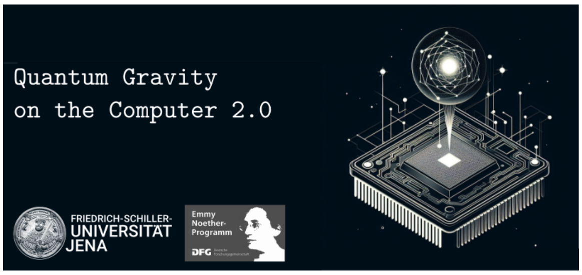

Contribution ID: **5** Type: **not specified**

Towards the phase structure of the Barrett-Crane GFT model for 4d Lorentzian quantum gravity

Monday 9 September 2024 15:00 (1 hour)

The Barrett-Crane (BC) spin foam and GFT model is a state-sum model which provides a tentative quantization of first order Lorentzian Palatini gravity written as a constrained BF-theory. It is conjectured that this model gives rise to continuum spacetime with General Relativity as an effective description for the dynamics at criticality via phase transition. In this talk, we discuss how phase transitions in this model can be studied using Landau-Ginzburg mean-field theory. We demonstrate this by restricting the building blocks of the model such that the Feynman diagrams are dual to spacelike triangulations and then show how this is generalized when arbitrary Lorentzian building blocks are incorporated. As a main result, we demonstrate that the mean-field approximation of a phase transition towards a non-trivial condensate state can always be realized. In particular, we show that the critical behavior is entirely driven by spacelike faces which are characterized by the boost part of the Lorentz group. In contrast, timelike faces do not play a role in this as they are characterized by the rotational and thus compact part of the Lorentz group. Since such a state is typically populated by a large number of GFT quanta, our work lends further considerable support to the existence of a sensible continuum gravitational regime for causally complete GFT models. Finally, we note that this setting paves also the way for the analysis of the phase structure of this model via functional renormalization group techniques in future research. This work is based on arXiv:2112.00091, arXiv:2206.15442, arXiv:2209.04297 and arXiv:2211.12768, arXiv:2305.06136, arXiv:2404.04524 and arXiv:2407.02325.

Presenter: PITHIS, Andreas (FSU Jena)