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A categorical characterisation of Lie algebras

In this talk we describe varieties of Lie algebras via *algebraic exponentiation*, a concept introduced by Gray in his Ph.D. thesis [3]. For $\mathbb{K}$ a field of characteristic zero, we prove that the variety of Lie algebras over $\mathbb{K}$ is the only non-abelian variety of non-associative $\mathbb{K}$-algebras which is *locally algebraically cartesian closed* (LACC). Moreover, if we allow n-ary operations instead of binary, the result still holds, i.e., a non-abelian variety of n-algebras $\mathcal{V}$ is (LACC) if and only if $n = 2$ and $\mathcal{V} = \mathsf{Lie}_{\mathbb{K}}$. This result became the first computer assisted proof in categorical algebra.

References:

[1] X. García-Martínez and T. Van der Linden, A characterisation of Lie algebras via algebraic exponentiation, preprint arXiv:1711.00689, 2017.

[2] X. García-Martínez and T. Van der Linden, A characterisation of Lie algebras amongst alternating algebras, preprint arXiv:1701.05493, 2017.

[3] J. Gray, Algebraic exponentiation in general categories, Ph.D. thesis, University of Cape Town.

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