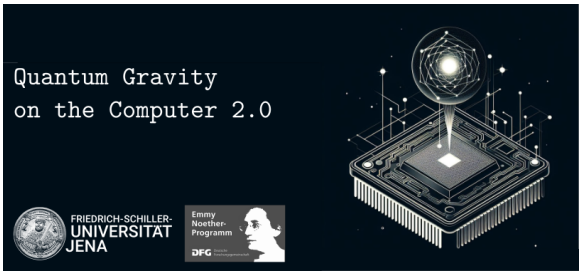

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Cosmological Dynamics from Covariant Loop Quantum Gravity with Scalar Matter

Tuesday 10 September 2024 15:00 (1 hour)

We numerically study homogenous and isotropic quantum cosmology using the spinfoam formalism of Loop Quantum Gravity (LQG). We define a coupling of a scalar field to the 4-dimensional Lorentzian Engle-Pereira-Rovelli-Livine (EPRL) spinfoam model. We employ the numerical method of complex critical points to investigate the model on two different simplicial complexes: the triangulations of a single hypercube and two connected hypercubes. We find nontrivial implications for the effective cosmological dynamics. In the single-hypercube model, the numerical results suggest an effective Friedmann equation with a scalar density that contains higher-order derivatives and a scalar potential. The scalar potential plays a role similar to a positive cosmological constant and drives an accelerated expansion of the universe. The double-hypercubes model resembles a symmetric cosmic bounce, and a similar effective Friedmann equation emerges with higher-order derivative terms in the effective scalar density, whereas the scalar potential becomes negligible.

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