The 23rd Takagi Lectures

June 8 (Sat), 2019

Lecture Hall (Room No. 420)

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ABSTRACT

Shun-ichi Amari: *Information Geometry*

Information geometry has emerged from a study on invariant structure of a family of probability distributions. The invariance gives a second-order symmetric tensor g and a third order-symmetric tensor T as unique invariant quantities. A pair (g,T) defines a Riemannian metric and dual affine connections which together preserves the metric. Information geometry studies a Riemannian manifold having a pair of dual affine connections. Such a structure also arises from an asymmetric divergence function and affine differential geometry. In particular, a dually flat Riemannian manifold is important for applications, because a generalized Pythagorean theorem and projection theorem hold. Wasserstein distance gives another important geometry which is non-invariant, preserving the metric of a sample space. We try to construct information geometry of the entropy-regularized Wasserstein distance.

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Mikhail Kapranov: *Infinite-dimensional (dg)Lie algebras and factorization algebras in algebraic geometry*

Infinite-dimensional Lie algebras (such as Kac–Moody, Virasoro etc.) govern, in many ways, various moduli spaces associated to algebraic curves. To pass from curves to higher-dimensional varieties, it is necessary to work in the setup of derived geometry. This is because many feature of the classical theory seem to disappear in higher dimensions but can be recovered in the derived (cohomological) framework.

The lectures will consist of 3 parts:

(1) Review of derived geometry and of the phenomenon of "recovery of missing features".

(2) The derived analog of the field of Laurent series in n variables ("with poles at a single point"). The corresponding higher current algebras and their relation to derived moduli spaces of G-bundles (based on joint work with G. Faonte and B. Hennion).

(3) Derived Lie algebras of vector fields, their central extensions and cohomology. Role of factorization algebras in studying such cohomology (based on joint work with B. Hennion).