

Institute for Applied Mathematics, Bonn University

Oberseminar Stochastik

Thursday, 20 June 2024, 16:30

Seminarraum LWK 0.011

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A new hyperbolic sigma model

Recently, Sabot and Tarrès introduced a new type of vertex reinforced jump process: the \star -VRJP. It is defined on a directed graph $G = (\Lambda, E)$ with a special involution $\star : G \mapsto G$, which sends each vertex j to a conjugate vertex j^\star , and each edge $\langle ij \rangle$ to a reversed conjugate edge $\langle j^\star i^\star \rangle$. Much like the ordinary VRJP, the \star -VRJP is linearly reinforced according to the local time L_t of the walker X_t , but where the ordinary VRJP prefers to jump to where it has been $\mathbb{P}(X_{t+dt} = j | X_t = i, L_t) = \beta_{ij} L_t^j$, the \star -VRJP prefers to jump to the *conjugate* of where it has been $\mathbb{P}(X_{t+dt} = j | X_t = i, L_t) = \beta_{ij} L_t^{j^\star}$.

Also much like the ordinary VRJP, the \star -VRJP possesses a variety of remarkable integral identities through its "magic formula" and random Schrödinger representation. In the case of the VRJP, through its deep connection with the $\mathbb{H}^{2|2}$ hyperbolic sigma model, the existence of these identities is seen to be a consequence of supersymmetric localisation: this naturally raises the question if there exists a " \star -sigma model" counterpart to the \star -VRJP to give a similar supersymmetric explanation. In this talk, I will introduce this new hyperbolic sigma model, the $\mathbb{H}_\star^{2n+1|4m}$ -model, which is, in a sense, a complexification of the ordinary $\mathbb{H}^{m|2m}$ -model, and will present several new isomorphism theorems which connect it to the \star -VRJP. Joint work with Sabot and Tarrès.