2022-04-13

Information Theoretic Error Bounds on NISQ Learning Systems

B.Tech Project I

Sankalp Gambhir

Advisor **Prof. Sai Vinjanampathy**

Email sgambhir@iitb.ac.in

Abstract In this report, we review the classical classification problem, common techniques to solve it, then identify computational bottle necks. We introduce and review Variational Quantum Algorithms (VQA), which form a model of computation on Noisy Intermediate-Scale Quantum (NISQ) computers, to perform relevant computation on quantum computers instead. We present a mathematical review of the structure of involved spaces, and discuss the constraints on computational precision imposed by the architecture. Finally, we discuss these information-theoretic bounds from contexts in optimal control to generalize them to VQAs, and present a resulting bound on Quantum Support Vector Machines (QSVMs).

Contents

1 Introduction 2
2 Preliminaries 2
3 Variational Quantum Algorithms 2
4 Information Theoretic Limits 2
5 Conclusion and Future Work 2

1 Introduction

2 Preliminaries

3 Variational Quantum Algorithms

4 Information Theoretic Limits

5 Conclusion and Future Work

Acknowledgements