INFINITE-DIMENSIONAL STOCHASTIC DIFFERENTIAL EQUATIONS RELATED TO RANDOM MATRICES AND A PHASE TRANSITION CONJECTURE

HIROFUMI OSADA
KYUSHU UNIVERSITY

I give general theorems to construct natural stochastic dynamics whose unlabeled processes are reversible with respect to random point fields (RPFs) related to random matrices. I solve the infinite-dimensional stochastic equations describing the labeled diffusion process of above mentioned dynamics. These are interacting Brownian motions with log interaction potentials. Typical examples of applications of our general theorems are Dyson, Airy, and Bessel random point fields, and the Ginibre random point field. All canonical Gibbs measures with Ruelle 's class interaction potentials satisfying suitable marginal assumptions are covered by our theorems as trivial applications. Our result on Airy RPF is the first time that the associated infinite-dimensional SDE is calculated. The top particle of the infinite-dimensional SDE is the Airy process, which has been attracting much attentions and studied extensively recently. This result is a joint work with Tanemura

Moreover, I state a conjecture concerning on the phase transition of the diffusive scaling limit of tagged particles of Ginibre interacting Brownian motions. I have been working on this for a long time, but still not yet succeeded to prove this. I give mathematically rigorous results related to this conjecture and explain an observation for this. And I also show simulations that support this conjecture. These simulations have been done by Ben Said (ENSTA) based on the one due to Otobe (Shinshu university).