(a)

(b)

(c)

(d)

(e)

algo2qpu

Algorithm: Quantum Classifier

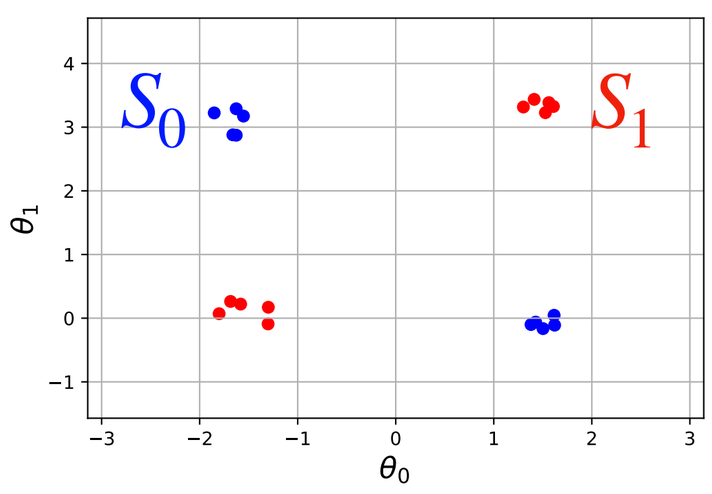
Training set with label 0,1: S_0, S_1

Given encoding $E(\boldsymbol{\theta})$ of classical data $\boldsymbol{\theta}$ and a parametrized circuit $U(\mathbf{w})$

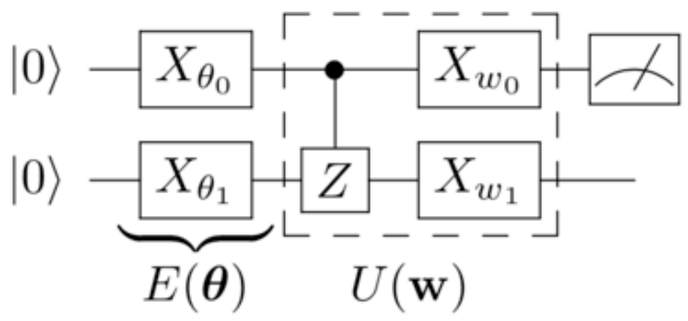
For data point i , Probability of measuring 0,1 in the top qubit: $p_0^{(i)}, p_1^{(i)}$

Objective function: $\min \sum_{i \in S_0} \log p_1^{(i)} - \sum_{i \in S_1} \log p_1^{(i)}$

Training set

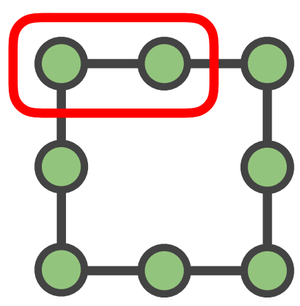


Instance: 2-qubit circuit



Abstract/pre-compiled circuit

Circuit Compilation



$q_0 \rightarrow 0$

$q_1 \rightarrow 1$

Qubit mapping

Gate depth: 9

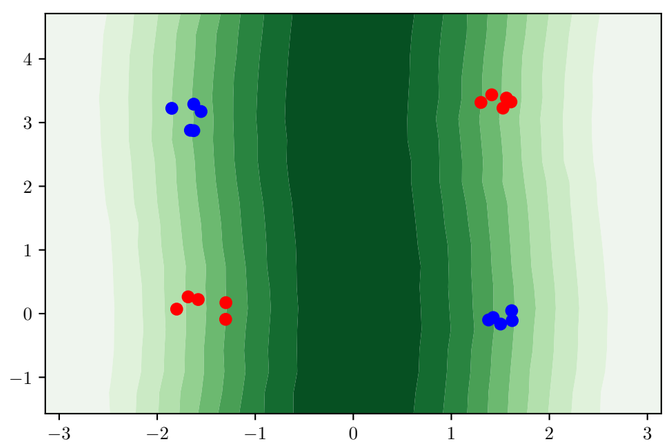
```
RZ(pi/2) 0
RX(pi/2) 0
RZ(0.1) 0
RX(-pi/2) 0
⋮
```

Gate compilation

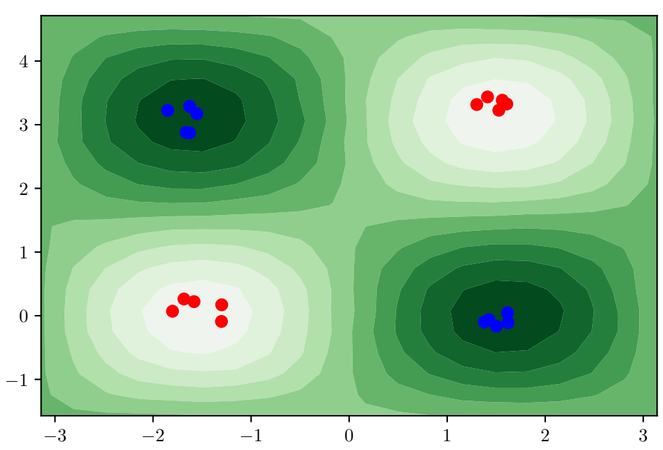
Circuit Execution on QVM and/or QPU

Post-process & Storage

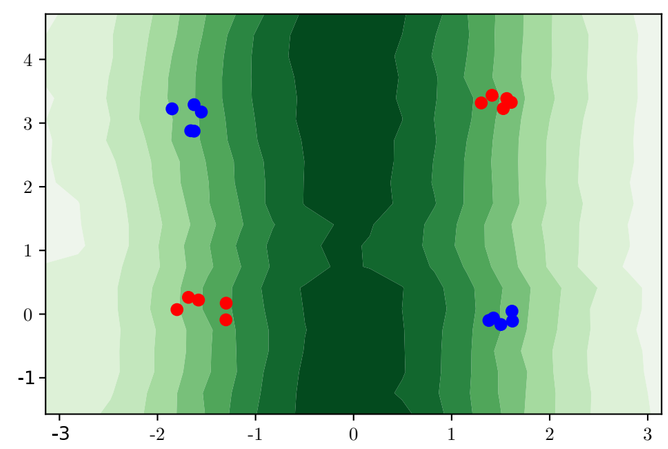
Decision boundaries of the classifier



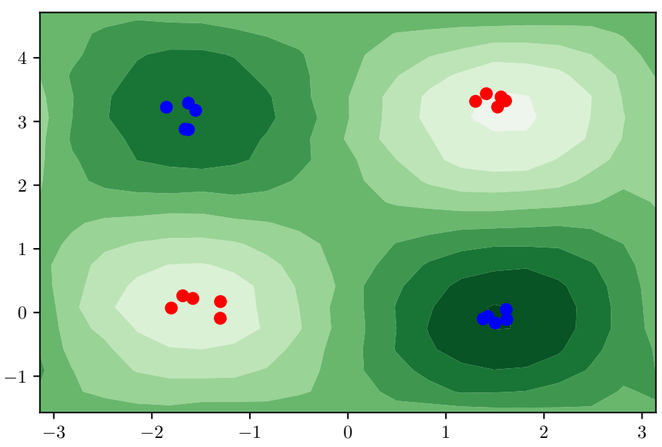
Before training (from QVM)



After training (from QVM)



Before training (from QPU)



After training (from QPU)