February 6-10,2023: Quantum Computing, Quantum Machine Learning and Quantum Information Theories

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Spectral Decomposition, Measurements and Density matrices

1. Density matrices and Measurements

2. Video of lecture

- Teaching material in different formats
- **Reading recommendation**: Scherrer, Mathematics of Quantum Computations, chapters 2 and 3

Introduction

In order to study entanglement and why it is so important for quantum computing, we need to introduce some basic measures and useful quantities. These quantities are the spectral decomposition of hermitian operators, how these are then used to define measurements and how we can define so-called density operators (matrices). These are all quantities which will become very useful when we discuss entanglement and in particular how to quantify it. In order to define these quantities we need to remind ourselves about some basic linear algebra properties of hermitian operators and matrices.

Basic properties of hermitian operators

Spectral Decomposition.

Measurements

Density matrices/operators