Reverse-mode differentiation for quantum gradients

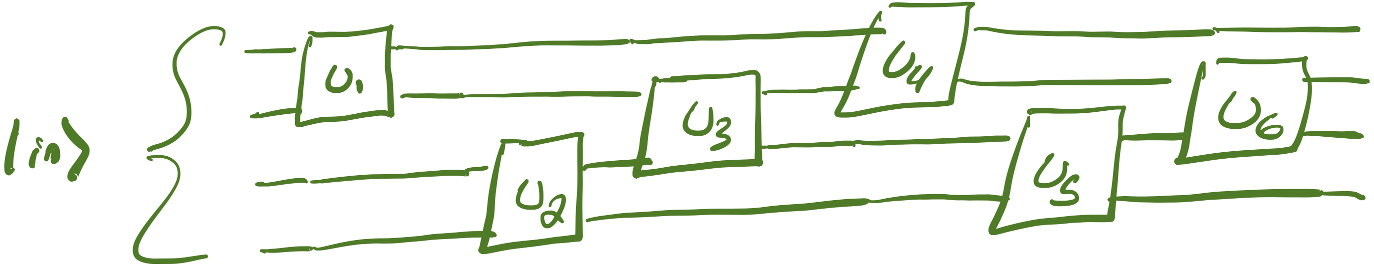
Review of *[Efficient calculation of gradients in classical simulations of variational quantum algorithms]*

https://arxiv.org/abs/2009.02823

Motivation

- Optimizing variational quantum circuits is very common now
  - VQE, QAOA, etc.
- Goal: Minimize [WLOG] the "energy"

$$E(\theta) := \langle\theta|H|\theta\rangle = \langle in|U^\dagger(\theta)\, H\, U(\theta)|in\rangle$$



$U_i = U_i(\theta_i)$
$i = 1, \dots, P$

→ Do this via gradient descent: $\Delta\theta \propto -\nabla E(\theta)$

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