Study meeting

Wasserstein geometry and Information geometry

Organizers: Hiroshi Matsuzoe (Nagoya Institute of Technology)
Asuka Takatsu (Nagoya University)

October 27 (Sat)-28(Sun) 2012
Room 309 in Building Science, Nagoya University

Program

October 27 (Sat)

10:00–11:30 Asuka Takatsu(Nagoya University)

A short review on the Wasserstein space over $\mathbb{R}^d$

-I give a brief survey on Wasserstein geometry over $\mathbb{R}^d$, in particular, explain how the heat flow is regarded as the Wasserstein gradient flow of the Boltzmann entropy.

13:30–15:00 Hiroshi Matsuzoe (Nagoya Institute of Technology)

A short review on conformal information geometry

-I give a brief survey on information geometry and geometry of statistical manifolds. In addition, I will talk conformal geometry of Tsallis anomalous statistics.

15:45–16:45 Jan Maas (Universität Bonn)

Gradient flows of the entropy for finite Markov chains

-Since the seminal work of Jordan, Kinderlehrer and Otto, it is known that the heat flow on R^n can be regarded as the gradient flow of the entropy in the Wasserstein space of probability measures. Meanwhile this interpretation has been extended to very general classes of metric measure spaces, but it seems to break down if the underlying space is discrete. In this talk I shall present a new metric on the space of probability measures on a discrete space, based on a discrete Benamou-Brenier formula. This metric defines a Riemannian structure on the space of probability measures and it allows to prove a discrete version of the JKO-theorem.

18:00– dinner (near Nagoya University)

-If you would like to attend the dinner, for convenience of reserving, please e-mail at takatsu @ math.nagoya-u.ac.jp until October 19 (Fri).

October 28 (Sat)

9:00–10:00 Jan Maas (Universität Bonn)

Gradient flows of the entropy in quantum probability

-I will be describe an analogue of the Wasserstein metric in a quantum mechanical setting, which defines a Riemannian structure on the space of density matrices. This allows us to interpret a fermionic Fokker-Planck equation as the gradient flow of the von Neumann entropy. This is joint work with Eric Carlen.

10:45–12:15 Atsumi Ohara (University of Fukui)

On deformation of the Legendre structures on the family of probability distributions

- The Legendre duality is one of important ingredients in both thermodynamics and information geometry (Amari and Nagaoka 2000). Recently various deformations of the duality on the family of probability distributions, such as pairs of an entropy and a Massieu function, divergences or exponential distributions are intensively studied in the field of generalized thermostatistics (Tsallis 2009, Naudts 2011). We show that such deformations can be formulated from viewpoints of the affine immersion and conformal flattening proposed by Kurose (Kurose 1994). This is a joint work with H. Matsuzoe and S. Amari.

14:00–15:30 Tatsuaki Wada (Ibaraki University)

On the κ-generalized Fokker-Planck equations

-The κ-generalized exponential proposed by Kaniadakis is another one-parameter extension different from Tsallis' q-exponential. The associated κ-Gaussian is a non-Gaussian distribution with asymptotic power-law tails. This talk explains some relations on the κ-generalized Fokker-Planck equations and the associated statistical distributions based on κ-entropy.