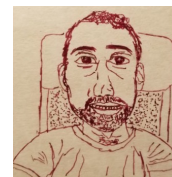# Kyler Siegel, November 19, 2024

CONTACT
INFORMATION

Department of Mathematics
University of Southern California
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Los Angeles, CA 90089 USA

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`kylersiegel@gmail.com`
`kylersiegel.xyz/`

RESEARCH
INTERESTS

Geometry, topology, and applications, with a focus on symplectic and complex geometry.

ACADEMIC
POSITIONS

University of Southern California, assistant professor (tenure track), July 2020 - present.

Barnard College (Columbia University), visiting research fellow, August 2023 - June 2024.

Institute for Advanced Study, member, September 2021 - December 2021.

Columbia University, Ritt assistant professor, September 2019 - June 2020.

Columbia University, NSF Postdoctoral Research Fellow and Department of Mathematics Postdoctoral Research Fellow, September 2017 - August 2019.

Massachusetts Institute of Technology, NSF Postdoctoral Research Fellow and Pure Mathematics Instructor, September 2016 - August 2017.

EDUCATION

Stanford University

Ph.D. mathematics, August 2016
- Advisor: Yakov Eliashberg

Columbia University

B.S. applied mathematics (summa cum laude), music minor, May 2011
- Senior thesis advisor: Robert Lipshitz

GRANTS AND
AWARDS

2021–present	NSF Mathematical Sciences Standard Grant (DMS 2105578, $353,255).
2016–2019	NSF Mathematical Sciences Postdoctoral Research Fellowship (DMS 1606371, $150,000).
2012–2015	NSF Graduate Research Fellowship.
2011	Applied Mathematics Faculty Award (top graduating senior in applied mathematics at Columbia University).

PUBLICATIONS AND
PREPRINTS

Sesquicuspidal curves, scattering diagrams, and symplectic nonsqueezing, with D. McDuff. Available at `https://kylersiegel.xyz/sesqui.pdf`.

Symplectic field theory: an overview, with R. Hind. *Celebratio Mathematica* (to appear).

Singular algebraic curves and infinite symplectic staircases, with D. McDuff, `arXiv: 2404.14702` (2024). Submitted.

On symplectic packing problems in higher dimensions, with Y. Yao, `arXiv:2312.13224` (2023). Submitted.

Ellipsoidal superpotentials and singular curve counts, with D. McDuff, `arXiv:2308.07542` (2023). Submitted.

A tree formula for the ellipsoidal superpotential of the complex projective plane. Proceedings of the Gökova Geometry-Topology Conference (2023).

Ellipsoidal superpotentials and stationary descendants, with G. Mikhalkin, `arXiv:2307.13252` (2023). Submitted.

Symplectic capacities, unperturbed curves, and convex toric domains, with D. McDuff. *Geometry & Topology* (2024).

On the embedding complexity of Liouville manifolds, with S. Ganatra. *Journal of Differential Geometry* (2024).

Higher symplectic capacities and the stabilized embedding problem for integral elllipsoids, with D. Cristofaro–Gardiner and R. Hind. *Journal of Fixed Point Theory and Applications* (Claude Viterbo's 60th birthday special volume, 2022).

Computing higher symplectic capacities I. International Mathematics Research Notices (2021).

Counting curves with local tangency constraints, with D. McDuff. *Journal of Topology* (2021).

Higher symplectic capacities. Algebraic & Geometric Topology (to appear).

Squared Dehn twists and deformed symplectic invariants. Journal of Symplectic Geometry (2021).

Subflexible symplectic manifolds, with E. Murphy. *Geometry & Topology* (2018).

Rationally convex domains and singular Lagrangian surfaces in $\mathbb{C}^2$, with S. Nemirovski. *Inventiones mathematicae* (2016).

OTHER PAPERS | *A Geometric proof of a faithful linear-categorical surface mapping class group action.* (2012). `arXiv:1108.3676v1`.

A Novel unsupervised clustering algorithm for binning DNA fragments in metagenomics, with K. Altenburger, Y. Hon, J. Lin, and C. Yu. *Current Bioinformatics*, (2015).

Stick index of knots and links in the cubic lattice, with C. Adams, M. Chu, T. Crawford, S. Jensen, and L. Zhang. *Journal of Knot Theory and its Ramifications* (2012).

Applying Poincaré's polyhedron theorem to groups of hyperbolic isometries. (2010). Available at `https://kylersiegel.xyz/Poincare.pdf`.

CONFERENCE AND SEMINAR ORGANIZATION | Co-founder and co-organizer for first annual *Kylerec graduate student workshop*, New Orleans, January 2016 (topic: "Lefschetz fibrations"). Served as mentor in Kylerec

2018 in Leavenworth, WA ("Symplectic geometry of cotangent bundles") and Kylerec 2022 in Foresthill, CA ("Quantitative symplectic geometry"), unofficial advisor for Kylerec 2017 ("Symplectic fillings of contact manifolds").

Co-founder and co-organizer for *Western Hemisphere Virtual Symplectic Seminar*, Spring 2020 - present (currently on indefinite hiatus).

Co-founder and co-organizer for annual *Southern California Symplectothon* intensive learning retreat in geometry, Big Bear Lake, CA in Fall 2022 ("Floer theory in symmetric products") and Fall 2024 ("Global Kuranishi charts").

Co-organizer for AMS special session on "Geometry and Dynamics of Symplectic and Contact Manifolds" in San Luis Obispo, May 2025.

Co-organizer for *USC topology seminar*, Fall 2021 - present.

Co-organizer for *Columbia Symplectic Geometry, Gauge Theory, and Categorification Seminar*, Fall 2017 - Spring 2020.

Organizer for *Stanford Student Symplectic Seminar*, 2013–2015.

ADVISING	Advisor for USC PhD student Jonathan Michala (expected graduation Spring 2025). Temporary advisor for USC PhD students Boxi Hao, David O'Connor, and Ivan Feng.

Co-advisor for USC postdocs Joseph Helfer (2021-2024), Chris Kuo (2022-2025), Wenyuan Li (2023-2026), and Soham Chanda (2024-2027).

Served on PhD thesis committee for Clara Dolfsen (Columbia University mathematics, 2021), Debtanu Sen (USC mathematics, 2023), Hae Jin Song (USC computer science, 2024).

MENTORING — Various reading courses in symplectic topology with USC PhD students since 2021.

Advised Columbia undergraduate Param Gujral on individual research project on symplectic capacities, Summer 2020.

Advised Columbia undergraduates Alex Gajewski, Eli Goldin, Jakwanul Safin, Navtej Singh and Junhui Zhang on research project as part of *Columbia Undergraduate Research Summer Program*, Summer 2019. Project title: "Optimization on symplectic embeddings".

Advised MIT undergraduates Gavin Brown and Max Vargas on research project about symplectic capacities as part of *MIT Undergraduate Research Opportunities Program*, Fall 2016–Spring 2017. Project title: "Calculating symplectic capacities in four-dimensional symplectic manifolds."

Co-advised Stanford undergraduates William Henry McCloskey, Jae Hee Lee, and Chase Middleman on research project as part of *Stanford Undergraduate Research Institute in Mathematics*, Summer 2015. Project title: "Computing Turaev–Viro invariants of 3-manifolds".

Contributed talks to *Stanford SPLASH* (talks for high school students), *Stanford University Mathematical Organization*, and *Stanford "KIDDIE" graduate student collo-*

quium.

TEACHING	Fall	2024	Instructor, *Topics in differential geometry (MATH 635), University of Southern California*
	Spring	2023	Instructor, *Differential Geometry (MATH 535a)*, University of Southern California
	Fall	2022	Instructor, *Geometry and transformations (MATH 434)*, University of Southern California
	Fall	2022	Instructor, *Calculus I (MATH 125)*, University of Southern California
	Spring	2022	Instructor, *Topics in differential geometry (MATH 635)*, University of Southern California
	Spring	2021	Instructor, *Differential Geometry (MATH 535a)*, University of Southern California
	Fall	2020	Instructor, *Fundamental Concepts of Analysis (MATH 425a)*, University of Southern California
	Spring	2020	Instructor, *Ordinary Differential Equations* (two sections), Columbia University
	Fall	2019	Instructor, *Introduction to Modern Algebra I*, Columbia University
	Fall	2018	Instructor, *Ordinary Differential Equations*, Columbia University
	Spring	2018	Instructor, *Ordinary Differential Equations*, Columbia University
	Fall	2014	Graduate Teaching Assistant, *Math 51*, Stanford University
	Fall	2013	Graduate Teaching Assistant, *Math 51*, Stanford University

INVITED TALKS

Toric and Tropical Techniques in Symplectic Field Theory, Mittag-Leffler Institute, Djursholm, Sweden, June 2024.

Journées Gabriel Cramer, Geneva, Switzerland, June 2024.

Persistence Homology in Symplectic and Contact Topology, Albi, France, June 2023.

Gökova Geometry Conference, Gökova, Turkey, May 2023.

Interactions between Symplectic and Holomorphic Convexity in 4 Dimensions, BIRS, Banff, Canada, April 2023.

Geometry in its Symplectic, Tropical and Real aspects, Paris, France, March 2023.

Stanford University Symplectic Geometry Seminar, Stanford, CA, February 2023.

Convexity in Contact and Symplectic Topology (conference in honor of Emmanuel Giroux), Institute Henri Poincaré, July 2022.

GeNeSys: Geneva–Neuchâtel Symplectic Geometry Seminar, Geneva, Switzerland, July 2022.

Symplectic Zoominar, online geometry seminar, April 2022.

Math Seminar, University of Georgia (online), April 2022.

University of Maryland Geometric Analysis Seminar, College Park, MD, December 2021.

Northern California Symplectic Geometry Seminar, UC Berkeley (online), Decemeber 2021.

Topology and Geometry Seminar, Hebrew University (online), December 2021.

Low-Dimensional Topology, Gauge Theory, and Symplectic Geometry Seminar, joint with Stony Brook University and Simons Center for Geometry and Physics, December 2021.

Institute for Advanced Study and Princeton University Joint Symplectic Seminar, Princeton, NJ, October 2021.

Freemath Seminar, online geometry seminar, November 2020.

USC Geometry, Topology, and Categorification Seminar, Los Angeles, CA, September 2020 (online).

Special Session on Computational aspects of Symplectic Topology, AMS Sectional Meeting, West Lafayette, Indiana, April 2020 (moved to online).

Oberseminar Differential Geometry, University of Augsburg, Germany, January 2020.

Symplectic Seminar, University of Augsburg, Germany, January 2020.

Rutgers University Geometry, Symmetry, and Physics Seminar, New Brunswick, December 2019.

Colloquium, University of Edinburgh School of Mathematics, Edinburgh, United Kingdom, December 2019.

University of Michigan Geometry Seminar, Ann Arbor, Michigan, November 2019.

Colloquium, Hausdorff Center for Mathematics, Bonn, Germany, November 2019.

Michael Zhao Memorial Student Colloquium, Columbia University, New York, NY October 2019.

Stanford University Symplectic Geometry Seminar, Stanford, CA, October 2019.

Colloquium, Seoul National University, Seoul, South Korea, October 2019.

Seoul National University Geometry Seminar, Seoul, South Korea, October 2019.

Homological Algebra, Microlocal Analysis and Symplectic Geometry, Montreal, Canada, June 2019.

Princeton University and Institute for Advanced Study Joint Symplectic Geometry Seminar, Princeton NJ, February 2019.

Northwestern University Geometry and Physics Seminar, Evanston IL, January 2019.

Boston University Geometry and Physics Seminar, Boston MA, November 2018.

Columbia University Student Mathematics Colloquium, New York, NY, September 2018.

Geometric methods in symplectic and contact topology (Yashafest), Asilomar, CA, Au-

gust 2018.

Symplectic geometry and its interactions with low-dimensional topology, Princeton, NJ, June 2018.

AMS sectional meeting at Northeastern University, special session on Facets of Symplectic Topology, Boston, MA, April 2018.

Humboldt University Working Group Seminar on Symplectic Geometry, Berlin, Germany, June 2017.

Hamburg University Pure Mathematics Colloquium, Hamburg, Germany, June 2017.

Berlin-Hamburg Symplectic Geometry Seminar, Berlin, Germany, June 2017.

Dartmouth Geometry and Topology Seminar, Hanover, NH, April 2017.

Workshop on Symplectic Field Theory VIII, Berlin, Germany, August 2016.

Institute for Advanced Study Symplectic Geometry Seminar, Princeton, NJ, March 2016.

MIT Geometry and Topology Seminar, Cambridge, MA, December 2015.

Columbia Symplectic Geometry, Gauge Theory, and Categorification Seminar, New York, NY, December 2015.

Berkeley Symplectic Geometry Seminar, Berkeley, CA, September 2015.

Icebreaker Workshop on Wrinkles, San Francisco, CA, January 2015.

Rigidity and Flexibility in Symplectic Topology and Dynamics, Lorentz Center, Leiden, July 2014.

Further Advances in Symplectic Flexibility, Asilomar State Beach, CA, May 2014.

Advances in Symplectic Flexibility, Asilomar State Beach, CA, April 2013.

Young Mathematicians Conference, Ohio State University, Columbus, OH, August 2010.

MAA MathFest, Pittsburgh, PA, August 2010.

OTHERS PROJECTS *Symplectic embedding machine.* Animations and report by undergraduate advisees available on author's website and at `https://kylersiegel.xyz/Optimization_on_Symplectic_Embeddings.pdf`.

Computing symplectic capacities - software to compute symplectic capacities of convex domains, with G. Banhatti, R. Castellano, Y. Ganor, J. Lane, C. Policastro, I. Rauch, K. Samvelyan, E. Tsukerman, and S. Tanny. Matlab code and report available at `https://kylersiegel.xyz/EHZ/index.html`.