

# CURRICULUM VITAE

YAKOV BERCHENKO-KOGAN

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## *Research Interests.*

- Geometric numerical analysis.
- Differential geometry, geometric analysis.

## *Appointments.*

- Florida Institute of Technology, assistant professor, 2022–present.
- Pennsylvania State University, postdoctoral scholar, 2021–2022.
- University of Hawaii at Manoa, temporary assistant professor, 2019–2021.
- Washington University in St. Louis, Chauvenet postdoctoral lecturer, 2016–2019.

## *Education.*

- MIT, Ph.D. in mathematics, 2016. Thesis: Yang–Mills Replacement, advisor T. Mrowka.
- Caltech, B.S. in mathematics with a minor in control and dynamical systems, 2011. Thesis: Uncovering the Lagrangian from observations of trajectories, advisor M. Desbrun.

## *Fellowships and Awards.*

- NSF award, Collaborative Research: Numerical Methods and Differential Geometry, 2024–2027. [https://www.nsf.gov/awardsearch/showAward?AWD\\_ID=2411209](https://www.nsf.gov/awardsearch/showAward?AWD_ID=2411209).
- Institutional Research Incentive grant to support a Caltech summer undergraduate research fellow, 2022.
- US Junior Oberwolfach Fellowship, 2022.
- CARES grant to support online instruction, 2020.
- AMS–Simons Travel Grant, 2017–2019.
- National Defense Science and Engineering Graduate Fellowship, 2011–2014.
- Axline Scholarship covering full tuition, Caltech, 2007–2011.
- Putnam Competition member of first place team, 2010.
- USA Mathematics Olympiad winner, 2006.

## *Preprints.*

- Y. Berchenko-Kogan and E. S. Gawlik. Finite element spaces of double forms. arXiv:2505.17243, 2025. <https://arxiv.org/abs/2505.17243>.
- Y. Berchenko-Kogan. Extension operators and geometric decompositions. arXiv:2505.00129, 2025. <https://arxiv.org/abs/2505.00129>.

## *Journal Publications.*

- Y. Berchenko-Kogan and E. S. Gawlik. Blow-up Whitney forms, shadow forms, and Poisson processes. *Results Appl. Math.*, special issue on Hilbert complexes, 25:100529, 2025. [https://authors.elsevier.com/sd/article/S2590-0374\(24\)00099-2](https://authors.elsevier.com/sd/article/S2590-0374(24)00099-2).
- Y. Berchenko-Kogan. Symmetric bases for finite element exterior calculus spaces. *Found. Comput. Math.*, 24:1485–1515, 2024. <https://rdcu.be/dhKk1>.
- Y. Berchenko-Kogan and E. S. Gawlik. Finite element approximation of the Levi-Civita connection and its curvature in two dimensions. *Found. Comput. Math.*, 24:587–637, 2024. <https://rdcu.be/c1xoT>.
- Y. Berchenko-Kogan. Numerically computing the index of mean curvature flow self-shrinkers. *Results Math.*, 77, 17, 2022. <https://doi.org/10.1007/s00025-021-01550-y>.
- Y. Berchenko-Kogan. Duality in finite element exterior calculus and Hodge duality on the sphere. *Found. Comput. Math.*, 21:1153–1180, 2021. <https://rdcu.be/cdSpS>.

- Y. Berchenko-Kogan and A. Stern. Charge-conserving hybrid methods for the Yang–Mills equations. *SMAI J. Comput. Math.*, 7:97–119, 2021. <https://doi.org/10.5802/smai-jcm.73>.
- Y. Berchenko-Kogan and A. Stern. Constraint-preserving hybrid finite element methods for Maxwell’s equations. *Found. Comput. Math.*, 21:1075–1098, 2021. <https://rdcu.be/b7PuZ>.
- Y. Berchenko-Kogan. Bounds on the index of rotationally symmetric self-shrinking tori. *Geom. Dedicata*, 213:83–106, 2021. <https://rdcu.be/b7qyj>.
- Y. Berchenko-Kogan. The entropy of the Angenent torus is approximately 1.85122. *Experimental Math.*, 30(4):587–594, 2021. <https://doi.org/10.1080/10586458.2019.1583616>.
- Y. Berchenko-Kogan. Yang–Mills Replacement. *J. Geom. Anal.*, 28(4):3603–3656, 2018. <https://rdcu.be/BAr0>.
- D. Shi, Y. Berchenko-Kogan, D. V. Zenkov, and A. M. Bloch. Hamel’s formalism for infinite-dimensional mechanical systems. *J. Nonlinear Science*, 27(1):241–283, 2017. <https://rdcu.be/vtfl>.
- Y. Berchenko-Kogan. Minimum product sets sizes in nonabelian groups. *J. Number Theory*, 132(10):2316–2335, 2012. <https://doi.org/10.1016/j.jnt.2012.04.011>

#### *Other Research Papers.*

- Y. Berchenko-Kogan. Duality in finite element exterior calculus, 2018. <https://arxiv.org/abs/1807.01161>.
- Y. Berchenko-Kogan. Distance in the ellipticity graph, 2010. <https://arxiv.org/abs/1006.4853>.

#### *General Audience Publications.*

- Y. Berchenko-Kogan. What do grad students in math do all day? *Math Horizons*, 20(3):18–19, 2013. <https://doi.org/10.4169/mathhorizons.20.3.18>.
- Y. Berchenko-Kogan. More than math: The lasting benefits of summer programs. *Imagine*, 21(2):20–21, 2013.

#### *Recent Research Presentations.*

- NSF CompMath Meeting, contributed talk, 2025.
- SIAM Conference on Computational Science and Engineering, invited talk, 2025.
- SIAM annual meeting, invited talk, 2024.
- Finite Element Circus, 2018, 2022, 2024.
- GallianFest, contributed talk, 2023.
- Florida Institute of Technology, colloquium, 2022, 2023.
- Oberwolfach Research Institute, invited talk, 2022.
- Canadian Applied and Industrial Mathematical Society annual meeting, invited talk, 2022.

#### *Selected Outreach, Service, and Professional Activities.*

- Mentored an undergraduate student in a research project on higher order finite element spaces of double forms, 2024–2025.
- Mentored an undergraduate student in a research project on higher order blow-up finite elements, 2024.
- Reviewer, *Found. Comput. Math.*, *IMA J. Numer. Anal.*, *Math. Comp*, *Numer. Math.*, *Proc. AMS*, MathSciNet, zbMATH, 2020–present.
- Mentored three undergraduate students in a summer research project on numerical methods for curvature flows in Riemannian manifolds, 2023.
- Question writer, National Science Bowl middle/high school competition, 2022.
- Session organizer, Geometric Analysis: Past, Present, and Future, 2022.