Resources Estimation for Quantum Computing Algorithms in Multiple Physical Platforms

Cesar Zaragoza Cortes

A dissertation
submitted in partial fulfillment of the
requirements for the degree of

Master of Science

University of Washington

2021

Reading Committee:

Program Authorized to Offer Degree:

Physics

Chapter 1

INTRODUCTION

*Write something

Limitations on current NISQ[1] technology...

1.1 The Purpose of This Thesis

This thesis...

1.2 Conventions and Notations

In this thesis...

[1]See, for example, John Preskill[1] for a recent discussion.

BIBLIOGRAPHY

[1] John Preskill. Quantum computing in the nisq era and beyond. *Quantum*, 2:79, Aug 2018.

Appendix A

BERNSTEIN-VAZIRANI Q# IMPLEMENTATION

The following code presents a simple implementation of the Bernstein-Vazirani algorithm in the Q# programming language:

```
namespace Quantum.BernsteinVazirani {

    open Microsoft.Quantum.Arrays;
    open Microsoft.Quantum.Canon;
    open Microsoft.Quantum.Intrinsic;

    @EntryPoint()
    operation BernsteinVazirani () : Unit {
        Message("Bernstein-Vazirani");
        let secret = [One, Zero, One, One, Zero];
        use (qubits, aux) = (Qubit[Length(secret)], Qubit()) {
            X(aux);
            H(aux);
            ApplyToEach(H, qubits);

            // Oracle.
            for index in 0 .. Length(qubits) - 1 {
                if (secret[index] == One){
                    CNOT(qubits[index], aux);
                }
```

```
            }

            ApplyToEach(H, qubits);
            let results = ForEach(M, qubits);
            ResetAll(qubits);
            Reset(aux);
        }
    }
}
```