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Towards the phase structure of first order Lorentzian Palatini gravity via Group field theory

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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. Its completion in terms of spacelike, timelike and lightlike components has only recently been accomplished. 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. In a first step, we demonstrate this by restricting the building blocks of the complete model such that the Feynman diagrams are dual to spacelike triangulations. This setting lays the groundwork to study the critical behavior when arbitrary Lorentzian building blocks are incorporated and also paves the way for the analysis of the phase structure of the complete 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.

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