

Dmitry Batenkov

Department of Applied Mathematics
School of Mathematical Sciences
Tel Aviv University

CURRICULUM VITAE

EDUCATION

- 1999-2002 B. A. Computer Science
Technion
Date of award: 2002
Summa cum Laude
- 2009-2014 Ph. D. Mathematics and Computer Science (Direct Track)
Weizmann Institute of Science
Date of award: 2014
Title of Doctoral Dissertation: Algebraic Reconstruction of
Geometric Models from Integral Measurements
Name of Supervisor: Professor Yosef Yomdin

ACADEMIC APPOINTMENTS

- 2014-2015 Postdoctoral researcher, Department of Computer Science, Technion
2016-2019 Postdoctoral Associate, Department of Mathematics, MIT, Cambridge, MA
2019-now Senior Lecturer, School of Mathematical Sciences, Tel-Aviv University
2023-2024 Visiting Scholar, Courant Institute, NYU

SUPERVISION OF STUDENTS AND POSTDOCS

- 2023- Dr. Gil Goldman (postdoc)
2022- Dr. Inbar Seroussi (postdoc) – **Dam Postdoc Fellowship**
2022- Nuha Diab (Ph.D) – **Rotschild Fellowship for Doctoral Students**
2023- Shai Zucker (Ph.D)
2023- Shimon Bogomolov (M.Sc.)
2021- Michael Levinov (M.Sc.)
2021-2023 Shai Zucker (M.Sc), co-supervised with Dr. Segal-Rozenhaimer
(Dept.of Geophysics, TAU) - **academic excellence award**
2022 Dr. Galyna Kriukova (visiting scholar)
2022 Ido Nitzan Hidekel (summer project)
2020-2022 Dr. Symeon Papadimitropoulos (postdoc)
2020-2022 Nuha Diab (M.Sc.) - **academic excellence award**

GRANTS, AWARDS AND FELLOWSHIPS

- 2020-2024 Israel Science Foundation Personal Grant, annual budget: NIS 210K.
2020 Israel Science Foundation International Collaboration Grant, NIS 38K.

2020-2023 Volkswagen Foundation Collaborative Grant, annual budget: €100,000.
 2015 Lady Davis Postdoctoral Fellowship
 2013 Best Student Paper Award, Sampling Theory and Applications (SAMPTA) International Conference
 2013 Rotschild Postdoctoral Fellowship, declined for family reasons
 2012 John F. Kennedy Memorial Prize, Weizmann Institute
 2011-2014 Adams Fellowship, Israeli Academy of Sciences and Humanities
 2001-2002 SAMBA Excellence Program, Technion Computer Science Dept.
 2001 Israeli Parliament Excellent Student
 2000-2002 Technion President's List Excellent Student

TEACHING

Foundations of Modern Analysis (Graduate)	2019
Inverse Problems and Super-Resolution (New Course, Graduate)	2019-
Numerical Analysis (Undergraduate)	2020-
Computational Science and Engineering (MIT, Graduate)	2018

ACTIVE PARTICIPATION IN SCIENTIFIC MEETINGS

Nov. 2023 Applied and Computational Mathematics Colloquium, ETH Zurich
 Oct. 2023 Mathematics Colloquium, City University of New York
 Aug. 2023 International Congress on Industrial and Applied Mathematics, Tokyo, Japan
 Jun. 2023 Technion, PDE & Applied Math.Seminar, Haifa, Israel
 Mar. 2023 SIAM conference on Computational Science and Engineering, Amsterdam, Netherlands
 Sep. 2022 International Conf. on Computational Harmonic Analysis (ICCHA), Ingolstadt, Germany
 Jun. 2022 Curves and Surfaces 2022 Conference, Arcachon, France
 May 2022 Dagstuhl Seminar 22221 on Sparse Modelling and Multi-Exponential Analysis, Dagstuhl, Germany (by invitation)
 Nov. 2021 Hebrew University of Jerusalem, Analysis seminar, Jerusalem, Israel.
 Sep. 2021 Online International Conference on Computational Harmonic Analysis
 May 2021 Ben-Gurion University, CS Colloquium, Beer-Sheva, Israel.
 Dec. 2019 25th Israeli Workshop on Applied and Computational Mathematics, invited lecture.
 Jul. 2019 International Congress on Industrial and Applied Mathematics, Valencia, Spain
 Jul. 2019 SIAM Conference on Applied Algebraic Geometry, Bern, Switzerland
 May 2019 Hebrew University of Jerusalem, CS&Engineering Colloquium, Jerusalem, Israel.
 Mar. 2019 IM-Workshop on Signals, Images, and Approximation, Bernried, Germany
 Jan. 2019 Bar-Ilan University, Applied Math.Seminar, Ramat-Gan, Israel.
 Jan. 2019 Technion, PDE & Applied Math.Seminar, Haifa, Israel.
 Jan. 2019 Ben-Gurion University, Mathematics Colloquium, Beer-Sheva, Israel.

- Jan. 2019 Weizmann Institute of Science, Math.Analysis and Applications Seminar, Rehovot, Israel.
- Dec. 2018 Tel-Aviv University, Applied Math.Seminar, Tel-Aviv, Israel.
- Nov. 2018 Yale University, Applied Math.Seminar, New Haven, CT, USA.
- Oct. 2018 Seminar talk at the Courant Institute , New York, NY, USA.
- Oct. 2018 Dartmouth College, Applied Mathematics Seminar, Hanover, NH, USA.
- Apr. 2018 AMS Sectional Meeting, Boston, USA
- Jan. 2018 Weizmann Institute of Science, Math.Analysis and Applications Seminar, Rehovot, Israel.
- Dec. 2017 Israeli Mini-Workshop on Applied and Computational Mathematics
- Dec. 2017 Tel-Aviv University, Applied Mathematics Seminar, Tel-Aviv, Israel.
- Oct. 2017 University of Maryland, CSCAMM Seminar, College Park, MD, USA.
- Dec. 2017 IEEE International Workshop on Computational Advances in Multi-Sensor Processing (CAMSAP), Curacao
- Sep. 2017 Princeton University, PACM Seminar, Princeton, NJ, USA.
- May 2016 15th International Conference on Approximation Theory, San Antonio, USA
- 2015 Dagstuhl Seminar 15251 on Sparse Modelling and Multi-Exponential Analysis
- 2015 Oberwolfach Workshop 1534 on Applied Harmonic Analysis and Sparse Approximation
- 2014 International Symposium on Symbolic-Numeric Computation, Shanghai, China
- 2014 2nd Joint IMU-AMS International Meeting, Tel-Aviv, Israel
- 2014 International Conference on Polyhedra, Lattices, Algebra, and Moments, Singapore
- 2013 Tel-Aviv University, Analysis Seminar, Tel-Aviv, Israel.
- 2013 10th International Conference on Sampling Theory and Applications (SAMPTA), Bremen, Germany
- 2013 2nd International Workshop on Geometry and Symbolic Computation, Haifa, Israel
- 2013 Research Workshop on Integral Transforms and Spectral Theory in Analysis and Geometry, Naharia, Israel
- 2012 18th International Conference on Difference Equations and Applications, Barcelona, Spain
- 2011 9th International Conference on Sampling Theory and Applications (SAMPTA), Singapore
- 2011 Israeli-Polish Mathematical Meeting, Lodz, Poland
- 2011 February Fourier Talks, Maryland, USA
- 2010 5th International Conference “Inverse Problems: Modeling and Simulation”, Antalya, Turkey

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Israeli Mathematical Society, Society for Industrial and Applied Mathematics

SERVICE FOR THE COMMUNITY

Organization

- 2023 Organizer of minisymposium on super-resolution, Workshop on Mathematical Signal and Image Analysis, Raitenhaslach, Germany
- 2022 Co-organizer of Abarbanel 2022 Memorial Conference, Tel-Aviv University, Israel
- 2019-now Organizer of the Applied Mathematics Colloquium, Tel-Aviv University, Israel
- 2021 Organized the Applied Mathematics session at the annual meeting of the Israeli Mathematical Union
- 2019 Co-organized the mini-symposium “Stability of Moment Problems and Super-Resolution Imaging” at the SIAM Conference on Applied Algebraic Geometry

Manuscript review

Math.Reviews, Constructive Approximation, Signal Processing Letters, IEEE Transactions on Signal Processing, Computer-Aided Geometric Design, Applied and Computational Harmonic Analysis, Applied Numerical Mathematics, SIAM J.Matrix Anal.Appl., BIT Numerical Mathematics, SIAM J.Sci.Comp., Numerical Algorithms, IEEE Transactions on Information Theory, Journal on Fourier Analysis and Applications, Armenian Journal of Mathematics, Information and Inference

Board Member

- 2010-2012 Associate Editor for the ACM Student Magazine “XRDS”

LIST OF PUBLICATIONS

JOURNAL ARTICLES UNDER REVIEW

- [1] R.Katz, N.Diab, D.Batenkov, “On the accuracy of Prony's method for recovery of exponential sums with closely spaced exponents”, *under review*

JOURNAL ARTICLES

- [1] D. Batenkov, “Moment inversion problem for piecewise D-finite functions,” *Inverse Problems*, vol. 25, no. 10, p. 105001, Oct. 2009.
- [2] D. Batenkov, “Open BEAGLE: a generic framework for evolutionary computations,” *Genet Program Evolvable Mach*, vol. 12, no. 3, pp. 329–331, Mar. 2011, doi: [10.1007/s10710-011-9135-4](https://doi.org/10.1007/s10710-011-9135-4).
- [3] D. Batenkov, N. Sarig, and Y. Yomdin, “An “algebraic” reconstruction of piecewise-smooth functions from integral measurements,” *Functional Differential Equations*, vol. 19, no. 1–2, pp. 9–26, 2012.

- [4] D. Batenkov and Y. Yomdin, “Algebraic Fourier reconstruction of piecewise smooth functions,” *Mathematics of Computation*, vol. 81, pp. 277–318, 2012, doi: [10.1090/S0025-5718-2011-02539-1](https://doi.org/10.1090/S0025-5718-2011-02539-1).
- [5] D. Batenkov and Y. Yomdin, “On the accuracy of solving confluent Prony systems,” *SIAM J. Appl. Math.*, vol. 73, no. 1, pp. 134–154, 2013, doi: [10.1137/110836584](https://doi.org/10.1137/110836584).
- [6] D. Batenkov, N. Sarig, and Y. Yomdin, “Accuracy of Algebraic Fourier Reconstruction for Shifts of Several Signals,” *Sampling Theory in Signal and Image Processing*, vol. 13, no. 2, pp. 151–173, 2014. Available: <http://stsip.org/pdf/vol13/vol13no2pp151-173.pdf>
- [7] D. Batenkov and Y. Yomdin, “Geometry and Singularities of the Prony mapping,” *Journal of Singularities*, vol. 10, pp. 1–25, 2014, doi: [10.5427/jsing.2014.10a](https://doi.org/10.5427/jsing.2014.10a).
- [8] D. Batenkov, O. Friedland, and Y. Yomdin, “Sampling, Metric Entropy, and Dimensionality Reduction,” *SIAM J. Math. Anal.*, vol. 47, no. 1, pp. 786–796, Jan. 2015, doi: [10.1137/130944436](https://doi.org/10.1137/130944436).
- [9] D. Batenkov, “Complete algebraic reconstruction of piecewise-smooth functions from Fourier data,” *Math. Comp.*, vol. 84, no. 295, pp. 2329–2350, 2015, doi: [10.1090/S0025-5718-2015-02948-2](https://doi.org/10.1090/S0025-5718-2015-02948-2).
- [10] D. Batenkov and G. Binyamini, “Uniform upper bounds for the cyclicity of the zero solution of the Abel differential equation,” *J. Differential Equations*, vol. 259, no. 11, pp. 5769–5781, 2015, doi: [10.1016/j.jde.2015.07.009](https://doi.org/10.1016/j.jde.2015.07.009).
- [11] D. Batenkov, “Accurate solution of near-colliding Prony systems via decimation and homotopy continuation,” *Theoretical Computer Science*, vol. 681, pp. 27–40, Jun. 2017, doi: [10.1016/j.tcs.2017.03.026](https://doi.org/10.1016/j.tcs.2017.03.026).
- [12] D. Batenkov, “Stability and super-resolution of generalized spike recovery,” *Applied and Computational Harmonic Analysis*, vol. 45, no. 2, pp. 299–323, Sep. 2018, doi: [10.1016/j.acha.2016.09.004](https://doi.org/10.1016/j.acha.2016.09.004).
- [13] D. Batenkov, L. Demanet, and H. N. Mhaskar, “Stable soft extrapolation of entire functions,” *Inverse Problems*, vol. 35, no. 1, p. 015011, Jan. 2019, doi: [10.1088/1361-6420/aaedde](https://doi.org/10.1088/1361-6420/aaedde).
- [14] D. Batenkov, L. Demanet, G. Goldman, and Y. Yomdin, “Conditioning of Partial Nonuniform Fourier Matrices with Clustered Nodes,” *SIAM J. Matrix Anal. Appl.*, vol. 44, no. 1, pp. 199–220, Jan. 2020, doi: [10/ggjwzb](https://doi.org/10/ggjwzb).
- [15] D. Batenkov, B. Diederichs, G. Goldman, and Y. Yomdin, “The spectral properties of Vandermonde matrices with clustered nodes,” *Linear Algebra and its Applications*, vol. 609, pp. 37–72, Jan. 2021, doi: [10.1016/j.laa.2020.08.034](https://doi.org/10.1016/j.laa.2020.08.034).

- [16] D. Batenkov, G. Goldman, and Y. Yomdin, “Super-resolution of near-colliding point sources,” *Inf Inference*, vol. 10, no. 2, pp. 515–572, Jun. 2021, doi: [10.1093/imaiai/iaaa005](https://doi.org/10.1093/imaiai/iaaa005).
- [17] D. Batenkov and G. Goldman, “Single-exponential bounds for the smallest singular value of Vandermonde matrices in the sub-Rayleigh regime,” *Applied and Computational Harmonic Analysis*, vol. 55, pp. 426–439, Nov. 2021, doi: [10.1016/j.acha.2021.07.003](https://doi.org/10.1016/j.acha.2021.07.003).
- [18] D. Batenkov and N. Diab, “Super-resolution of generalized spikes and spectra of confluent Vandermonde matrices,” *Applied and Computational Harmonic Analysis*, vol. 65, pp. 181–208, Jul. 2023, doi: [10.1016/j.acha.2023.03.002](https://doi.org/10.1016/j.acha.2023.03.002).
- [19] R. Katz, N. Diab, and D. Batenkov, “Decimated Prony’s Method for Stable Super-Resolution,” *IEEE Signal Processing Letters*, vol. 30, pp. 1467–1471, 2023, doi: [10.1109/LSP.2023.3324553](https://doi.org/10.1109/LSP.2023.3324553).
- [20] A. Kahana, S. Papadimitropoulos, E. Turkel, and D. Batenkov, “A physically informed deep-learning approach for locating sources in a waveguide,” *The Journal of the Acoustical Society of America*, vol. 154, no. 4, pp. 2553–2563, Oct. 2023, doi: [10.1121/10.0021889](https://doi.org/10.1121/10.0021889).

PEER-REVIEWED CONFERENCE PROCEEDINGS

- [1] D. Batenkov, N. Sarig, and Y. Yomdin, “An ‘algebraic’ reconstruction of piecewise-smooth functions from integral measurements,” in *SAMPTA ’09*, Marseille, France, May 2009, p. Special Session on sampling using finite rate of innovation principles. Accessed: Aug. 05, 2016. [Online]. Available: <https://hal.archives-ouvertes.fr/hal-00452200>
- [2] D. Batenkov and Y. Yomdin, “Algebraic Reconstruction of piecewise-smooth functions from Fourier data”, Proceedings of the 9th International Conference on Sampling Theory and Applications (SAMPTA), 2011.
- [3] D. Batenkov, G. Dinkin, and Y. Yomdin, “Automatic animation of high resolution images,” in *2012 IEEE 27th Convention of Electrical Electronics Engineers in Israel (IEEEI)*, Nov. 2012, pp. 1–5. doi: [10.1109/EEEL.2012.6376903](https://doi.org/10.1109/EEEL.2012.6376903).
- [4] D. Batenkov, N. Sarig, and Y. Yomdin, “Decoupling of Fourier Reconstruction System for Shifts of Several Signals”, Proceedings of the 10th International Conference on Sampling Theory and Applications (SAMPTA), 2013.
- [5] D. Batenkov and Y. Yomdin, “Algebraic signal sampling, Gibbs phenomenon and Prony-type systems”, Proceedings of the 10th International Conference on

Sampling Theory and Applications (SAMPTA), 2013. **Best Student Paper Award.**

- [6] D. Batenkov, “Prony Systems via Decimation and Homotopy Continuation,” in *Proceedings of the 2014 Symposium on Symbolic-Numeric Computation*, New York, NY, USA, 2014, pp. 59–60. doi: [10.1145/2631948.2631961](https://doi.org/10.1145/2631948.2631961).
- [7] A. Akinshin, D. Batenkov, and Y. Yomdin, “Accuracy of spike-train Fourier reconstruction for colliding nodes,” in *2015 International Conference on Sampling Theory and Applications (SampTA)*, May 2015, pp. 617–621. doi: [10.1109/SAMPTA.2015.7148965](https://doi.org/10.1109/SAMPTA.2015.7148965).
- [8] D. Batenkov and L. Demanet, “Soft extrapolation of bandlimited functions,” in *2017 IEEE 7th International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*, Dec. 2017, pp. 1–5. doi: [10.1109/CAMSAP.2017.8313182](https://doi.org/10.1109/CAMSAP.2017.8313182).
- [9] D. Batenkov, A. Bhandari, and T. Blu, “Rethinking Super-resolution: the Bandwidth Selection Problem,” in *ICASSP 2019 - 2019 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, May 2019, pp. 5087–5091. doi: [10.1109/ICASSP.2019.8683322](https://doi.org/10.1109/ICASSP.2019.8683322).

BOOK CHAPTERS

- [1] D. Batenkov and G. Binyamini, “Moment Vanishing of Piecewise Solutions of Linear ODEs,” in *Difference Equations, Discrete Dynamical Systems and Applications*, L. A. i Soler, J. M. Cushing, S. Elaydi, and A. A. Pinto, Eds. Springer Berlin Heidelberg, 2012, pp. 15–28. doi: [10.1007/978-3-662-52927-0_2](https://doi.org/10.1007/978-3-662-52927-0_2).
- [2] D. Batenkov and Y. Yomdin, “Taylor Domination, Difference Equations, and Bautin Ideals,” in *Difference Equations, Discrete Dynamical Systems and Applications*, L. A. i Soler, J. M. Cushing, S. Elaydi, and A. A. Pinto, Eds. Springer Berlin Heidelberg, 2012, pp. 303–319. doi: [10.1007/978-3-662-52927-0_21](https://doi.org/10.1007/978-3-662-52927-0_21).
- [3] D. Batenkov, V. Golubyatnikov, and Y. Yomdin, “Reconstruction of planar domains from partial integral measurements,” in *Complex analysis and dynamical systems V*, vol. 591, Amer. Math. Soc., Providence, RI, 2013, pp. 51–66. Accessed: Dec. 23, 2017. [Online]. Available: <https://mathscinet.ams.org/mathscinet-getitem?mr=3155677>
- [4] D. Batenkov and Y. Yomdin, “Local and Global Geometry of Prony Systems and Fourier Reconstruction of Piecewise-Smooth Functions,” in *Operator-Related Function Theory and Time-Frequency Analysis*, Springer, 2015, pp. 57–76. Accessed: Nov. 29, 2014. [Online]. Available: http://link.springer.com/chapter/10.1007/978-3-319-08557-9_2

- [5] D. Batenkov and Y. Yomdin, “Taylor domination, Turán lemma, and Poincaré-Perron sequences,” in *Contemporary Mathematics*, vol. 659, B. Mordukhovich, S. Reich, and A. Zaslavski, Eds. Providence, Rhode Island: American Mathematical Society, 2016, pp. 1–15. Accessed: Apr. 07, 2016. [Online]. Available: <http://www.ams.org/conm/659>
- [6] D. Batenkov, Y. Romano, and M. Elad, “On the Global-Local Dichotomy in Sparsity Modeling,” in *Compressed Sensing and its Applications*, Birkhäuser, Cham, 2017, pp. 1–53. doi: [10.1007/978-3-319-69802-1_1](https://doi.org/10.1007/978-3-319-69802-1_1).