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Compositories and gleaves

Sheaves are objects of a *local* nature: a global section is determined by how it looks locally. Hence, a sheaf cannot describe mathematical structures which contain global or nonlocal geometric information. We introduce the notion of *gleaf* as a presheaf together with a certain additional piece of data. In contrast to sheaves, gleaves can describe geometric structure of a global nature. The prototypical example is the gleaf of (pseudo-)metrics over a set: assigning to every subset the collection of pseudometrics on that subset is a presheaf which turns out to be a gleaf in a natural way.

Moreover, we describe a related notion of higher category called *compository*. A compository is a simplicial set in which an m -simplex and an n -simplex can be composed along a common k -simplex, and the composite is an $(m + n - k)$ -simplex. There is a multitude of examples of such structures: nerves of categories, compositories of higher spans in categories, compositories constructed in terms of gleaves, and compositories of joint probability distributions of random variables.

This is joint work with Tobias Fritz; a working draft of the associated paper is available at: <http://perimeterinstitute.ca/personal/tfritz/compositories.pdf>.