Gabriel Khan

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Professional Website
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EDUCATION AND ACADEMIC POSITIONS

Iowa State University Ames, Iowa
Assistant Professor, August 2020 to Present

University of Michigan Ann Arbor, Michigan
Postdoctoral Research Fellow, May 2018 to July 2020
Mentor: Jun Zhang

The Ohio State University Columbus, Ohio
Ph.D, Mathematics, May 2018
Masters, Mathematics, May 2015
Advisor: Fangyang Zheng
Thesis: *On the Hermitian Geometry of k-Gauduchon Orthogonal Complex Structures*

Boston University Boston, Massachusetts
B.A. in Mathematics with distinction, Minor in Physics, magna cum laude, May 2012
Advisor: Glen Richard Hall

RESEARCH

Research Grants

1. Simons Collaboration Grant ($42,000) 2021 - 2026

Scholarly Works

1. Modulus of concavity and fundamental gap estimates on surfaces (with M. Tuerkoen and G. Wei). Submitted. Available at arxiv.org/abs/2306.06053
2. Curvature-torsion entropy for twisted curves under curve shortening flow. To appear in the Bulletin of Australian Math Society. Available at arxiv.org/abs/2305.07171
3. Log-concavity and fundamental gaps on surfaces of positive curvature (with X.H. Nguyen, M. Tuerkoen and G. Wei). arxiv.org/abs/2211.06403
4. Negative curvature constricts the fundamental gap of convex domains (with X.H. Nguyen). arxiv.org/abs/2211.06404
5. When optimal transport meets information geometry (with J. Zhang). Introduction for a special issue in Information Geometry. (June 2022) arxiv.org/abs/2206.14791
6. *An illustrated introduction to Ricci flow* `Preprint`

7. *A hall of statistical mirrors* (with J. Zhang). Asian Journal of Mathematics. arxiv.org/abs/2109.13809
8. *Recent developments on the MTW tensor* (with J. Zhang). Proceedings of the 5$^{\text{th}}$ International Conference for Geometric Science of Information.
9. *Kähler-Ricci Flow preserves negative anti-bisectional curvature* (with F. Zheng). arxiv.org/abs/2011.07181
10. *Positively curved Kähler metrics on tube domains and their applications to optimal transport* (with J. Zhang and F. Zheng). arxiv.org/abs/2001.06155
11. *The Kähler Geometry of Certain Optimal Transport Problems* (with J. Zhang), Pure and Applied Analysis (May 2020). arxiv.org/abs/1812.00032

    An extended abstract for these results appeared in the proceedings to the 4$^{\text{th}}$ International Conference for Geometric Science of Information under the title *Hessian Curvature and Optimal Transport*.
12. *Connections with torsion in (para-)complexified structures* (with J. Zhang). Contributed chapter to Progress in Information Geometry: Theory and Applications (March 2021).
13. *Statistical Mirror Symmetry* (with J. Zhang). Differential Geometry and its Applications (August 2020).
14. *A Conjectural Inequality for Visible Points in Lattice Parallelograms* (with M. Khan, J. Saha, and P. Zhao). Proceedings of Combinatorial and Additive Number Theory IV (September 2020), arxiv.org/abs/1909.01306
15. *On the Expected Total Curvature of Confined Equilateral Quadrilaterals.* , arxiv.org/abs/1902.06316
16. *Eigenvalue estimates without Bakry-Èmery-Ricci bounds.* arxiv.org/abs/1901.06277
17. *Weitzenböck Connections as a Generalization of Dually Flat Connections* (with J. Zhang), Information Geometry (July 2019)

    An extended abstract for these results appeared in the proceedings to the 4$^{\text{th}}$ International Conference for Geometric Science of Information under the title *New Geometry of Parametric Statistical Models*.
18. *Hall's Conjecture on Extremal Sets for Random Triangles,* Journal of Geometric Analysis (May 2019), arxiv.org/abs/1704.05913
19. *The Set of All Orthogonal Complex Structures on the Flat* 6*-Tori* (with B. Yang and F. Zheng), Advances in Mathematics (August 2017), arxiv.org/abs/1604.05745
20. *Eigenvalues of the Complex Laplacian on compact non-Kähler manifolds,* Annals of Global Analysis and Geometry (August 2017), arxiv.org/abs/1512.05044
21. *Revisiting Toom's Proof of Bulgarian Solitaire* (with T. Hart and M. Khan), Annales des Sciences Mathématiques du Québec 36(2) (December 2011)

Service

Editor

Guest editor for a special issue on optimal transport for *Information Geometry*

Grant Reviews

Simons Foundation Collaboration Grant Program

Referee/Reviewer

Information Geometry, Rose-Hulman Undergraduate Mathematics Journal, SIGMA, Pure and Applied Analysis, Math Reviews, Zentralblatt

SELECTED TEACHING EXPERIENCE

Iowa State University	Fall 2020 -Present
Calculus 1	Fall 2021
Calculus 2	Fall 2020
Calculus 3	Spring 2022, Fall 2022
Linear Algebra	Fall 2022
Differential Equations	Spring 2021
Real Analysis I	Fall 2021
Manifolds, Tensors, and Differential Geometry	Spring 2023
University of Michigan	Fall 2018 -Spring 2020
Readings in Information Geometry and Optimal Transport	Fall 2019
The Ohio State University	September 2013-December 2017
Introduction to ODEs and PDEs for Incoming Masters Students	Summer 2016
Introduction to Statistics for Incoming Masters Students	Summer 2016
Educational Testing Services	June 2017
AP Calculus Reader, Kansas City, Missouri	

OTHER SKILLS

Mathematica
LaTeX typesetting
French and Spanish (reading)
Triathlon — USAT All-American 2017

Last updated: June 27, 2023