TANGENT ∞-CATEGORIES AND GOODWILLIE CALCULUS

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In 1984 Rosický introduced tangent categories in order to capture axiomatically some properties of the tangent bundle functor on the category of smooth manifolds and smooth maps. Starting in 2014 Cockett and Cruttwell have developed this theory in more detail to emphasize connections with cartesian differential categories and other contexts arising from computer science and logic.

In this talk I will discuss joint work with Kristine Bauer and Matthew Burke which extends the notion of tangent category to ∞-categories. To make this generalization we use a characterization by Leung of tangent categories as modules over a symmetric monoidal category of Weil-algebras and algebra homomorphisms. Our main example of a tangent ∞-category is based on Lurie's model for the tangent bundle to an ∞-category itself. Thus we show that there is a tangent structure on the ∞-category of (differentiable) ∞-categories. This tangent structure encodes all the higher derivative information in Goodwillie's calculus of functors, and sets the scene for further applications of ideas from differential geometry to higher category theory.