Beitrag ID: **21** Typ: **Talk**

Building an AI generator for quantum gravity

Mittwoch, 12. November 2025 15:30 (30 Minuten)

Modern physics rests on two pillars: quantum mechanics which governs the microscopic world and general relativity which describes gravity and the structure of spacetime. Yet, these two pillars are fundamentally incompatible. String theory provides a promising way forward in unifying quantum mechanics with gravity, but it comes at a price of having an enormous number of solutions. The vastness of solutions stems from the multitude of choices for the internal space on which string theory is compactified, and additional structures (e.g. fluxes and branes) on these internal spaces. We do not know how many topologically distinct internal manifolds there are. Even for tractable subsets such as toric Calabi-Yau constructions, only upper bounds are known—rendering exhaustive searches infeasible, as brute-force enumeration would exceed the age of the universe. In this talk, I will present a transformer-based generative model capable of producing new Calabi–Yau manifolds with efficient and unbiased sampling. The model can self-improve through iterative retraining on its own high-quality outputs, offering a scalable approach to exploring quantum gravity. This talk is based on arXiv:2507.03732 [hep-th] and a companion community-driven platform for AI-assisted research in quantum gravity known as AICY.

Vortragende(r): SHIU, Gary (University of Wisconsin-Madison)

Sitzung Einordnung: Plenary