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Cartesian Linearly Distributive Categories: Revisited

Linearly distributive categories (LDC) were introduced by Cockett and Seely as alternative categorical semantics for multiplicative linear logic, taking conjunction and disjunction as primitive notions. Given that a LDC has two monoidal products, it is natural to ask when these coincide with categorical products and coproducts. Such LDCs, known as cartesian linearly distributive categories (CLDC), were introduced alongside LDCs. Initially, it was believed that CLDCs and distributive categories would coincide, but this was later found not to be the case. Consequently, the study of CLDCs was largely abandoned. In this talk, we will revisit the notion of CLDCs, demonstrating strong structural properties they all satisfy and investigating two key classes of examples: bounded distributive lattices and semi-additive categories. Additionally, we re-examine a previously assumed class of CLDCs, the Kleisli categories of exception monads of distributive categories, and show that they do not, in fact, form CLDCs.