Curriculum Vitæ of Anton Leykin

School of Mathematics, Georgia Institute of Technology
686 Cherry Street, Atlanta, GA 30332-0160, USA
leykin@math.gatech.edu

RESEARCH INTERESTS

Numerical and symbolic algebraic computation, computational algebraic geometry, algorithms in algebraic analysis, parallel algorithms.

EDUCATION

1997-2003 Ph.D., School of Mathematics, University of Minnesota, Minneapolis.
Advisor : Gennady Lyubeznik.

1992-1997 Diploma with Honors, Department of Mathematics and Mechanics, Kharkov State University, Kharkov, Ukraine.

EMPLOYMENT

2013+ *Associate Professor*, School of Mathematics, Georgia Institute of Technology.

2009-2013 *Assistant Professor*, School of Mathematics, Georgia Institute of Technology.

2008-2009 *Visiting Assistant Professor*, Department of Mathematics, Statistics and Computer Science, University of Illinois at Chicago.

2006-2008 *Postdoctoral Associate*, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis.

2003-2006 *Research Assistant Professor*, Department of Mathematics, Statistics and Computer Science, University of Illinois at Chicago.
Postdoctoral mentor : Jan Verschelde.

PUBLICATIONS

Preprints:

[1] Timothy Duff, Cvetelina Hill, Anders Jensen, Kisun Lee, Anton Leykin, and Jeff Sommars. Solving polynomial systems via homotopy continuation and monodromy. *arXiv preprint arXiv:1609.08722*, 2016.

[2] Anton Leykin, Jose Israel Rodriguez, and Frank Sottile. Trace test. *arXiv preprint arXiv:1608.00540*, 2016.

[3] Daniel J Bates, Elizabeth Gross, Anton Leykin, and Jose Israel Rodriguez. Bertini for Macaulay2. *arXiv:1310.3297*.

Published (in reverse chronological order):

[1] Robert Krone, Anton Leykin, and Andrew Snowden. Hilbert series of symmetric ideals in infinite polynomial rings via formal languages. *To appear in Journal of Algebra*, 2017.

[2] Christopher J Hillar, Robert Krone, and Anton Leykin. Equivariant Gröbner bases. *To appear in Advanced Studies in Pure Mathematics*, 2017.

[3] Robert Krone and Anton Leykin. Numerical algorithms for detecting embedded components. *Journal of Symbolic Computation*, 82:1–18, 2017.

[4] Anton Leykin and Daniel Plaumann. Determinantal representations of hyperbolic curves via polynomial homotopy continuation. *To appear in Mathematics of Computation*, 2017.

[5] Robert Krone and Anton Leykin. Eliminating dual spaces. *Journal of Symbolic Computation*, 79:609–622, 2017.

[6] Anders Jensen, Anton Leykin, and Josephine Yu. Computing Tropical Curves via Homotopy Continuation. *Exp. Math.*, 25(1):83–93, 2016.

[7] Jan Draisma, Rob Eggermont, Robert Krone, and Anton Leykin. Noetherianity for infinite-dimensional toric varieties. *Algebra Number Theory*, 9(8):1857–1880, 2015.

[8] Uli Walther. Survey on the D-module f^s. *Commutative Algebra and Noncommutative Algebraic Geometry*, 1:391, 2015. With appendix by Anton Leykin.

[9] Thomas Kahle, Robert Krone, and Anton Leykin. Equivariant lattice generators and markov bases. In *International Symposium on Symbolic and Algebraic Computation*, 2014.

[10] Carlos Beltrán and Anton Leykin. Robust certified numerical homotopy tracking. *Foundations of Computational Mathematics*, pages 1–43, 2013.

[11] Carlos Beltrán and Anton Leykin. Certified numerical homotopy tracking. *Experimental Mathematics*, 21(1):69–83, 2012.

[12] Francisco-Jesús Castro-Jiménez and Anton Leykin. Computing localizations iteratively. In T. Hibi, editor, *The Second CREST-SBM International Conference, Osaka, Japan, 28 June - 2 July 2010*. World Scientific Publishing Company Incorporated, 2012.

[13] Anton Leykin. A search for an optimal start system for numerical homotopy continuation. In *Randomization, Relaxation, and Complexity in Polynomial Equation Solving: Banff International Research Station Workshop on Randomization, Relaxation, and Complexity, February 28–March 5, 2010, Banff, Ontario, Canada*, volume 556, page 113. American Mathematical Soc., 2011.

[14] Anton Leykin. Numerical algebraic geometry. *The Journal of Software for Algebra and Geometry*, 3:5–10, 2011.

[15] Christine Berkesch and Anton Leykin. Algorithms for Bernstein–Sato polynomials and multiplier ideals. In *International Symposium on Symbolic and Algebraic Computation*, 2010.

[16] Anton Leykin and Frank Sottile. Galois groups of Schubert problems via homotopy computation. *Math. Comp.*, 78(267):1749–1765, 2009.

[17] Matthias Aschenbrenner and Anton Leykin. Degree bounds for Gröbner bases in algebras of solvable type. *J. Pure Appl. Algebra*, 213(8):1578–1605, 2009.

[18] Anton Leykin and Jan Verschelde. Decomposing solution sets of polynomial systems: a new parallel monodromy breakup algorithm. *International Journal of Computational Science and Engineering*, 4(2):94–101, 2009.

[19] Anton Leykin. Introduction to the algorithmic D-module theory. In *Algebraic theory of differential equations*, volume 357 of *London Math. Soc. Lecture Note Ser.*, pages 132–155. Cambridge Univ. Press, Cambridge, 2009.

[20] Anton Leykin. Numerical primary decomposition. In *International Symposium on Symbolic and Algebraic Computation*, pages 165–172, 2008.

[21] Anton Leykin, Jan Verschelde, and Ailing Zhao. Higher-order deflation for polynomial systems with isolated singular solutions. In *Algorithms in algebraic geometry*, volume 146 of *IMA Vol. Math. Appl.*, pages 79–97. Springer, New York, 2008.

[22] Anton Leykin, Jan Verschelde, and Ailing Zhao. Evaluation of Jacobian matrices for Newton's method with deflation to approximate isolated singular solutions of polynomial systems. In Dongming Wang and Lihong Zhi, editors, *Symbolic-Numeric Computation*, pages 269–278, 2007.

[23] Josep Àlvarez Montaner and Anton Leykin. Computing the support of local cohomology modules. *J. Symbolic Comput.*, 41(12):1328–1344, 2006.

[24] Anton Leykin, Jan Verschelde, and Ailing Zhao. Newton's method with deflation for isolated singularities of polynomial systems. *Theoretical Computer Science*, 359(1-3):111–122, 2006.

[25] Anton Leykin and Jan Verschelde. Interfacing with the numerical homotopy algorithms in PHCpack. In Nobuki Takayama and Andres Iglesias, editors, *Proceedings of ICMS 2006*, pages 354–360, 2006.

[26] Anton Leykin, Verschelde Jan, and Yang Zhuang. Parallel homotopy algorithms to solve polynomial systems. In Nobuki Takayama and Andres Iglesias, editors, *Proceedings of ICMS 2006*, pages 225–234, 2006.

[27] Anton Leykin and Jan Verschelde. Factoring pure dimensional solution sets of polynomial systems in parallel. In *Proceedings of the 2005 International Conference on Parallel Processing Workshops*, pages 173–180, 2005.

[28] Anton Leykin and Jan Verschelde. PHCmaple: A Maple Interface to the Numerical Homotopy Algorithms in PHCpack. In *Proceedings of ACA'2004*, 2004.

[29] Anton Leykin. On parallel computation of Gröbner bases. In *Proceedings of ICPP 2004 workshops*, High Performance Scientific and Engineering Computing, pages 160–164. IEEE Computer Society, 2004.

[30] Anton Leykin. Algorithmic proofs of two theorems of Stafford. *Journal of Symbolic Computation*, 38(6):1535–1550, 2004.

[31] Anton Leykin. D-modules for Macaulay 2. In *Mathematical Software: ICMS 2002*, pages 169–179. World Scientific, 2002.

[32] Anton Leykin. Computing local cohomology in Macaulay 2. In Gennady Lyubeznik, editor, *Local cohomology and its applications*, volume 226 of *Lecture Notes in Pure and Applied Mathematics*, pages 195–206. Marcel Dekker, 2001.

[33] Anton Leykin. Constructibility of the Set of Polynomials with a Fixed Bernstein-Sato Polynomial: an Algorithmic Approach. *Journal of Symbolic Computation*, 32(6):663–675, 2001.

BOOKS

[ILL$^+$07] Srikanth Iyengar, Graham J. Leuschke, Anton Leykin, Claudia Miller, Ezra Miller, Anurag K. Singh, and Uli Walther. *Twenty-four hours of local cohomology*, volume 87 of *Graduate Studies in Mathematics*. American Mathematical Society, Providence, RI, 2007.

SOFTWARE

Contributions to the core of *Macaulay2* and the packages of this computer algebra system. The major packages are:

- *MonodromySolver* (with Duff, Hill, Jensen, Lee, Sommars). A polynomial system solver that uses homotopy continuation and monodromy.
- *NumericalAlgebraicGeometry* (a.k.a., *NAG4M2*). An implementation of methods of numerical algebraic geometry.
- *Dmodules* (with Tsai). This package implements a number of algorithms coming from the theory of algebraic D-modules.

GRANTS

2012-2017 NSF CAREER award "Algorithms and Software for Computational Algebraic Geometry" ($470,070)

2012 IMA Participation Institutions Summer Program for Graduate Students "Algebraic Geometry for Applications" ($70,000 in IMA funding + $22,500 NSF Award)

2009-2012 NSF award "Algorithms and Software for Decomposition of Singular Varieties" ($158,365)