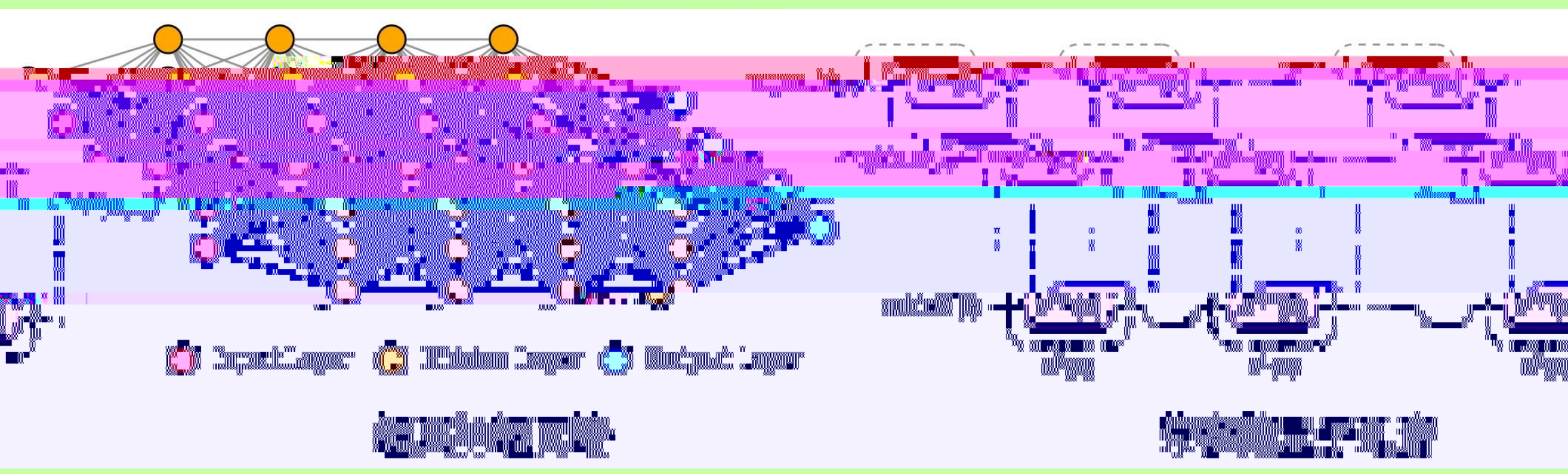


GitHub Repo

Differentiable Quantum Programming with Unbounded Loops

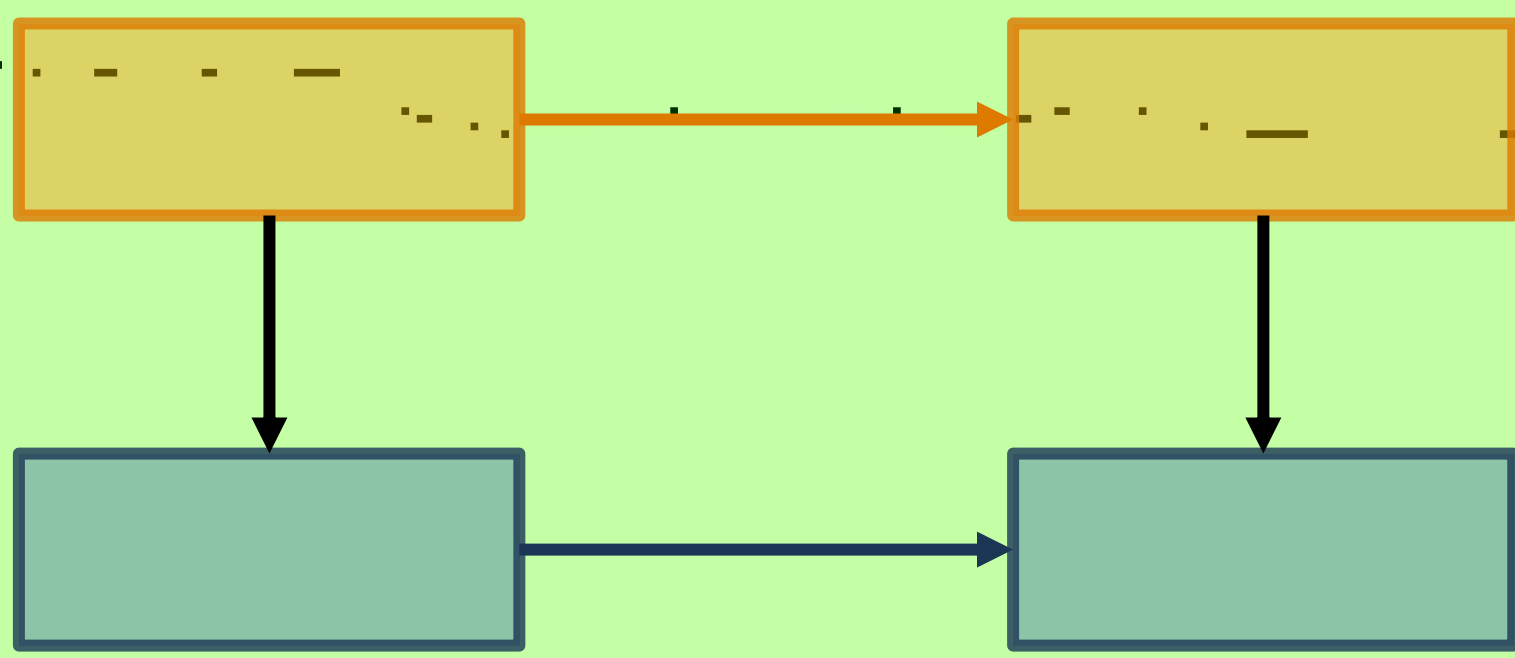
ACM Transactions on Software Engineering and Methodology
 fangw@ios.ac.cn



$$\Pr[\text{程序在第 } n \text{ 次迭代结束循环}] \leq c \cdot \epsilon^n$$

$$\partial_\theta \sum_{\pi} \mu_{\pi}(\theta) f_{\pi}(\theta) = \partial_\theta F(\theta) \text{ 存在且连续}$$

PyTorch



设计带参数量子程序 · 参数化酉操作 $U = e^{-i\theta H}$

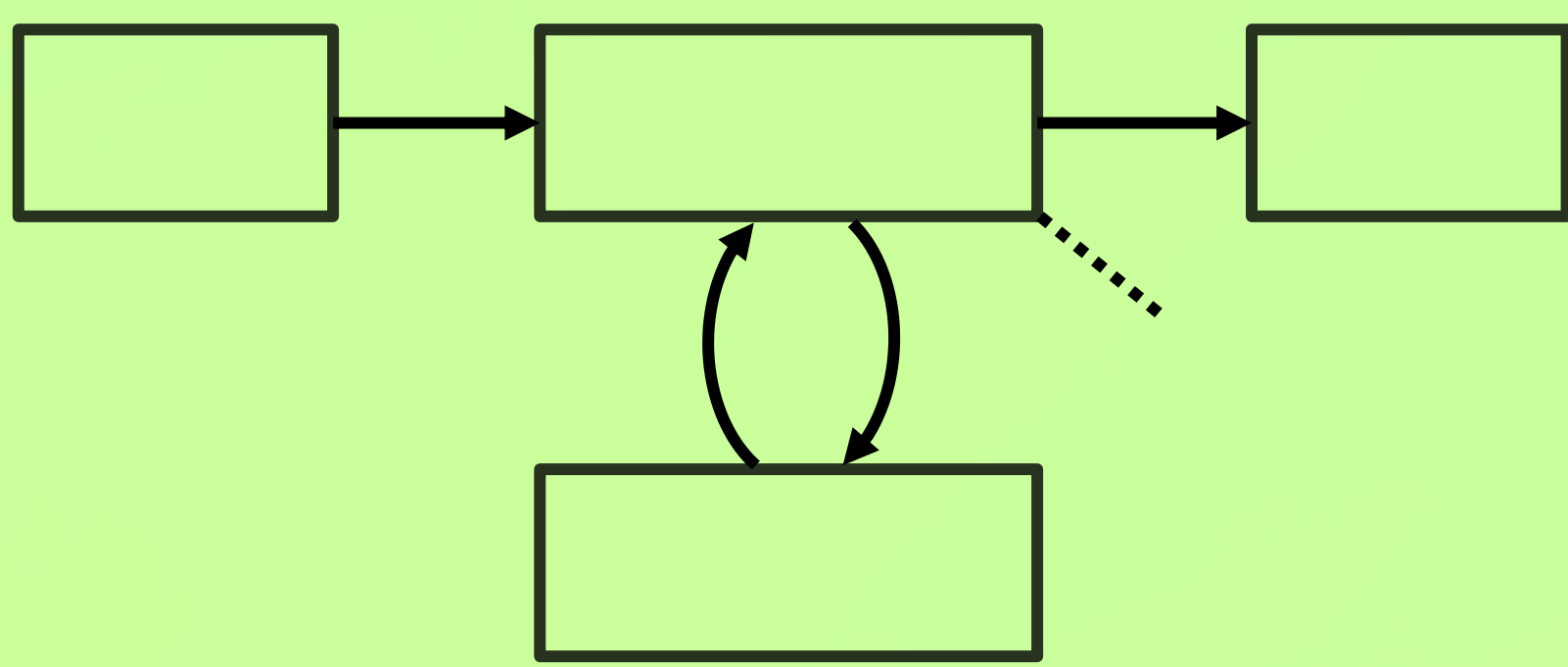
研究带参数量子程序的可微性
 实现带参数量子程序的自动微分

条件语句 \rightarrow 函数公式定义 · 产生不可微点

$$\text{ReLU}(x) = \lambda x \text{ if } x < 0 \text{ then } 0 \text{ else } x$$

程序语句上的断言 \rightarrow 程序语句上的断言

$$\text{SillyId}(x) \equiv \lambda x. \text{ if } x = 0 \text{ then } 0 \text{ else } x$$



可微性 · 带参数量子程序 · 量子操作 U
 $f(\theta)$ 是否可微? $\mu(\theta) = \sum_k \frac{1}{Z^k} \mu_k(\theta)$

$$g(\theta) = \sum_k \frac{1}{Z^k} g_k(\theta)$$