

## CURRICULUM VITAE

YAKOV BERCHENKO-KOGAN

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### *Research Interests.*

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

### *Appointments.*

- Pennsylvania State University, postdoctoral scholar, 2021–present.
- 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.*

- CARES grant to support online instruction, 2020.
- AMS–Simons Travel Grant, 2017–2019.
- National Defense Science and Engineering Graduate Fellowship, 2011–2014.
- NSF Graduate Research Fellowship Award, declined to accept NDSEG fellowship, 2011.
- Axline Scholarship covering full tuition, Caltech, 2007–2011.
- Putnam Competition member of first place team, 2010.
- USA Mathematics Olympiad winner, 2006.

### *Journal Publications.*

- Y. I. Berchenko-Kogan. Numerically computing the index of mean curvature flow self-shrinkers. *Results Math.*, 77, 2022. <https://doi.org/10.1007/s00025-021-01550-y>.
- Y. I. 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. I. 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. I. 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. I. Berchenko-Kogan. Bounds on the index of rotationally symmetric self-shrinking tori. *Geom. Dedicata*, 213:83–106, 2021. <https://rdcu.be/b7qyj>.
- Y. I. Berchenko-Kogan. The entropy of the Angenent torus is approximately 1.85122. *Experimental Math.*, 2019. <https://doi.org/10.1080/10586458.2019.1583616>.
- Y. I. Berchenko-Kogan. Yang–Mills Replacement. *J. Geom. Anal.*, 28(4):3603–3656, 2018. <https://rdcu.be/BAr0>.
- D. Shi, Y. I. 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. I. 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>

*Recent Preprints.*

- Y. I. Berchenko-Kogan. Symmetric bases for finite element exterior calculus spaces, 2021. <https://arxiv.org/abs/2112.06065>.
- Y. I. Berchenko-Kogan and E. Gawlik. Finite element approximation of the Levi–Civita connection and its curvature in two dimensions, 2021. <https://arxiv.org/abs/2111.02512>.

*Other Research Papers.*

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

*General Audience Publications.*

- Y. I. 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. I. Berchenko-Kogan. More than math: The lasting benefits of summer programs. *Imag-ine*, 21(2):20–21, 2013.

*Selected Research Presentations.*

- Finite Element Circus, 2018, 2022.
- Computational and Systems Neuroscience (COSYNE), accepted poster, 2022.
- Society for Neuroscience, poster, 2021.
- Geometric Analysis Festival, 2021.
- AMS Sectional Meeting, Hawaii, special session on numerical methods for PDEs, 2019.
- College of Charleston, colloquium, 2019.
- Oklahoma State University, colloquium, 2019.
- North Carolina State University, geometry and topology seminar, 2018, 2019.
- Missouri University of Science and Technology, colloquium, 2018.
- UC San Diego, Center for Computational Mathematics seminar, 2018.
- Kansas State University, applied math seminar, 2018.

*Teaching and Mentoring.*

- University of Hawaii: calculus II, calculus III, linear algebra & differential equations, undergraduate numerical analysis, graduate PDEs, 2019–2021.
- Washington University in St. Louis: calculus II, differential equations, math for the physical sciences, point-set topology, undergraduate analysis, graduate analysis, 2016–2019.
- Washington University in St. Louis, mentor of a reading course in analysis, 2019.
- MIT, mentor, Directed Reading Program for undergraduates, 2015.

*Selected Outreach, Service, and Professional Activities.*

- Session organizer, Geometric Analysis: Past, Present, and Future, 2022.
- Reviewer, *Found. Comput. Math.*, *Numerische Mathematik*, zbMATH, 2020–present.
- Co-organizer of Putnam training sessions, University of Hawaii, 2019–2021.
- Volunteer at “Be a Scientist Night” at Kahauiki Village (housing for homeless families with children), 2019.
- Math circle speaker, Washington University in St. Louis, 2018.
- Math club speaker, Manhattan High School, Kansas, 2018.
- Organizer, reading seminar on Serre’s *Complex Semisimple Lie Algebras*, WashU, 2018.
- Intern, curriculum and software development, Art of Problem Solving, 2017.
- Organizer, Caltech undergraduate math seminar, 2009–2011.