Quantum Computing Seminar

Symmetric Monoidal Categories (II)

By

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Abstract: The structure involved in a symmetric monoidal category is very broad, which is of benefit to the general theory. However, quantum mechanics, which is typically formulated using Hilbert spaces, requires substan tially more structure than is present in an arbitrary SMC. In particular, the notions of conjugation and transpose are of key import in the study of quantum mechanics. In this talk, we introduce dagger structures on categories, and dagger SMCs, which axiomatize some of the necessary structure (Primary reference: [1, §4.3], secondary reference: [2,§2.3.1]). We then discuss internal mapping objects and compact closed categories (Primary reference: [1.§4.3], secondary references: [2,§3.4], [3]). We motivate these definitions for the features of the category of finite dimensional Hilbert Spaces, and provide other examples throughout.

References:
1. Abramsky, Samson, and Bob Coecke. Categorical quantum mechanics. Handbook of quantum logic and quantum structures 2 (2009): 261-325.
2. Heunen, Chris, and Jamie Vicary. Categories for Quantum Theory: an introduction. Oxford University Press, 2019.
3. Brian Day Note on compact closed categories. (doi: 10.1017/S1446788700020334).

Date: Friday, March 1, 2024
Time: 14:00
Place: SA141 - Mathematics Seminar Room & ZOOM

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