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Examples of Orthogonal Factorization Systems for Double Categories

Double categories enable us to consider two types of arrows between objects as part of one structure. For instance, ring homomorphisms and modules, or ordinary arrows and spans of arrows. Typically, one types of arrows, the *tight* arrows, composes with strict identities and associativity, whereas the other type of arrows, the *loose* arrows, composes with weak identities and associativity. The connection between the two structures is given through double cells, which come with a tight and loose composition.

In this talk I will introduce orthogonal factorization systems for double categories as pairs of suitably compatible factorization systems on the category of tight arrows and on the category of double cells, with loose arrows as objects and tight composition. The focus of the talk will be on examples of such factorization systems and ways to construct double orthogonal factorization systems that extend a given orthogonal factorization system on the tight arrows of the double category.

Specifically, we will consider the double categories of paths in a 2-category, the double category of spans in a category with pullbacks, the double category of relations (on sets) and if time permits the double category of rings with ring homomorphisms and modules.