Assignment Lecture 1
Encoding

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Abstract

In this assignment you will be creating quantum circuits to convert classical to quantum data. Three encoding patterns, i.e. basis, angle and amplitude encoding, will be used in three different exercises.

Introduction

Guidelines for this assignment:

- This exercise is done by a team of two students.
- The deadline for submitting the exercise is a week after the assignment is issued.
- You will create a Jupiter notebook for each exercise and hand in this notebook.
- In the notebook you will give ample comments on what you are doing and why.
- You will use Qiskit as a simulation tool.

1 Basis encoding

1.1 Excercise 1a

Encode the following numbers using the basis encoding pattern:

- 2,
- 3,
- 5,
- 7,

- 11,
- 13,
- 17,
- 19,
- 23,

1.2 Excercise 1b

How would you encode a negative number?

1.3 Excercise 1c

Is it possible to encode multiple numbers in one go?

2 Angle encoding

Encode the following numbers using the angle encoding pattern:

- 29,
- 31,
- 37,
- 41,
- 43,
- 47,
- 53,
- 59,

3 Amplitude encoding

Encode the following numbers using the amplitude encoding pattern:

- 61,
- 67,
- 71,
- 73,
- 79,
- 83,

- 89,

- 97

Use *'qc.prepare_state(state, qubits)'* as a method to create the gates needed for this encoding, where

- *qc* is the QuantumCircuit

- *state* is the list with the amplitudes

- *qubits* is the list of qubits

4   Uniform Superposition

Create a notebook which implements the Uniform Superposition pattern found at Quantum patterns.