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Polypytch varieties

Toric degenerations allow the combinatorial techniques of toric geometry to be applied to more general projective varieties. Escobar and Harada have defined a notion of wall-crossing in this context, where the moment polyhedra of different toric degenerations are connected by piecewise linear maps. Similar phenomena appear in the work of Rietsch and Williams, and Bossinger, Cheung, Magee, and Nájera Chávez on Newton-Okounkov bodies associated to compactifications of cluster varieties. In these settings, the piecewise linear maps reflect important aspects of the geometry and combinatorics of the associated variety. With Laura Escobar and Megumi Harada, we wrap the data of a collection of lattices related by piecewise-linear bijections together into a single semi-algebraic object, equipped with its own semialgebraic geometry, and notions of convexity and polyhedra. A generalized notion of a polyhedral fan in this setting then encodes compactifications of a certain affine variety. Various aspects of the geometry of this compactification can then be computed combinatorially. This is joint work with Escobar, Frias Medina, Harada, and Magee.