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Weil algebras and Smoothology

There is no known category of manifolds that is cartesian closed, yet there have been various generalizations of manifolds that are: diffeological spaces (Souriau), differential spaces (Sikorksi), Frölicher spaces, and Weil spaces (Bertram, Dubuc, Nishimura).

In this talk, we will explore these categories of generalized smooth spaces from the point of view of Weil algebra actions. Leung's theorem says that to have a tangent structure is to have a Weil-actegory structure that interacts well with transverse limits. We will then show how to extract a cartesian closed tangent category from each of these settings together with a coherence that allows two features: the categories admit a model of the differential lambda-calculus of Ehrhard-Regnier, and the categories have a cartesian closed embedding into a representable tangent category, extending a result of Garner.