Dr. Tim Hoheisel

Curriculum Vitae

Research Interests

Continuous Optimization, Nonsmooth Analysis.

Academic Appointments

09/2021- **Director of Applied Math Lab**, *Centre de Recherches Mathématiques (CRM)*, Montréal.

06/2021- **Associate Professor**, *Continuous Optimization*, Department of Mathematics and Statistics, McGill University, Montréal.

08/2016- **Assistant Professor**, *Continuous Optimization*, Department of Mathematics and Statistics, McGill University, Montréal.

10/2011–02/2012 **Visiting Professor**, Chair of Applied Mathematics, University of Düsseldorf.

02/2010-07/2016 **PostDoc**, Chair of Numerical Mathematics and Optimization, University of Würzburg.

08/2006–01/2010 **Research Associate**, Chair of Numerical Mathematics and Optimization, University of Würzburg.

Education

12/2009 **Doctorate degree**, *Dr. rer. nat.*, Chair of Numerical Mathematics and Optimization, University of Würzburg.

07/2006 **Diploma**, *Dipl.-Math.*, Institute of Mathematics, University of Würzburg.

2002–2006 **Studies**, Mathematics (Minor: Economics), University of Würzburg.

2001–2002 **Studies**, Jazz and Jazz-related Music (Major: Saxophone), School of Performing Arts (*Hochschule für Musik und Theater*) Hamburg.

2000–2001 **Community Service (*Zivildienst*)**, Albert-Schweitzer-Hospital, Northeim.

06/2000 **Abitur**, Gymnasium Corvinianum, Northeim.

Longer Research Visits

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http://www.math.mcgill.ca/hoheisel

04–10/2014 **Visiting scholar**, University of Washington, Seattle.

03–10/2012 **Visiting scholar**, University of Washington, Seattle.

Memberships in Professional Institutions

2019- **MTL ML Opt**, *Core member.*

2017- **Society of Applied and Industrial Mathematics (SIAM)**.

2016- **CRM Applied Math Lab**.

Funding history

2018 **Start-up Supplement for Teaching Innovation**, *10,000 CAD.*

2017-2022 **NSERC Discovery Grant**, *95,000 CAD.*

2016 **University Start-up Fund**, *100,000 CAD.*

2014 **DFG Research Scholarship**, *€18,000*, Research Stay at the University of Washington, Seattle.
April-October 2014

2012 **DFG Research Scholarship**, *€18,000*, Research Stay at the University of Washington, Seattle.
March-October 2012

Awards

2010 **UTIA Best Paper Award (2nd prize)**, Institute of Information Theory and Automation, Academy of Sciences of the Czech Republic.

Academic Service

2021- **Chairs Advisory Committee**, *Elected Member*, Department of Mathematics and Statistics, McGill University.

2020- **CRM Applied Math Seminar**, *Co-Organizer*, Department of Mathematics and Statistics, McGill University.

2018- **Science Scholarships Committee**, *Department Representative*, Department of Mathematics and Statistics, McGill University.

2017-2021 **Committee of Undergraduate Affairs**, *Member*, Department of Mathematics and Statistics, McGill University.

Publications

Journal Articles

25. **Sufficient conditions for metric subregularity of constraint systems with applications to disjunctive and ortho-disjunctive programs**, *M. Benko, M. Cervinka, and T. Hoheisel*, Set-valued and Variational Analysis, to appear.

24. **A study of one-parameter regularizations for mathematical programs with vanishing constraints**, *T. Hoheisel, B. Pablos, A. Pooladian, L. Steverango, and A. Schwartz*, Optimization Methods and Software, to appear.

23. **A study of convex convex-composite functions via infimal convolution with applications**, *J.V. Burke, T. Hoheisel, and Q.V. Nguyen*, Mathematics of Operations Research, to appear.

22. **The maximum entropy on the mean method for image deblurring**, *G. Rioux, R. Choksi, T. Hoheisel, and C. Scarvelis*, Inverse Problems 37, 2021 (29 pp.).

21. **Blind deblurring of barcodes via Kullback-Leibler divergence**, *G. Rioux, C. Scarvelis, R. Choksi, T. Hoheisel, and P. Maréchal*, IEEE Transactions on Pattern Analysis and Machine Intelligence 43(1), 2021, pp. 77–88.

20. **A regularization interpretation of the proximal point method for weakly convex functions**, *T. Hoheisel, A. Oberman, and M. Laborde*, Journal of Dynamics and Games 7(1), 2020, pp. 79–96.

19. **Variational properties of matrix functions via the generalized matrix-fractional function**, *J.V. Burke, Y. Gao, and T. Hoheisel*, SIAM Journal on Optimization 29(3), 2019, pp. 1958–1987.

18. **Convex geometry of the generalized matrix-fractional function**, *J.V. Burke, Y. Gao, and T. Hoheisel*, SIAM Journal on Optimization 28(3), 2018, pp. 2189–2200.

17. **Epi-convergence properties of smoothing by infimal convolution**, *J.V. Burke, T. Hoheisel*, Set-Valued and Variational Analysis 25(1), 2016, 201, pp. 1–23, .

16. **Matrix support functionals for inverse problems, regularization, and learning**, *J.V. Burke, T. Hoheisel*, SIAM Journal on Optimization 25(2), 2015, pp. 1135–1159.

15. **On a smooth dual gap function for a class of player convex generalized Nash equilibrium problems**, *N. Harms, T. Hoheisel, and C. Kanzow*, Journal of Optimization Theory and Applications 166(2), 2015, pp. 659–685 .

14. **On a a smooth dual gap function for a class of quasi-variational inequalities**, *N. Harms, T. Hoheisel, and C. Kanzow*, Journal of Optimization Theory and Applications, 163, 2014, pp. 413–438.

13. **Epi-convergent smoothing with applications to convex composite functions**, *J.V. Burke and T. Hoheisel*, SIAM Journal on Optimization 23(3), 2013, pp. 1457–1479.
12. **Gradient consistency for integral-convolution smoothing functions**, *J.V. Burke, T.Hoheisel, and C. Kanzow*, Set-valued and Variational Analysis 21(2), 2013, pp. 359–376.
11. **A smoothing-regularization approach to mathematical programs with vanishing constraints**, *W. Achtziger, T. Hoheisel, and C. Kanzow*, Computational Optimization and Applications 55(3), 2013, pp. 733–767.
10. **Theoretical and numerical comparison of relaxation methods for mathematical programs with complementarity constraints**, *T. Hoheisel, C. Kanzow, and A. Schwartz*, Mathematical Programming 137, 2013, pp. 257–288.
9. **On a relaxation method for mathematical programs with vanishing constraints**, *W. Achtziger, T. Hoheisel, and C. Kanzow*, GAMM-Mitteilungen 35, 2012, pp. 110–130.
8. **Mathematical programs with vanishing constraints: A new regularization approach with strong convergence properties**, *T. Hoheisel, C. Kanzow, and A. Schwartz*, Optimization 61(6), 2012, pp. 619–636.
7. **Generalized Newton's method based on graphical derivatives**, *T. Hoheisel, C. Kanzow, B.S. Mordukhovich, and H. Phan*, Nonlinear Analysis Series A: Theory, Methods, and Applications 75(3), 2012, pp. 1324–1340.
6. **Convergence of a local regularization approach for mathematical programs with complementarity or vanishing constraints**, *T. Hoheisel, C. Kanzow, and A. Schwartz*, Optimization Methods and Software 27(3), 2012, pp. 483–512.
5. **Improved convergence properties of the Lin-Fukushima-regularization method for mathematical programs with complementarity constraints**, *T. Hoheisel, C. Kanzow, and A. Schwartz*, Numerical Algebra, Control, and Optimization 1(1), 2011, pp. 49–60.
4. **Exact penalty results for mathematical programs with vanishing constraints**, *T. Hoheisel, C. Kanzow, and J.V. Outrata*, Nonlinear Analysis Series A: Theory, Methods, and Applications 72, 2010, pp. 2514–2526.
3. **On the Abadie and Guignard constraint qualification for mathematical programs with vanishing constraints**, *T. Hoheisel and C. Kanzow*, Optimization 58(4), 2009, pp. 431–448.

2. **Stationary conditions for mathematical programs with vanishing constraints using weak constraint qualifications**, *T. Hoheisel and C. Kanzow*, Journal of Mathematical Analysis and Applications 337, 2008, pp. 292–310.

1. **First- and second-order optimality conditions for mathematical programs with vanishing constraints**, *T. Hoheisel and C. Kanzow*, Applications of Mathematics 52, 2007, pp. 495–514..

Conference Proceedings

1. **A principled approach to generating adversarial attacks under non-smooth dissimilarity metrics**, *A. Pooladian, C. Finlay, T. Hoheisel, and A. Oberman*, Proceedings of the 23rd International Conference on Artificial Intelligence and Statistics (AISTATS), 2020.

Theses

12/2009 **Dissertation**, *Mathematical Programs with Vanishing Constraints*, Institute of Mathematics, University of Würzburg.
Supervisor: Prof. Dr. Christian Kanzow, Co-Supervisor: Prof. Dr. Wolfgang Achtziger

1/2006 **Diploma Thesis**, *Mathematische Programme mit vanishing constraints*, Institute of Mathematics, University of Würzburg.
Supervisor: Prof. Dr. Christian Kanzow

Other Publications

- **A note on epi-convergence of sums under the inf-addition rule**, *J.V. Burke, T. Hoheisel*, Optimization Online, 2015.

Talks and Conferences

Organizing

7/2024 **25th International Symposium on Mathematical Programming**, *Member of the Organizing Committee*, Montreal, July 2024.

07/2021 **SIAM Conference on Optimization**, *Minisymposium on the occasion of Jim Burke's 65th birthday*, Spokane, July 2021.

08/2019 **International Conference on Continuous Optimization**, *Minisymposium on Convex-Composite Optimzation (with J.V. Burke)*, Berlin, August 2019.

07/2018 **23rd International Symposium on Mathematical Programming**, *Stream on Nonsmooth Optimization (with D. Russell Luke, S. Sabach)*, Bordeaux, July 2018.

07/2017 **15th EUROPT Conference on Continuous Optimization**, *Member of the Program Committee*, Montréal, July 2017.

05/2017 **SIAM Conference on Optimization**, *Stream on Nonsmooth Optimization (with D. Russell Luke)*, Vancouver, May 2017.

05/2014 **SIAM Conference on Optimization**, *Minisymposium Variational Analysis and Optimization*, San Diego, May 2014.

08/2013 **International Conference on Continuous Optimization**, *Session within the Cluster Convex and Nonsmooth Optimization*, Lisbon, July/August 2013.

Plenary speaker or lecturer

05/2019 **Spring School on Variational Analysis 2019**, *Topics in Convex Analysis*, Paseky, May 2019.

Invited talks and lectures

12/2020 **CMS Winter Meeting**, *From perspective maps to epigraphical porjections*, Montreal, December 2020.

05/2020 **Montreal ML OPT Seminar**, *Cone-Convexity and Composite Functions*, Montreal, May 2020.

03/2020 **Department Colloquium**, *Cone-convexity and composite functions*, Department of Mathematics and Statistics, Queen's University, March 2020.

12/2019 **Kolloquium über Angewandte Mathematik**, *A study of convex convex-composite functions*, University of Göttingen, December 2019.

11/2019 **Special Semester Optimization: Workshop on Nonsmooth Optimization**, *A study of convex convex-composite functions*, RICAM Linz, November 2019.

11/2019 **Oberseminar Optimierung**, *A study of convex convex-composite functions*, Institute of Mathematics, University of Würzburg, November 2019.

10/2019 **CRM Applied Math Seminar**, *A study of convex convex-composite functions*, McGill University, Montreal, October 2019.

09/2019 **West Coast Optimization Meeting (WCOM)**, *Convex convex-composite functions*, Vancouver, September 2019.

08/2019 **International Conference on Continuous Optimization**, *Convex convex-composite functions*, Berlin, August 2019.

07/2018 **23rd International Symposium on Mathematical Programming**, *Applications of the Generalized Matrix-Fractional Function*, Bordeaux, July 2018.

03/2018 **COCANA Live Seminar Series**, *Epi-convergent Smoothing with Applications to Convex-composite Functions*, Centre for Optimization, Convex Analysis, and Nonsmooth Analysis, University of British Columbia, Kelowna, March 2018.

11/2017 **CRM Lecture**, *Convex Analysis on a Class of Matrix Support Functionals*, Department of Mathematics, University of Ottawa, November 2017.

10/2017 **CACM Seminar**, *Convex Analysis on a Class of Matrix Support Functionals*, Center for Applied and Computational Mathematics, Rochester Insitute of Technology (RIT), Rochester, NY, October 2017.

07/2017 **Mathematical Congress of the Americas**, *On a class of Matrix Support Functionals with Applications*, Montreal, July 2017.

07/2017 **EUROPT Workshop on Continuous Optimization**, *On a class of Matrix Support Functionals with Applications*, Montreal, July 2017.

05/2017 **SIAM Conference on Optimization**, *On a class of Matrix Support Functionals with Applications*, Vancouver, May 2017.

05/2017 **Mathematisches Kolloquium**, *Convex Analysis on a Class of Matrix Support Functionals*, Institute of Mathematics, Technical University of Darmstadt, May 2017.

05/2017 **Oberseminar Optimierung**, *Convex Analysis on a Class of Matrix Support Functionals*, Institute of Mathematics, University of Würzburg, May 2017.

12/2016 **CMS Winter Meeting**, *Epi-convergent Smoothing with Applications to Convex-composite Functions*, Niagara Falls, December 2016.

08/2016 **Modelling and Optimization: Theory and Applications**, *On a New Class of Matrix Support Functionals with Applications*, Bethlehem, PA, August 2016.

10/2015 **Central European Set-Valued and Variational Analysis Meeting**, *On a New Class of Matrix Support Functionals with Applications*, Göttingen, October 2015.

07/2015 **22nd International Symposium of Mathematical Programming (ISMP)**, *On a New Class of Matrix Support Functionals with Applications*, Pittsburgh, July 2015.

06/2015 **Kolloquium at the Institute of Operations Research**, *On a New Class of Matrix Support Functionals with Applications*, Karlsruhe, June 2015.

01/2015 **Kolloquium on Applied Mathematics**, *Epi-convergent Smoothing with Applications to Convex-composite Functions*, Institute of Numerical and Applied Mathematics, University of Göttingen, January 2015.

05/2014 **SIAM Conference on Optimization**, *Epi-convergent Smoothing with Applications to Convex-composite Functions*, San Diego, May 2014.

01/2014 **Kolloquium at the Institute of Operations Research**, *Epi-Glättungen mit Anwendungen auf konvex-veknüpfte Funktionen*, Karlsruhe, January 2014.

08/2013 **International Conference on Continuous Optimization**, *Epi-convergent Smoothing with Applications to Convex-composite Functions*, Lisbon, July/August 2013.

07/2013 **European Conference on Computational Optimization**, *On Relaxation Methods for Mathematical Programs with Complementarity Constraints*, Chemnitz, July 2013.

05/2013 **Oberseminar Mathematik in den Naturwissenschaften**, *Epi-convergent Smoothing with Applications to Convex-composite Functions*, Würzburg, May 2013.

06/2012 **Optimization Seminar**, *Mathematical Programs with Vanishing Constraints*, University of Washington, June 2012.

05/2011 **SIAM Conference on Optimization**, *Mathematical Programs with Vanishing Constraints*, Darmstadt, May 2011.

09/2010 **International Conference on Operations Research**, *Mathematical Programs with Vanishing Constraints*, Munich, September 2010.

08/2009 **20th International Symposium of Mathematical Programming (ISMP)**, *Mathematical Programs with Vanishing Constraints*, Chicago, August 2009.

07/2009 **23rd European Conference on Operational Research**, *Mathematical Programs with Vanishing Constraints*, Bonn, July 2009.

03/2009 **4th German-Polish Conference on Optimization**, *Mathematical Programs with Vanishing Constraints*, Moritzburg, March 2009.

Teaching

As a primary instructor

Winter 2021 **Honours Applied Linear Algebra**, *McGill University*.

Fall 2020 **Honours Linear Optimization**, *McGill University*.

Winter 2020 **Optimization (Nonlinear Programming)**, *McGill University*.

Honours Applied Linear Algebra, *McGill University*.

Winter 2019 **Optimization (Nonlinear Programming)**, *McGill University*.

Honours Applied Linear Algebra, *McGill University*.

Fall 2018 **Topics in Applied Mathematics (Convex Optimization)**, *McGill University*.

Winter 2018 **Optimization (Nonlinear Programming)**, *McGill University*.

Fall 2017 **Mathematical Programming (Linear Optimization and Extensions)**, *McGill University*.

Winter 2017 **Topics in Analysis (Convex Analysis and Nonsmooth Optimization)**, *McGill University*.

Fall 2016 **Mathematical Programming (Linear Optimization and Extensions)**, *McGill University*.

Summer 2016 **Convex Analysis**, *University of Würzburg*.

Winter 2015/16 **Linear Algebra II**, *University of Würzburg*.

Summer 2015 **Linear Algebra I**, *University of Würzburg*.

Winter 2011/12 **An Introduction to Optimization**, *University of Düsseldorf*.

Winter 2011/12 **Computer-aided Linear Algebra**, *University of Düsseldorf*.

As a teaching assistant

Winter 2015/16 **Linear Algebra II**, *University of Würzburg*.

Winter 2014/15 **Linear Algebra I**, *University of Würzburg*.

Winter 2013/14 **Analysis III**, *University of Würzburg*.

Summer 2013/14 **Analysis II**, *University of Würzburg*.

Winter 2012/13 **Analysis I**, *University of Würzburg*.

Summer 2011 **Linear Algebra I**, *University of Würzburg*.

Winter 2010/11	**Analysis II**, *University of Würzburg.*
Summer 2010	**Analysis I**, *University of Würzburg.*
Winter 2009/10	**Linear Algebra I**, *University of Würzburg.*
Summer 2009	**Optimization II**, *University of Würzburg.*
Winter 2008/09	**Optimization I**, *University of Würzburg.*
Summer 2008	**Analysis II**, *University of Würzburg.*
Winter 2007/08	**Analysis I**, *University of Würzburg.*
Summer 2007	**Numerical Mathematics II**, *University of Würzburg.*
Winter 2006/07	**Numerical Mathematics I**, *University of Würzburg.*

Lecture Notes

- **Optimization**, *McGill University 2020*, 175 pages.
- **Honours Applied Linear Algebra**, *McGill University 2020*, 147 pages.
- **Convex Optimization**, *McGill University 2018*, 144 pages.
- **Linear Optimization and Extensions**, *McGill University 2018*, 193 pages.
- **Convex Analysis**, *University of Würzburg 2016*, 140 pages.
- **Linear Algebra I+II**, *University of Würzburg 2016*, 235 pages, in German.
- **An Introduction to Optimization**, *University of Düsseldorf 2012*, 143 pages, in German.

Student and Post Doctoral Supervision

Postdocs

09/2020-	**Post Doc**, *Yakov Vaisbourd*, supported by a grant from the CRM Applied Math Lab, co-supervision with Courtney Paquette.
09/2018-08/20	**Post Doc**, *Quang V. Nguyen*, supported by a grant from the CRM Applied Math Lab.

Grad students

01/2021- **PhD student**, *George Orfanides*, co-supervised with Adam Oberman.

09/2018- 08/2020 **Masters student**, *Gabriel Rioux*, suported by a CGSM-NSERC grant, co-supervised with Rustum Choksi.
Thesis: *The Maximum Entropy on the Mean Method for Image Deblurring: Applying Fenchel-Rockafellar Duality in Finite and Infinite Dimensions*

09/2018- 05/2020 **Masters student**, *George Orfanides*.
Thesis: *A Smoothing-Regularization Method for Mathematical Programs with Cardinality Constraints*

05/2018- 08/2020 **Masters student**, *Aram Pooladian*, supported by a CGSM-NSERC grant, co-supervised with Adam Oberman.
Thesis: *Numerical Methods for the Fermat-Weber Problem in the polyhedral l_p norms*

Interns

10/2020- 7/2021 **Resarch Intern**, *Armand Gissler*, ENS Paris-Saclay.

Undergraduate students

Summer 2021 **Summer research**, *Jack Richter-Powell*, Maximum Entropy on the Mean Methods in Data Science, Co-supervised with Prof. R. Choksi.

Summer 2021 **NSERC summer research fellowship**, *Ariel Goodwin*, Maximum Entropy on the Mean Methods in Data Science, Co-supervised with Prof. R. Choksi.

Fall 2020 **Honours independent study**, *Ariel Goodwin*, Projections onto K-epigraphs.

Summer 2020 **NSERC summer research fellowship**, *Ariel Goodwin*, Epigraphical Projections.

Summer 2018 **SURA summer research fellowship**, *Benjamin Paul-Dubois-Taine*, Newton-type Methods for the Fermat-Weber Problem with Weighted Euclidean norms.

Summer 2018 **CRM-ISM summer research fellowssip**, *Luke Steverango*, Comparison of Relaxation Methods for Mathematical Programs with Vanishing Constraints.

Summer 2018 **NSERC summer research fellowship**, *Gabriel Rioux*, Barcode Deblurring via Kullback-Leibler Divergence, Co-supervised with Prof. R. Choksi.

Summer 2018 **NSERC summer research fellowship**, *Christopher Scarvelis*, Barcode Deblurring via Kullback-Leibler Divergence, Co-supervised with Prof. R. Choksi.

Winter 2018 **Honours independent study**, *Luke Steverango*, Relaxation Methods for Mathematical Programs with Vanishing Constraints.

Winter 2018 **Honours independent study**, *Aram Pooladian*, Proximal-Point Methods for Weakly Convex Minimization.

Winter 2018 **Independent study**, *Frédéric Boileau*, DC Optimization.

Fall 2017 **Honours Research Project**, *Luke Steverango*, Relaxation Methods for Mathematical Programs with Vanishing Constraints.

Fall 2017 **Honours Research Project**, *Aram Pooladian*, Weakly Convex Functions.

Summer 2017 **NSERC summer research fellowship**, *Aram Pooladian*, Semismooth Methods for Smoothed Composite Minimization.

Refereeing and Editorial Activities

Member of Editorial Board

01/2015-1/2021 **Optimization**, *A Journal of Mathematical Programming and Operations Research*, Taylor & Francis.

Refereeing for Journals (in alphabetical order)

Annals of Operations Research.
Asia-Pacific Journal of Operational Research.
Computational and Applied Mathematics.
Journal of Convex Analysis.
Journal of Global Optimization.
Journal of Mathematical Analysis and Applications.
Journal of Nonsmooth Analysis and Optimizationn.
Journal of Optimization Theory and Applications.
Mathematical Methods of Operations Research.
Mathematical Programming.
Numerical Functional Analysis and Optimization.
Numerische Mathematik.
Operations Research Letters.
Optimization.
Optimization and Engineering.
Optimization Letters.
Optimization Methods and Software.
Pacific Journal of Optimization.

SIAM Journal on Mathematics of Data Science.

SIAM Journal on Matrix Analysis and Applications.

SIAM Journal on Optimization.

SIAM Review.

Book reviews

First-Order Methods in Optimization, *by Amir Beck*, reviewed for SIAM Review 61(2), p. 393.

Refereeing of Grant proposals

10/2020 **DFG (German research fundation)**, *Review of Individual Proposal.*

04/2018 **DFG (German research foundation)**, *Review of Individual Proposal.*

01/2018 **NSERC Discovery Grant**, *External reviewer for 2 grant proposals.*