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Lower bounds of the success probability in quantum state exclusion for general ensembles

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The dumbest people I know are those who know it all.

Malcolm S. Forbes

Abstract

Given a quantum state known to be prepared from an ensemble of two or more states, quantum state exclusion aims to rule out the possibility that it was prepared in a particular state from the ensemble. Using the known solution for group generated ensembles [1], we study this result as a lower bound for randomly generated ensembles via semidefinite programming.

Keywords: *SDP, Quantum state exclusion , Add keywords.*

I INTRODUCTION

In many real-world scenarios, excluding a certain hypothesis can be more practical than solving the problem entirely. For instance, in disease diagnosis, ruling out potential diseases often serves as the first step in identifying the actual condition. Similarly, when repairing a machine, it is sometimes more efficient to identify the components that are functioning correctly, which narrows down the search for the faulty part.

In this project, we adapt this concept to the quantum domain, focusing on the exclusion of quantum states. Rather than directly determining the exact state of a quantum system, we explore the process of eliminating states from a known ensemble, which may be more suitable or efficient in certain quantum applications.

In some daily problems the exclusion of a certain hypothesis is more suitable than the actual solution of the matter. For instance, in disease diagnosis, discarding potential diseases is usually the first approach to the sickness, or when repearing a machine is some times preferable to know the parts of the machine that work as expected to start to look for a problem. In this project we transport this idea to the quantum realm, the exclusion of quantum states.

REFERENCES

[1] Arnau Diebra, Santiago Llorens, Emili Bagan, Gael Sentís, and Ramon Muñoz-Tapia. Quantum state exclusion for group-generated ensembles of pure states, 2025.