MATT BURKE, University of Calgary
The Calculus of Infinity Functors and Tangent Categories

In classical calculus we approximate an appropriately differentiable function using a sequence of simpler functions called the Taylor polynomials. In an analogous way the functor calculus describes how to approximate a functor whose domain and codomain are appropriately topological by using a sequence of simpler functors. Since its introduction by Goodwillie several different variants of the functor calculus have been studied. A first step towards the unification of some these variants was made in the paper [1] which constructs a directional derivative in the calculus of functors that satisfies all the axioms for being a Cartesian differential category. Cartesian differential categories [2] provide an axiomatisation of the salient features of differentiable functions between Euclidean spaces.

In this talk we describe an ongoing project to formulate the fundamental parts of the Goodwillie calculus in terms of a tangent structure on the category of presentable infinity categories. A tangent structure on a category is an axiomatisation of the tangent bundle functor on the category of smooth manifolds that was introduced by Rosicky in 1984 and further extended in [3]. This work is part of a joint project with Kristine Bauer and Michael Ching.

[1] Bauer, Johnson, Osborne, Riehl, Tebbe. Directional derivatives and higher order chain rules for abelian functor calculus. Topology Appl. 235 (2018), 375–427.

[2] Blute, Cockett, Seely. Cartesian differential categories. Theory Appl. Categ. 22 (2009), 622–672.

[3] Cockett, Cruttwell. Differential structure, tangent structure, and SDG. Appl. Categ. Structures 22 (2014), no. 2, 331–417.