Curriculum Vitae

Seonghyeon Jeong

Personal Information

- E-mail : jeongs1466@gmail.com
- Website : https://sjeong.info

Education

- Michigan State University (09/2016 $\sim$ 04/2021)

  Ph.D in Mathematics

  Advisor : Jun Kitagawa
- Hong Ik University (03/2011 $\sim$ 08/2016)

  B.S in Mathematics Education

Professional Career

- Postdoc in National Sun Yat-Sen University

  08/2024 -

  Mentor: Chih-Wei Chen (National Sun Yat-Sen University)
- Postdoc fellow in National Center for Theoretical Science

  09/2021 - 07/2024

  Mentors: Hau-Tieng Wu (Courant Institute of Mathematical Sciences)
  Chih-Wei Chen (National Sun Yat-Sen University)

Teaching Experience

- Calculus 1-3 in National Taiwan University

  2023 Fall $\sim$ 2024 Spring

Research Interests

My research area are optimal transport and related PDEs. Especially, my researches are about Regularity using the Monge-Ampere type equations which are derived from the optimal transportation problem. I am interested in the conditions (such as MTW type conditions) that make the transport plan regular.

I am also trying to study some applications of optimal transportation theory. As a part of the application, I am studying some problems originating from data science area, especially dimension reduction problems, and attempting to apply optimal transportation theory regarding the data points as my source and target measures. Then the dynamics of the data points generated by the algorithms sometimes can be viewed as a gradient descent in the measure spaces. Then, using the Wasserstein distance, we can view the algorithm as an equation that describes certain dynamics of measures.

Right now my biggest interest is a problem which I call the quadratic optimal transportation problem (QOT). While I was studying some dimension reduction algorithms such as t-SNE, I realized that the minimization problems that are considered in the dimension reduction algorithms has a structure which is similar but different to the optimal transportation problem. It had double integral with respect to the same measure which turns out to generate quadratic dependency on the solution. QOT has very clear motivation from the data science, but yet studied only for a very specific case which is called Gromov-Wasserstein distance. I believe that studying QOT in some generality is worth.

Awards and Fellowships

- Silver prize in University Students Contest of Mathematics (33rd, 34th)
  Korea Mathematical Society (KMS)
  Korea Institute for Advanced Study (KIAS)
  2014 (33rd), 2015 (34th)
- College Scholarship (Undergraduate)
  Hong Ik University
  2014 (FS), 2015 (SS, FS), 2016 (SS)
- University fellowship (Graduate)
  Michigan State University
  2017(Summer)

Seminar talks

- Partial Regularity of Solutions of the Monge-Ampère Equations

Student PDE Seminar, MSU, 2018

- Underlying Geometry of Optimal Transport

  Student Geometry/Topology Seminar, MSU, 2020

- Strong MTW condition to local Hölder regularity in generated Jacobian equations

  MPHA Seminar, TAMU, 2020

- Equivalence of the synthetic MTW conditions

  CMS winter meeting Optimal transport and applications session, CMS, 2020

- Introduction to optimal transportation, Monge-Ampére type equation, and applications.

  NSYSU analysis seminar, NSYSU, 2021

- Optimal transportation and Monge-Ampère type equations

  NCTS Nonlinear PDE and Analysis seminar, NCTS, 2021

- Introduction to the Optimal Transportation Problem and the Monge-Ampère equation

  Taipei Postdoc Seminar, NCTS, 2022

- Structural conditions for generated Jacobian equations

  Geometry seminar, Tokyo Metropolitan university, 2022

- Optimal transportation problems and its relation to the Monge-Ampère equations

  PDE seminar, UNIST, 2022

- Optimal Transportation problem on a convex body with a small Wasserstein distance

  NCTS Spring day, NCTS, 2023

- Boundedness of t-SNE with data points sampled from a undemanding probability measure

  NSYSU Colloquium, NSYSU, 2023

- Boundedness and Existence of a minimizer of t-SNE algorithm with mild conditions on the data points

  NCKU Colloquium, NCKU, 2024

- Optimal Transportation problem on a surface of a convex body without twisted condition.

  Workshop on optimal transport and dynamics, BIRS-CMO, 2024

- Optimal Transportation problem on a surface of a convex body without twisted condition.

  Analysis Seminar, UT Austin, 2024

- Introduction on the quadratic optimal transportation problems.

  Analysis and PDE seminar, MSU, 2024

Research preprints and Publications

- Local Hölder regularity of solutions to generated Jacobian equations

  Pure and Applied Analysis 3-1 (2021), 163–188.

  DOI 10.2140/paa.2021.3.163

- Synthetic MTW conditions and their equivalence under mild regularity assumption on the cost function

  ArXiv : 2010.14471

- Conditions for existence of single valued optimal transport maps on convex boundaries with nontwisted cost

  Calculus of Varations and Partial Differential Equations

  DOI 10.1007/s00526-025-02974-y

- Convergence analysis of t-SNE as a gradient flow for point cloud on a manifold

  ArXiv : 2401.17675

- Quadratic optimal transportation problem with a positive semi definite structure on the cost function

  ArXiv : 2408.05161

- An alternative definition for c-convex functions and another synthetic statement of the MTW condition

  ArXiv : 2505.12063