Dott. Luis Andres Colmenarez Gomez

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Thursday, 23 November 2023: 2:00 p.m.

Aula seminari grande - Palazzina B
via alla Cascata 56 C

BEC seminar: Coherent information as practical tool for obtaining optimal thresholds of quantum error correcting codes

Abstract

Quantum error correcting codes protect quantum information from decoherence as long as they are operating under a threshold error rate. In general, obtaining optimal thresholds implies simulating the error correction procedure using complicated decoding strategies. In a few cases, optimal decoding can be framed as a phase transitions in disorder classical spin models. In both situations, accurate estimation of thresholds demands intensive computational resources. In this work we use the coherent information of the noisy mixed-state for estimating accurately quantum error correction thresholds from small codes at moderate computational cost. We show the effectiveness of our method by applying it to the surface and color code under bit-flip and depolarizing noise. Then we extend the coherent information to phenomenological and circuit level noise settings. In all examples we obtain accurate estimates of optimal thresholds from small instances of the codes. We propose the coherent information as a reliable competitive tool for the calculation of optimal thresholds in relevant codes and error models.

This initiative is part of the European Project EU

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