



# Quantum Computing Seminar

## ZX calculus

By

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**Abstract:** Several quintessentially quantum notions, such as no-cloning, no-deleting, as well as classical and complementary structures can be made precise in the categorical approach to quantum mechanics. The so-called ZX calculus consists of two complementary classical structures on an underlying object in a compact dagger category. Many quantum gates used in quantum computation have natural representations in the ZX-calculus. In this talk we will give the main definition of the ZX-calculus and highlight interesting aspects of the formalism; e.g., ZX-calculus is sound and (approximately) universal for quantum computation. Time permitting, we will make connections to the measurement-based model of quantum computation.

References:

1. Heunen, Chris, and Jamie Vicary. Categories for Quantum Theory: an introduction. Oxford University Press, 2019. Chapter 6
2. Coecke, Bob, and Ross Duncan. Interacting quantum observables: categorical algebra and diagrammatics. New J. Phys (13), 2011. arXiv: 0906.4725
3. Duncan, Ross. A graphical approach to measurement-based quantum computing. arXiv preprint arXiv:1203.6242, 2012.

**Date:** Friday, April 26, 2024

**Time:** 14:00

**Place:** SA141 - Mathematics Seminar Room & ZOOM

To request the event link, please send a message to [selman.ipek@bilkent.edu.tr](mailto:selman.ipek@bilkent.edu.tr)