewing

Journals

Since 2003, I have on average reviewed 5 papers per year for ACM Transactions on Algorithms, Algorithmica, Discrete and Applied Mathematics, Information Processing Letters, Journal of Discrete Algorithms, Journal of Graph Algorithms and Applications, Journal of the ACM, Mathematical Programming, SIAM Journal on Computing, SIAM Journal on Discrete Mathematics, Operations Research, Operations Research Letters, and Theoretical Computer Science.

Conferences

Since 2003, I have on average reviewed 5–10 papers per year for ACM Symposium on the Theory of Computing (STOC), ACM-SIAM Symposium on Discrete Algorithms (SODA), ACM Symposium on Principles of Distributed Computing (PODC), Conference on Integer Programming and Combinatorial Optimization (IPCO), European Symposium on Algorithms (ESA), IEEE Symposium on Foundations of Computer Science (FOCS), International Colloquium on Automata, Languages and Programming (ICALP), Workshop on Comb. & Alg. Aspects of Networking (ISAAC), International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX), Foundations of Software Technology and Theoretical Computer Science (FSTTCS), Latin American Theoretical Informatics (LATIN), Workshop on Approximation and Online Algorithms (WAOA), Workshop on Comb. & Alg. Aspects of Networking (CAAN), Symposium on Theoretical Aspects of Computer Science (STACS), Scandinavian Workshop on Algorithm Theory (SWAT). This count does not include papers refereed during program committee memberships.

Consulting

Correcting Cranofacial Deformations 2011–2015, 2018 – present
SickKids Hospital, Toronto, Canada

Optimization Issues in the DVD Rental Industry 2009–2010
Zip.Ca, Ottawa, Canada

Scheduling automated stacker cranes 2006
Hutchinson, Hong Kong, China