

# Some recent advances in Synthetic Differential Geometry

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Some of these recent advances have been connected with aspects of the *neighbour relation*, deriving from the “first neighbourhood of the diagonal”, as known from algebraic geometry.

The neighbour relation gives rise to a simplicial set, and hence to “combinatorial differential forms” in the sense of the author, and of Breen and Messing. But the neighbour notion also gives rise to a *cubical set*, consisting of “infinitesimal parallelepipeda”. This cubical set provides an alternative basis for a theory of combinatorial differential forms, which is well suited to be generalized into a theory of higher connections with values in multiple groupoids.

For instance, the curvature of a 1-connection in a groupoid is a (flat) 2-connection in the associated double groupoid.

The tool behind the construction of infinitesimal parallelepipeda is the possibility of forming affine combinations of mutual neighbour points in a manifold.