ICFO

ALUMNI SEMINAR: : Quantum circuit synthesis with diffusion models

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15:00 to 16:00
Seminar Room

Quantum computing has recently emerged as a transformative technology. Yet, its promised advantages rely on efficiently translating quantum operations into viable physica realizations. In this talk, I will show how to use generative machine learning model , specifically denoising diffusion models (DMs), to facilitate this transformation. Leveragi g text-conditioning, we steer the model to produce desired quantum operations wit in gate-based quantum circuits. Notably, DMs allow to sidestep during training the exponen ial overhead inherent in the classical simulation of quantum dynamics-a consistent bottlene k in preceding ML techniques. We demonstrate the model's capabilities across two t sks: entanglement generation and unitary compilation. The model excels at generati g new circuits and supports typical DM extensions such as masking and editing to, for in tance, align the circuit generation to the constraints of the targeted quantum device. Giv n their flexibility and generalization abilities, we envision DMs as pivotal in quantu circuit synthesis, enhancing both practical applications but also insights into theoretica quantum computation.

Hosted by: Prof. Dr. Maciej Lewenstein