

# Bifurcations and Chaos in Hořava-Lifshitz Cosmology

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## Abstract

The nature of generic spacelike singularities in general relativity (such as the Big Bang) is connected with *first principles*, notably Lorentzian causal structure, scale invariance and general covariance. To bring a new perspective on how these principles affect generic spacelike singularities, we consider the initial singularity modeled by an ordinary differential equation (ODE) that describes spatially homogeneous Bianchi type VIII and IX vacuum models in Hořava-Lifshitz gravity, where relativistic first principles are replaced with anisotropic scalings of Lifshitz type and thereby the aforementioned ODE is perturbed by a parameter. Within this class of models, General Relativity is shown to be a bifurcation where chaos becomes generic. To describe the chaotic features of generic singularities in Hořava-Lifshitz cosmology, we introduce symbolic dynamics within Cantor sets and iterated function systems in a billiard-like game.

## References

- [1] J. Hell, P. Lappicy and C. Ugla, Bifurcations and Chaos in Hořava-Lifshitz Cosmology, *Submitted*, <https://arxiv.org/abs/2012.07614>, 91 pages, (2020).

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