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A glance at some aspects of 2-dimensional categorical algebra

This survey mini course is (dis)organized in four (almost disconnected) parts.

In the first part, I will report on some recent works by Bourke, Garner and Lack where ideas coming from the nineties culminate in a very general notion of regularity and exactness for 2-categories.

In the second part, I will adopt the point of view of symmetric categorical groups and 2-dimensional factorization systems therein, which leads to Dupont notion of abelian groupoid-enriched category.

In the third part, I will propose a notion of equivalence relation suitable for groupoid-enriched categories and slightly different from that arising in the first part.

In the fourth part, I will move towards the semi-abelian world, giving some examples of the interplay between groups, categorical groups, and groupoids internal to a protomodular category.