1 Introduction

With the advent of quantum computing, the field of quantum machine learning has seen a surge in interest within the field. Theoretically, quantum computers already outperform classical computers in certain tasks, and new algorithms are continually developed to exceed their classical counterparts. The field of machine learning is a massive field that has taken the world by storm the last decade, and the combination of quantum computing and machine learning is a natural progression. In this project, we will explore the basics of quantum machine learning, and how quantum circuits can be used to classify data.

One area where quantum machine learning could prove useful is for classification purposes, where the goal is to predict the class of a given input data point. This is due to the nature of measurements in a circuit translates to probabilities, which is a natural fit for classification tasks. In this report, we will explore the Iris dataset [**misc˙iris˙53**], one of the earliest and most well-known datasets for evaluating classification algorithms.

We will employ a simple quantum circuit for data classification, utilizing qubit-based data encoding and a quantum circuit ansatz with adaptable parameters for making predictions. The framework will be implemented in Python, leveraging the Qiskit library for quantum computing and the Scikit-learn library for classical machine learning. This report will cover the theoretical background of quantum machine learning in the theory section **??**, followed by the implementation details of the quantum circuit and classical optimizer in method & impleentation section **??**. The result section **??** will present the project outcomes, with an analysis of the results and methods used, before we conclude our findings and provide some final insights on quantum machine learning section **??**.