



Quantum Computing Seminar

Complete Positivity

By

Selman Ipek
(Bilkent University)

Abstract: To handle a theory of mixed states — essential to the study of quantum mechanics — it is necessary to consider completely positive maps in a compact closed dagger monoidal category \mathcal{C} . We will define mixed states and completely positive maps, and show how this leads to the construction of a category $\text{CP}(\mathcal{C})$, whose objects are certain Frobenius algebras in \mathcal{C} , and whose morphisms are completely positive morphisms. We will then discuss how both classical statistical mechanics and quantum mechanics can be expressed in the category $\text{CP}(\mathcal{C})$.

References:

1. Heunen, Chris, and Jamie Vicary. Categories for Quantum Theory: an introduction. Oxford University Press, 2019. Chapter 7
2. Selinger, Peter. Dagger Compact Closed Categories and Completely Positive Maps. Electronic Notes in Theoretical Computer Science 170 (2007) 139–163
3. Coecke, Bob and Heunen, Chris. Pictures of complete positivity in arbitrary dimension. Information and Computation 250 (2016) 50–58

Date: Friday, May 3, 2024

Time: 14:00

Place: ZOOM

To request the event link, please send a message to selman.ipek@bilkent.edu.tr