Beitrag ID: **9** Typ: **Talk**

Understanding diffusion models by Feynman's path integral

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Diffusion models have emerged as powerful tools in generative modeling, especially in image generation tasks. In this talk, we introduce a novel perspective by formulating diffusion models using the path integral method introduced by Feynman for describing quantum mechanics. We find this formulation providing comprehensive descriptions of score-based diffusion generative models, such as the derivation of backward stochastic differential equations and loss functions for optimization.The formulation accommodates an interpolating parameter connecting stochastic and deterministic sampling schemes, and this parameter can be identified as a counterpart of Planck's constant in quantum physics. This analogy enables us to apply the Wentzel-Kramers-Brillouin (WKB) expansion, a well-established technique in quantum physics, for evaluating the negative log-likelihood to assess the performance disparity between stochastic and deterministic sampling schemes.

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