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Ricardo Campos, Homotopical relations between commutative, associative and Lie algebras

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Résumé : The forgetful functor from commutative algebras to associative algebras is fully faithful, but this is no longer the case if we consider these objects homotopically, where commutativity should be seen as structure, not property.
Studying properties of this functor helps answering the question in rational homotopy theory of how much of the homotopy type of a space is captured by its algebra of singular cochains? (The experienced homotopy theorist will tell you to consider instead a commutative algebra of forms.) This is surprisingly related to the isomorphism problem for universal enveloping algebras of Lie algebras.
We show that in characteristic zero, these functors satisfy homotopical faithfulness, as well as some sort of injectivity on quasi-isomorphism type of objects. This is in essence a result in deformation theory which is naturally addressed with tools from higher Lie theory and the operadic calculus.
This joint work with Dan Petersen, Daniel Robert-Nicoud and Felix Wierstra; based on arXiv:1904.03585 and 2211.02387.