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*Curvature and torsion without negatives*

A tangent category abstracts settings in which each object has an associated “tangent bundle”. Examples range from standard settings for differential geometry (smooth manifolds, infinite-dimensional manifolds, synthetic differential geometry) to algebraic geometry (schemes) to computer science (Cartesian differential categories) and to homotopy theory (Abelian functor calculus, potentially Goodwillie functor calculus). One advantage of this abstraction is that it captures settings which have a tangent bundle but may not have negation of tangent vectors.

In the past several years, there has been a lot of development of differential geometric ideas within a tangent category: definitions have been given for the Lie bracket, vector bundles, connections, differential forms, and de Rham cohomology. However, in a few cases, these definitions have required the assumption that one could negate tangent vectors, reducing the applicability of those definitions from the full range of settings mentioned above.

In particular, the previously given definitions of curvature and torsion in this setting required negatives. In this talk, I’ll show how to define curvature and torsion in this abstract setting without requiring the existence of negatives, leading to their applicability in a wider variety of examples.