

Dmitriy Drusvyatskiy

Curriculum Vitae

1 Personal Data

Name: Dmitriy Drusvyatskiy

Citizenship: United States

Work address: Department of Mathematics, University of Washington, Padelford C-434,
Seattle, WA 98195-4350

Contact Information:

(206) 543-9435 (office), ddrusv@uw.edu, www.math.washington.edu/~ddrusv

Degrees:

- B.S. (Computer Science) May 2008, Polytechnic Institute of NYU
- M.S. (Operations Research) September 2010, Cornell University
- Ph.D. (Operations Research) Aug. 2013, Cornell University.
Committee: A.S. Lewis (chair), J. Renegar, M.J. Todd

Positions:

1. Sep. 2014 onwards: Assistant Professor, Department of Mathematics, University of Washington.
2. Sep. 2013 - Aug. 2014: Postdoctoral Fellow, Department of Combinatorics and Optimization, University of Waterloo (Supervisors: S. Vavasis, H. Wolkowicz).

2 Research and Scholarship

Awards and Fellowships:

1. NSF CAREER, 2017-2022. Budget: \$420,000.
2. coPI for NSF TRIPODS Institute (Transdisciplinary Research in Principles of Data Science), 2018-2021. Budget \$1.5m (5 pp). www.nsf.gov/news/news_summ.jsp?cntn_id=242888
3. Air Force Office of Scientific Research (AFOSR) Young Investigator Program (YIP) award, 2015-2018. Budget: \$330,000.

4. Finalist for the A.W. Tucker prize from the Mathematical Optimization Society (MOS), 2015. www.mathopt.org/?nav=tucker_2015#dd

Funding:

1. 2017-2022: NSF CAREER award, "Structure, complexity, and conditioning in nonsmooth optimization". Total budget: \$420,000.
2. 2018-2021: co-PI for the NSF TRIPODS Phase I Institute: "Algorithms for Data Science: Complexity, Scalability, and Robustness", w/ M. Fazel, Z. Harchaoui, Y.T. Lee, and Sham Kakade. Total budget: \$1,500,000.
3. 2015-2018: AFOSR (Young Investigator Program) FA9550-15-1-0237, "Exploiting geometry and degeneracy in large scale structured optimization". Total budget: \$330,000.
4. 2015-1018: NSF DMS-1512758 "Convex and variational geometry in nonsmooth optimization: theory and computation". Withdrawn in favor of the AFOSR YIP award.
5. 2015-2019: United States-Israel Binational Science Foundation (BSF) grant, "Variational analysis, computation, and structure in optimization and dynamics", with A.S. Lewis and A.D. Ioffe. Budget amount: \$82,800.

Expository writing:

1. D. Drusvyatskiy, 'The proximal point method revisited ', To appear in SIAG/OPT Views and News, 2018.
2. D. Drusvyatskiy, H. Wolkowicz, 'The many faces of degeneracy in conic optimization', Foundations and Trends in Optimization, Vol. 3, No. 2, pp 77-170, 2017.
3. D. Drusvyatskiy, 'Semi-algebraic geometry', Chapter 8.3 in the book 'Variational Analysis of Regular Mappings: Theory and Applications' by Alexander Ioffe, Springer Monographs in Mathematics, 2017.

Publications (submitted):

1. D. Davis, D. Drusvyatskiy, 'Stochastic subgradient method converges at the rate $O(k^{-1/4})$ on weakly convex functions', Manuscript, 12 pages, 2018.
2. D. Davis, D. Drusvyatskiy, C. Paquette, 'The nonsmooth landscape of phase retrieval', Manuscript, 42 pages, 2017.
3. A.Y. Aravkin, J.V. Burke, D. Drusvyatskiy, M.P. Friedlander, K. MacPhee, 'Foundations of gauge and perspective duality', Manuscript (second round at *SIAM J. Optim.*), 28 pages, 2017.
4. D. Drusvyatskiy, A.D. Ioffe, A.S. Lewis, 'Nonsmooth optimization using Taylor-like models: error bounds, convergence, and termination criteria', Manuscript (second round at *Math. Program. Ser. A*), 24 pages, 2017.

5. D. Drusvyatskiy, C. Paquette, ‘Efficiency of minimizing compositions of convex functions and smooth maps’, Manuscript (third round at *Math. Program.*), 38 pp, 2016.
6. A.Y. Aravkin, J.V. Burke, D. Drusvyatskiy, M.P. Friedlander, S. Roy, ‘Level-set methods for convex optimization’, Manuscript (second round in *Math. Program.*), 38 pages, 2016.

Publications (accepted or appeared):

1. D. Drusvyatskiy, A.S. Lewis, ‘Error bounds, quadratic growth, and linear convergence of proximal methods’. To appear in *Math. Oper. Res.*, 2018.
2. D. Drusvyatskiy, M. Fazel, S. Roy, ‘An optimal first order method based on optimal quadratic averaging’. *SIAM J. Optim.*, 28 (2018), no. 1, 251-271.
3. A.Y. Aravkin, D. Drusvyatskiy, T. van Leeuwen, ‘Efficient quadratic penalization through the partial minimization technique’. To appear in *IEEE Trans. Automat. Contr.*, 2017.
4. D. Drusvyatskiy, N. Krislock, Y.-L. Voronin, and H. Wolkowicz, ‘Noisy Euclidean distance realization: robust facial reduction and the Pareto frontier’, *SIAM J. Optim.*, 27-4 (2017), 2301-2331.
5. D. Drusvyatskiy, A. Daniilidis, ‘Sweeping by a tame process’, *Annales de l’institut Fourier*, 67 (2017), no. 5, pp 2201-2223.
6. D. Drusvyatskiy, H.-L. Lee, G. Ottaviani, R.R. Thomas, ‘The Euclidean distance degree of orthogonally invariant matrix varieties’. *Israel J. Math.* 221 (2017), no. 1, 291-316.
7. D. Drusvyatskiy, C. Paquette, ‘Variational analysis of spectral functions simplified’. *J. Conv. Anal.* 25 (2018), No. 1, 119–134.
8. D. Drusvyatskiy, G. Li, H. Wolkowicz, ‘A note on alternating projections for ill-posed semidefinite feasibility problems’. *Math. Program.*, 162 (2017), no. 1-2, Ser. A, 537-548.
9. D. Drusvyatskiy, A.D. Ioffe, A.S. Lewis, ‘Generic minimizing behavior in semialgebraic optimization’. *SIAM J. Optim.* 26 (2016), no. 1, 513-534.
10. D. Drusvyatskiy, A.D. Ioffe, A.S. Lewis, ‘Transversality and alternating projections for nonconvex sets’. *Found. Comput. Math.* 15 (2015), no. 6, 1637-1651.
11. D. Drusvyatskiy, H.-L. Lee, R.R. Thomas, ‘Counting real critical points of the distance to spectral matrix sets’, *SIAM J. Matrix Anal. Appl.* 36 (2015), no. 3, 1360-1380.
12. D. Drusvyatskiy, G. Pataki, H. Wolkowicz, ‘Coordinate shadows of semidefinite and Euclidean distance matrices’, *SIAM J. Optim.* 25 (2015), no. 2, 1160-1178.
13. D. Drusvyatskiy, C.-K. Li, D.C. Pelejo, Y.-L. Voronin, H. Wolkowicz, ‘Projection methods in quantum channel construction’, *Quantum Inf. Proc.* 14 (2015), no. 8, 3075-3095.

14. D. Drusvyatskiy, A.D. Ioffe, ‘Quadratic growth and critical point stability of semi-algebraic functions’. *Math. Program. Ser. A* 153 (2015), no. 2, 635-653.
15. D. Drusvyatskiy, S.A. Vavasis, H. Wolkowicz, ‘Extreme point inequalities and geometry of the rank sparsity ball’, *Math. Program. Ser. A* 152 (2015), no. 1-2, 521-544.
16. D. Drusvyatskiy, A.D. Ioffe, A.S. Lewis, ‘Clarke subgradients for directionally Lipschitzian stratifiable functions’. *Math. Oper. Res.* 40 (2015), no. 2, 328-349.
17. D. Drusvyatskiy, A.D. Ioffe, A.S. Lewis, ‘Curves of descent’. *SIAM J. Control and Optim.* 53 (2015), no. 1, 114-138.
18. D. Drusvyatskiy, M. Larsson, ‘Approximating functions on stratified sets’. *Trans. Amer. Math. Soc.* 367 (2015), no. 1, 725-749.
19. A. Daniilidis, D. Drusvyatskiy, A.S. Lewis, ‘Orbits of geometric descent’. *Canad. Math. Bull.* 58 (2015), no. 1, 44-50.
20. A. Daniilidis, D. Drusvyatskiy, A.S. Lewis, ‘Orthogonal invariance and identifiability’. *SIAM J. Matrix Anal. Appl.* 35 (2014), no. 2, 580-598.
21. D. Drusvyatskiy, A.S. Lewis, ‘Optimality, identifiability, and sensitivity’. *Math. Program. Ser. A* 147 (2014), no. 1-2, 467-498.
22. D. Drusvyatskiy, B. Mordukhovich, T.T.A. Nghia, ‘Second-order growth, tilt-stability, and metric regularity of the subdifferential’, *J. Convex Anal.* 21 (2014), no. 4, 1165-1192.
23. D. Drusvyatskiy, A.S. Lewis, ‘Semi-algebraic functions have small subdifferentials’, *Math. Program. Ser. B* 140 (2013), no. 1, 5-29.
24. D. Drusvyatskiy, A.S. Lewis, ‘Tilt stability, uniform quadratic growth, and strong metric regularity of the subdifferential’, *SIAM J. Optim.* 23 (2013), no. 1, 256-267.
25. D. Drusvyatskiy, A.D. Ioffe, A.S. Lewis, ‘The dimension of semi-algebraic subdifferential graphs’, *Nonlinear Anal. Theory Methods Appl.* 75 (2012), no. 3, 1231-1245.
26. D. Drusvyatskiy, A.S. Lewis, ‘Generic nondegeneracy in convex optimization’, *Proc. Amer. Math. Soc.* 139 (2011), no. 7, 2519-2527.

Invited conference and seminar presentations:

- Jan. 2018: ‘Slope and geometry in variational mathematics’, CNA Seminar, Carnegie Mellon University, Pittsburgh, PA.
- Dec. 2017: ‘Algorithms for minimizing compositions of convex functions and smooth maps’, CS Theory Seminar, University of Washington, Seattle, WA.
- Nov. 2017: ‘Structure, complexity, and conditioning in nonsmooth optimization’, Mathematics colloquium, UCSD, San Diego, CA.
- Nov. 2017: ‘Composite nonlinear models at scale’, ORIE colloquium, Cornell, Ithaca.

- Jul. 2017: ‘Efficiency of minimizing compositions of convex functions and smooth maps’, Foundations of Computational Mathematics (FoCM), Barcelona, Spain.
- May 2017: ‘Accelerated first-order methods beyond convexity’, Workshop on non-smooth optimization and its applications, Hausdorff center for mathematics, Bonn, Germany.
- May 2017: ‘Taylor-like models in nonsmooth optimization’, SIAM Conference on Optimization, University of British Columbia (UBC), Vancouver, USA.
- Apr. 2017: ‘Accelerated first-order methods beyond convexity’, Workshop on optimization and statistical learning, Les Houches, France.
- Apr. 2017: ‘Accelerated first-order methods beyond convexity’, AMS Spring Western Sectional Meeting, Washington State University, Pullman, WA.
- Jul. 2016: ‘Expanding the reach of optimal methods’, SIAM Annual meeting, Boston, Massachusetts, USA.
- May 2016: ‘Error bounds, quadratic growth, and linear convergence of proximal methods’, CORS Annual conference (session organizer), Banff, Alberta, Canada.
- May 2016: ‘Expanding the reach of optimal methods’, West Coast Optimization Meeting (WCOM 2016) (conference organizer), University of Washington, Seattle, WA.
- Apr. 2016: ‘Geometry of orthogonally invariant matrix varieties’, Algebra & Discrete Math. seminar, UC Davis, CA, USA.
- Aug. 2015: ‘Tame variational analysis’, Workshop on Variational Analysis and Applications, Erice, Sicily.
- Jul. 2015: ‘Slope and variational geometry in optimization’, A.W. Tucker prize session, International Symposium on Mathematical Programming (ISMP 2015), Pittsburgh, USA.
- Jul. 2015: ‘Singularity degree in semi-definite programming’, International Symposium on Mathematical Programming (ISMP 2015), Pittsburgh, USA.
- May 2015: ‘Tame variational analysis’, International conference on variational analysis, optimization, and quantitative finance, Limoges, France
- Jun. 2014: ‘Feasibility problems: from alternating projections to matrix completions’, Joint meeting of the Israel Math. Union - American Math. Soc., Tel Aviv University, Israel.
- May 2014: ‘Feasibility problems: from alternating projections to matrix completions’, SIAM Conference on Optimization, San Diego, CA, USA.
- Mar. 2014: ‘Feasibility problems: from alternating projections to matrix completions’, Tutte Seminar, University of Waterloo, Canada.
- Nov. 2013: ‘Slope and geometry in variational mathematics’, Optimization and Equilibrium seminar, DIM-CMM Universidad de Chile, Santiago, Chile.

- Oct. 2013: ‘Slope and geometry in variational mathematics’, Midwest Optimization Meeting, University of Western Ontario, ON, Canada.
- Oct. 2013: ‘Slope and geometry in variational mathematics’, West Coast Optimization Meeting (WCOM 2013), University of Victoria, BC, Canada.
- Feb. 2013: ‘Optimization and intrinsic geometry’, Department of Industrial and Systems Engineering Seminar, Lehigh University, Pennsylvania, USA.
- Feb. 2013: ‘Slope and geometry in variational mathematics’, South Pacific Optimization Meeting (SPOM 2013), The University of Newcastle, Newcastle, Australia.
- Jan. 2013: ‘Slope and geometry in variational mathematics’, UW-PIMS Mathematics Colloquium, University of Washington, Seattle, Washington, USA.
- Jan. 2013: ‘Active sets, steepest descent, and smooth approximation of functions’, Combinatorics and Optimization Seminar, University of Waterloo, Waterloo, Ontario, Canada.
- Nov. 2012: ‘Active sets, steepest descent, and smooth approximation of functions’, Seminar on Nonlinear Analysis and Optimization, Technion - Israel Institute of Technology, Haifa, Israel.
- Oct. 2012: ‘Active sets, steepest descent, and smooth approximation of functions’, Optimization Seminar, University of Washington, Seattle, Washington, USA.
- Aug. 2012: ‘Identifiability and the foundations of sensitivity analysis’ (session chair), International Symposium on Mathematical Programming (ISMP 2012), Berlin Institute of Technology, Berlin, Germany.
- June 2012: ‘Variational analysis and smooth substructure’, Constructive Nonsmooth Analysis and Related Topics, Euler International Mathematical Institute, St. Petersburg, Russia.
- May 2012: ‘Variational analysis and smooth substructure’, Variational Analysis and Applications, Erice, Sicily.
- Jan. 2012: ‘Variational analysis and smooth substructure’, Seminar on Nonlinear Analysis and Optimization, Technion - Israel Institute of Technology, Haifa, Israel.

Research Visits:

- Jul. 2017: Cornell University, USA.
- Apr. 2016: UC Davis, USA.
- Apr. 2015: Northern Illinois University, USA.
- Nov. 2014: University of Waterloo, CA.
- Jun. 2014: Technion - Israel Institute of Technology, Israel.
- Nov. 2013: DIM-CMM Universidad de Chile, Santiago, Chile.

- Feb. 2013: Priority Research Centre for Computer-Assisted Research Mathematics and its Applications (CARMA), The University of Newcastle, Australia.
- Nov. 2012: Technion - Israel Institute of Technology, Israel.
- Jan. 2012: Technion - Israel Institute of Technology, Israel.
- Sep. 2010 - Dec. 2010: Centre De Recerca Matemàtica, Bellaterra, Spain, 'Research Program on Variational Analysis and Optimization: Theory and Applications'.

Editorial Activity: Editorial board member

- *Set-Valued and Variational Analysis*, Springer.

3 Teaching activities

Courses taught (approximate class sizes in parenthesis):

University of Washington

- MATH 408: Nonlinear Optimization (40), Instructor, Winter 2018.
- MATH 582: Convex Analysis (10), Instructor, Winter 2017.
- MATH 408: Nonlinear Optimization (40), Instructor, Winter 2017.
- MATH 124: Calculus with Analytic Geometry I (2x120), Instructor, Autumn 2016.
- MATH/AMATH 516: Numerical Optimization (20), Instructor, Spring 2016.
- MATH 408: Nonlinear Optimization (40), Instructor, Winter 2016.
- MATH 581: Convex Analysis (15), Instructor, Fall 2015.
- MATH/AMATH 516: Numerical Optimization (15), Instructor, Spring 2015.
- MATH 408: Nonlinear Optimization (40), Instructor, Winter 2015.

Ph.D. Committee Chair:

1. Courtney Paquette (09/2015 - 08/2017) - Postdoc at Lehigh (01/2018 - 09/2018), NSF Postdoc at U. Waterloo (09/2018 - onwards)
2. Scott Roy (09/2015 - 12/2017) - Data Scientist at Microsoft (01/2018 -onwards)
3. Kellie J. MacPhee (09/2016 - present)