Contribution ID: **33** Type: **not specified**

Search as (quantum) selforganized process

Thursday, June 15, 2023 11:00 AM (40 minutes)

Efficient retrieval of information is a core operation in the world wide web, it is essential for the sustainance fof living organism. Search dynamics, moreover, is a paradigm for optimization algorithms: Searches permeate our everyday life. Inspired by the food search dynamics of a living organism, the Physarum polycephalum, we analyse the role of noise in finding the optimal path on a graph with multiple constraints and where the weight of the edges connecting the nodes is a dynamical variable. The network dynamics results from the interplay between a nonlinear function of the flow, dissipation, and Gaussian, additive noise. At a finite value the noise amplitude, the network selforganizes in the most robust topology with a resonant-like behavior. This specific topology maximizes the transport efficiency, it is reached with the maximal convergence rate, and it is not found by the noiseless dynamics. We argue that this dynamics is a manifestation of noise-induced resonances in network self-organization. Drawing from this knowledge, we then discuss the perspectives of designing quantum search algorithms that are assisted by stochastic dnamics.

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