最优输运与交互作用粒子系统
Optimal transport and interacting particle systems

Instructor

Name: Lei Li *E-mail:* leili2010@sjtu.edu.cn

Personal Website: https://ins.sjtu.edu.cn/people/leili/

References

1. Optimal Transport for applied mathematicians. Filippo Santambrogio. 2010.
2. Mean Field Kinetic Equations (lecture notes online). F. Golse. 2013
3. Random batch methods (RBM) for interacting particle systems. S. Jin, L. Li, J.-G. Liu, 2020
4. A random-batch Monte Carlo method for many-body systems with singular kernels. L. Li, Z. Xu, Y. Zhao, SISC, 2020.
5. Neural Ordinary Differential Equations, R. Chen et. al., NIPS, 2018
6. Other papers that will be mentioned in the lectures.

Tentative Schedule:

There are 6 lectures in total. Each lecture lasts for about 3 hours.

- **Lecture 1**: Lagrangian formulation versus the Eulerian formulation; the Fokker-Planck equations; evolving a measure to a target distribution, and the normalizing flows.
- **Lecture 2-Lecture 3**: Optimal transport and Wasserstein distances, gradient flows in the probability measure space.
- **Lecture 4-lecture 5** Interacting particle systems, the mean-field limit and the random batch method and applications to MD simulations.
- **lecture 6** MCMC and some splitting Monte Carlo with random batch ideas for interacting particle systems.

Grading Policy

- *Homework (70%)* There will be several assignments.
- *Exam (30%)* There will be a final test.