On formal deformations of evolution algebras

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Abstract.

Deformation theory was introduced by Gerstenhaber in [1] for associative algebras and later extended to other algebraic structures, especially Lie algebras, by Nijenhuis and Richardson in [3]. Roughly speaking, a deformation of an algebraic structure $\mathcal{A}$ with multiplication μ consists of constructing a family of new multiplications

$$\mu_t = \mu + \sum_{i \geq 1} \mu_i t^i$$

on the formal power series space $\mathcal{A}[[t]]$, where each μ_i is a bilinear map on $\mathcal{A}$. The purpose of deformation theory is to understand how these new multiplications modify and enrich the original algebraic structure.

In this poster, we focus on our investigation [2] concerning deformations of *evolution algebras*, a class of commutative non-associative algebras introduced by Tian and Vojtěchovský in [4] in connection with non-Mendelian genetics.

References

[1] M. Gerstenhaber, *On the deformation of rings and algebras*, Ann. of Math. 79 (1964), 59–103.

[2] A. Makhlouf and A. Pérez-Rodríguez, *On formal deformations and degenerations of evolution algebras*, preprint arXiv:2512.07002 (2025).

[3] A. Nijenhuis and R. W. Richardson, Jr., *Deformations of Lie algebra structures*, J. Math. Mech. 17 (1967), 89–105.

[4] J. P. Tian and P. Vojtěchovský, *Mathematical concepts of evolution algebras in non-Mendelian genetics*, Quasigroups Related Systems 14 (2006), 111–122.