Department of Mathematics, Michigan State University
619 Red Cedar Road, East Lansing, MI 48824
E-mail: kitagawa@math.msu.edu

Professional History

- Visiting Research Scholar, Department of Mathematics, Tokyo Metropolitan University, 12/2021-3/2022
- Associate Professor, Department of Mathematics, Michigan State University, 07/2021-present
- Assistant Professor, Department of Mathematics, Michigan State University, 08/2015-06/2021
- Postdoctoral Fellow, The Fields Institute for Research in Mathematical Sciences, 07/2014-12/2014
- Postdoctoral Fellow, Department of Mathematics, University of Toronto, 01/2014-07/2015
- Postdoctoral Fellow, Mathematical Sciences Research Institute, 08/2013-12/2013
- Postdoctoral Fellow, University of British Columbia/Pacific Institute for the Mathematical Sciences, 08/2011-07/2013

Education History

- Ph.D. Mathematics, Princeton University, 05/2011 (Advisor: S-Y. Alice Chang)
- B.A. Pure Mathematics, Highest Honors, University of California, Berkeley, 05/2006

Grants

- Single-PI: National Science Foundation grant DMS-2000128. 2020-2023. ($180,000)
- Single-PI: Simons Foundation Collaboration Grants for Mathematicians. 2020-2025. (Declined due to award of NSF grant)
- Co-PI: NSA grant "Summer Undergraduate Research Institute in Experimental Mathematics (SURIEM)" H98230-20-1-0006 (with Robert Bell, Teena Gerhardt, and Aklilu Zeleke). 2020-2021. ($103,214.44)
- Single-PI: National Science Foundation grant DMS-1700094. 2017-2021. ($150,000)
- Single-PI: Simons Foundation Collaboration Grants for Mathematicians. 2017-2023. (Declined due to award of NSF grant)
- Single-PI: AMS-Simons Travel Grant. 2014-2016. ($4,000)

Awards and Honors

- NatSci Teacher-Scholar Award. (College of Natural Sciences, MSU, 2020.)
- J.S. Frame Teaching Excellence Award. (Dept. of Mathematics, MSU, 2018.)

Service / Outreach

- Panelist: National Science Foundation, 2023.
- Volunteer: Girls Math and Science Day, May 2022. Michigan State University.
- Speaker: Catch-all Math Colloquium of Japan, part 2, Feb. 2022. Online.
- Speaker: Math Club, Feb. 2021. Michigan State University.
- Co-organizer: Canadian Mathematical Society 2020 winter meeting session "Optimal transport and applications", Dec. 2020.
- Volunteer: Girls Math and Science Day, Feb. 2020. Michigan State University.
- Panelist: National Science Foundation, 2020.
- Article: "Fūiruzushō gyouseki shōkai Figalli (Tokushuu Kokusai Suugakusha Kaigi 2018). [The Work of Fields Medalist Alessio Figalli (ICM2018 Special)]." *Sūgaku Seminar [Mathematics seminar]* (Japanese), 58(1), pp. 20–25, 2019.
- Volunteer: Girls Math and Science Day, Mar. 2019. Michigan State University.
- Organizer: Mathematics Department Colloquium, Fall 2018-Spring 2019. Michigan State University.

- Speaker: Topical Seminar for Undergraduate Mathematicians, Nov. 2018. Michigan State University.
- Panelist: National Science Foundation, 2017.
- Co-organizer: BIRS workshop 17w5078 "Generated Jacobian Equations: from Geometric Optics to Economics", April 2017, BIRS.
- Co-organizer: Analysis and PDE Seminar, Fall 2015-Spring 2020. Michigan State University.
- Co-organizer: 76th Midwest PDE Seminar, Nov. 2015. Michigan State University.

Mentoring / Advising

- Ph.D. candidate: Chamila Gamage Malagoda (MSU, Fall 2018-Summer 2023)
- Postdoctoral researcher: Farhan Abedin (MSU, Fall 2018-Spring 2021)
- Ph.D. candidate: Seonghyeon Jeong (MSU, Fall 2017-Spring 2021)
- Summer REU team: Abigail Brauer, Megan Krawick, Manuel Santana (Summer 2020)
- Undergraduate research assistant: Cecilia Mikat (MSU, Fall 2019-May 2022)
- Undergraduate research assistant: Mohit Bansil (MSU, Fall 2016-May 2020. 2019 Goldwater scholar, current NSF GRF at UCLA)
- Undergraduate exchange student: Zongyu Dai (Nankai University, Fall 2016)

Peer-reviewed publications (All authors listed have made equal contributions to all articles).

(19) "A perturbative approach to the parabolic optimal transport problem for non-MTW costs." (with Farhan Abedin). Accepted to *SIAM J. Math. Anal.*. (arXiv:2108.01253)

(18) "An optimal transport problem with storage fees." (with Mohit Bansil). *Electron. J. Differential Equations*, vol 2023, paper no. 22, 24pp, 2023.

(17) "Quantitative stability in the geometry of semi-discrete optimal transport." (with Mohit Bansil). *Int. Math. Res. Not. IMRN*, no. 10, pp. 7354–7389, 2022.

(16) "A Newton algorithm for semi-discrete optimal transport with storage fees." (with Mohit Bansil). *SIAM J. Optim.*, 31(4), pp.2586–2613, 2021.

(15) "$\mathcal{W}_\infty$-transport with discrete target as a combinatorial matching problem." (with Mohit Bansil). *Arch. Math. (Basel)*, 117(2), pp. 189–202, 2021.

(14) "Optimal transport and the Gauss curvature equation." (with Nestor Guillen). *Methods Appl. Anal.*, 27(4), pp. 387–404, 2020.

(13) "Exponential Convergence of Parabolic Optimal Transport on Bounded Domains." (with Farhan Abedin). *Anal. PDE*, 13(7), pp. 2183-2204, 2020.

(12) "Inverse Iteration for the Monge-Ampère Eigenvalue Problem." (with Farhan Abedin). *Proc. Amer. Math. Soc.*, 148(11), pp. 4875-4886, 2020.

(11) "Estimates for Dirichlet-to-Neumann maps as integro-differential operators." (with Nestor Guillen and Russell Schwab). *Potential Anal.*, 53(2), pp. 483–521, 2020.

(10) "Free discontinuities in optimal transport." (with Robert McCann). *Arch. Ration. Mech. Anal.*, 232(3), pp. 1505–1541, 2019.

(9) "Convergence of a newton algorithm for semi-discrete optimal transport." (with Quentin Mérigot and Boris Thibert). *J. Eur. Math. Soc. (JEMS)*, 21(9), pp. 2603-1651, 2019.

(8) "Pointwise estimates and regularity in geometric optics and other generated Jacobian equations." (with Nestor Guillen). *Comm. Pure Appl. Math.*, 70(6), pp. 1146-1220, 2017.

(7) "Prohibiting isolated singularities in optimal transport." (with Young-Heon Kim). *Ann. Sc. Norm. Super. Pisa Cl. Sci.*, 16(1), pp. 277-290, 2016.

(6) "The multi-marginal optimal partial transport problem." (with Brendan Pass). *Forum Math. Sigma*, 3, pp. e17, 28, 2015.

(5) "On the local geometry of maps with c-convex potentials." (with Nestor Guillen). *Calc. Var. Partial Differential Equations*, 52(1-2), pp. 345-387, 2015.

(4) "On the degeneracy of optimal transportation." (with Young-Heon Kim). *Comm. Partial Differential Equations*, 39(7), pp. 1329-1363, 2014.

(3) "An iterative scheme for solving the optimal transportation problem." *Calc. Var. Partial Differential Equations*, 51(1-2), pp. 243-263, 2014.

(2) "Regularity for the optimal transportation problem with Euclidean distance squared cost on the embedded sphere." (with Micah Warren). *SIAM J. Math. Anal.*, 44(4), pp. 2871-2887, 2012.

(1) "A parabolic flow toward solutions of the optimal transportation problem on domains with boundary." *J. Reine Angew. Math.*, 672, pp. 127-160, 2012.

- "Extended Erratum to: A parabolic flow toward solutions of the optimal transportation problem on domains with boundary (J. Reine Angew. Math. 672 (2012), 127–160)". *J. Reine Angew. Math.*, 781 pp. 207–209, 2021.

Minicourses / Lecture series

2022: Mar. *A brief introduction to branched optimal transport*, Okinawa Institute of Science and Technology, Japan.

2019: May *2019 NCTS & Sinica Summer Course: Topics on Mathematical Foundation of Machine Learning*, National Center for Theoretical Sciences, Taiwan.

2018: June *2018 NCTS Summer Course: Theoretical Foundation of Data Science, with Application*, National Center for Theoretical Sciences, Taiwan.

2014: May *Regularity of the Monge-Ampère equation and the optimal transportation problem*, Chinese University of Hong Kong, Hong Kong.

Invited Talks (funded, except online) (†: cancelled due to Covid-19)

2023: May *Optimal transport in data science*, ICERM, Brown University.

Apr. *Analysis and PDE seminar*, UCLA.

Mar. *Optimal Transport Theory and Applications to Physics*, École de Physique des Houches, France.

Mar. *MokaMeeting*, Inria, France.

2022: Dec. *One day workshop on persistent homology and optimal transport*, ASHBi / Kyoto University, Japan.

Nov. *Tokyo Probability Seminar*, Keio University, Japan.

Oct. *Applied Analysis Seminar*, Kumamoto University, Japan.

Sept. *Analysis Seminar*, Fukuoka University, Japan.

Sept. *Continuum Mechanics Seminar*, University of Nebraska-Lincoln, online.

Sept. *Analysis & PDE Seminar*, Johns Hopkins University, online.

July *Analysis & Geometry Seminar*, University of Bristol, UK.

May *Applied Optimal Transport*, IMSI, Chicago.

May *Analysis Seminar*, University of Texas at Austin.

May *Differential Equations and Applied Math Seminar*, Texas State University.

Apr. *Applied Math & Analysis*, Duke University.

Mar. *Geometry seminar*, Tokyo Metropolitan University, Japan.

Mar. *Workshop on Markov Processes and related aspects*, Kumamoto University, Japan.

Feb. *Catch-all Math Colloquium of Japan, part 1*, Online.

Feb. *Mini-workshop on optimal transport and discrete geometry*, Fukuoka University, Japan.

Feb. *Seminar*, RIKEN Center for Advanced Intelligence Project / Osaka University, Japan.

Jan. *Probability Seminar*, Kansai University, Japan.

2021: Nov. *Geometry and Analysis seminar*, Columbia University.

Apr. *Center for Nonlinear Analysis Seminar*, Carnegie Mellon University, Online.

2020: Oct. *Mathematical Physics and Harmonic Analysis Seminar*, Texas A&M University, Online.

Oct. *One World MINDS Seminar*, Online.

May† *Optimal Transport: Advances and Applications*, MIT.

May† *Optimal Transport and Analysis for Machine Learning (20w5126)*, BIRS, Banff, Canada.

Mar. *Applied Math & Analysis seminar*, Duke University.

Feb. *Differential geometry & geometric analysis seminar*, Princeton University.

2019: Aug. *Workshop on Monge-Ampère equations: in Celebration of Professor John Urbas's 60th Birthday*, Australia.

June *Workshop on Transport at Metropolitan*, Tokyo Metropolitan University, Japan.

June *Applied analysis seminar*, The University of Tokyo, Japan.

June *Geometry seminar*, Osaka University, Japan.

May *Colloquium*, National Cheng Kung University, Taiwan.

Apr. *Colloquium*, University of Michigan-Dearborn.

Mar. *Analysis seminar*, University of Texas at Austin.

Feb. *PDE seminar*, Wayne State University.

Jan. *Geometry and Probability*, Fukuoka University, Japan.

Jan. *Probability seminar*, Kansai University, Japan.

2018: Dec. *Analysis and Partial Differential Equations Seminar*, Johns Hopkins University.

Oct. *Applied math and Analysis seminar*, Duke University.

July *Probability seminar*, Kansai University, Japan.

July *Seminar*, RIKEN Center for Advanced Intelligence Project / Osaka University, Japan.

July *Mathematics seminar*, National Taiwan University, Taiwan.

June *Variational Problems in Optical Engineering and Free Material Design*, Banach Center, Poland.

2017: July *CMC conference: Optimal transport and related topics*, KIAS, South Korea.

May French ANR *Monge-Ampère et Géométrie Algorithmique* meeting, France.

May *Séminaire Analyse Numérique et E.D.P*, Universíte Paris-Sud, France.

May *Optimal Transport meets Probability, Statistics and Machine Learning (17w5093)*, CMO, Mexico.

Mar. *Analysis and Applied Mathematics Seminar*, University of Illinois, Chicago.

2016: Oct. *Geometry and Analysis seminar*, Columbia University.

Oct. *Differential Geometry & Geometric Analysis Seminar*, Princeton University.

July *Workshop on Computational Optimal Transportation*, CRM, Canada.

Apr. *Analysis seminar*, University of Texas at Austin.

2015: Nov. *Applied analysis & computation seminar*, University of Massachusetts, Amherst.

June *ANR OPTIFORM meeting*, CEREMADE-Université Paris Dauphine.

May *Analysis and PDE seminar*, University of California, Los Angeles.

Mar. *Montreal Analysis Seminar*, McGill University, Canada.

Jan. *Mathematics Colloquium*, University of Virginia.

Jan. *Colloquium*, Michigan State University.

Jan. *Mathematics Colloquium*, University of Wisconsin, Madison.

2014: Nov. *PDE/Analysis seminar*, McMaster University, Hamilton, Canada.

June *Probability theory seminar*, Kansai University, Japan.

May *Seminar*, Chinese University of Hong Kong, Hong Kong.

Apr. *Applied Math and PDE Seminar*, Michigan State University.

Apr. *Analysis and PDE seminar*, University of California, Los Angeles.

Mar. *Analysis seminar*, University of Texas at Austin.

2013: Nov. *Analysis / PDE seminar*, University of California, Berkeley.

Aug. *Workshop ID1332: Partial Differential Equations*, MFO, Oberwolfach, Germany.

July *Analysis seminar*, University of Edinburgh, Scotland.

July *Séminaires LJK-Géométrie-Images: Calcul des variations*, Université Joseph Fourier, France.

June *Probability theory seminar*, Kansai University, Japan.

June *BIBUNHOUTEISHIKI (PDE) seminar*, Osaka University, Japan.

2012: Dec. *Analysis and PDE seminar*, University of California, Los Angeles.

Nov. *Differential Geometry & Geometric Analysis Seminar*, Princeton University.

May *Optimal Transportation and Differential Geometry (12w5118)*, BIRS, Canada.

Mar. *Analysis and PDE seminar*, University of California, Los Angeles.

2011: July *37th Osaka University Finance and Insurance Seminar Series (CSFI-CREST joint seminar)*, Center for the Study of Finance and Insurance, Osaka University, Japan.

2010: Nov. *Workshop on Geometric Probability and Optimal Transportation*, Fields Institute, Canada.