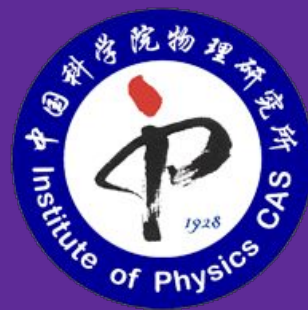


# Julia

## High Performance Matrix Computation

Jin-Guo Liu (刘金国)



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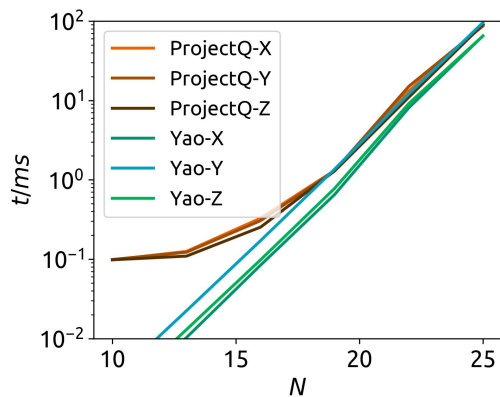
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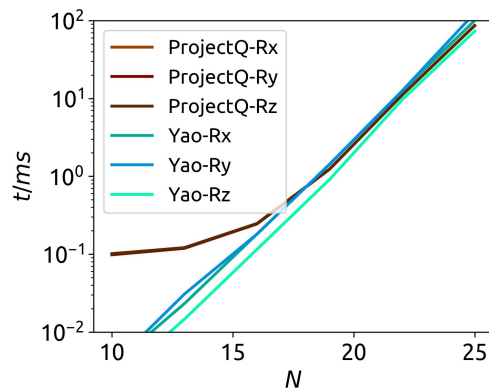
Extensible, Efficient Quantum Algorithm Design for Humans. [https://quantumbfs.github.io/Yao.jl/...](https://quantumbfs.github.io/Yao.jl/)

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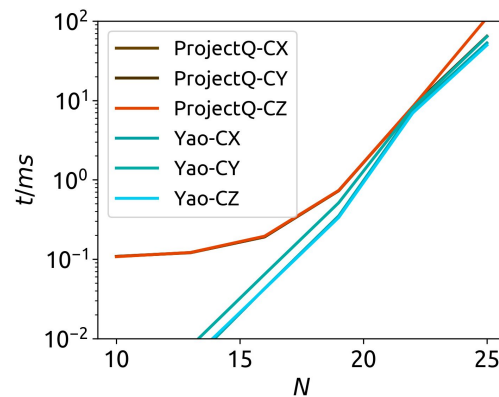
### Pauli Gates

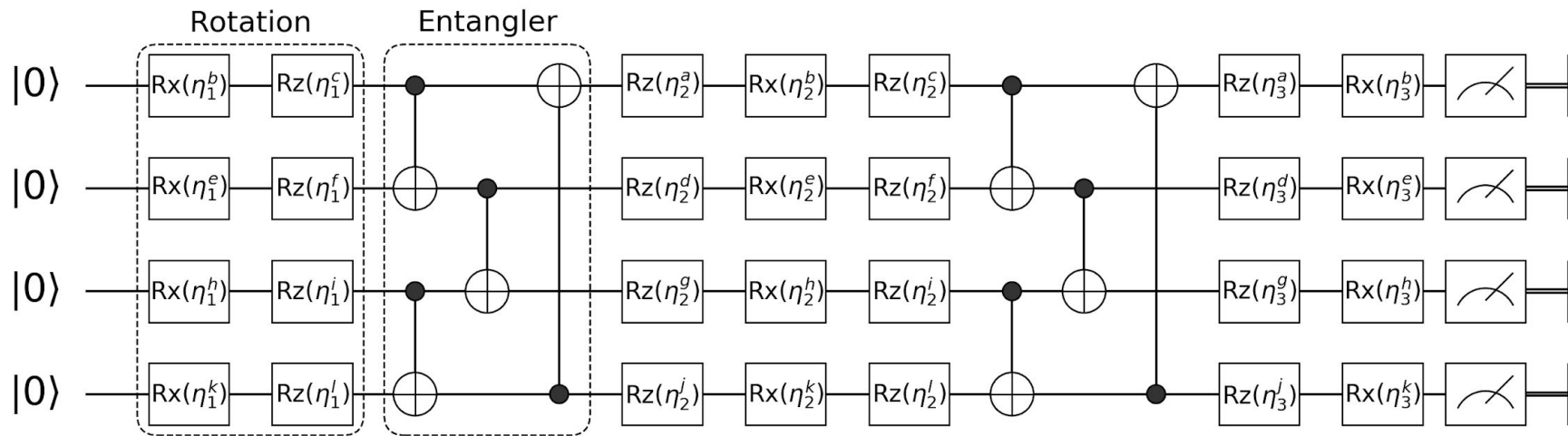


### Rotation Gates




### Control Gates








Differentiable Circuit of Size 4, depth 2


# Nothing more than matrix computation!


Hadamard   $\frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$

Pauli- $X$    $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

Pauli- $Y$    $\begin{bmatrix} 0 & -i \\ i & 0 \end{bmatrix}$

Pauli- $Z$    $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$

Phase   $\begin{bmatrix} 1 & 0 \\ 0 & i \end{bmatrix}$

$\pi/8$    $\begin{bmatrix} 1 & 0 \\ 0 & e^{i\pi/4} \end{bmatrix}$

controlled-NOT



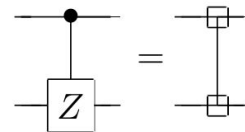
$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

swap



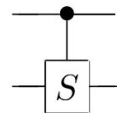
$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

controlled- $Z$

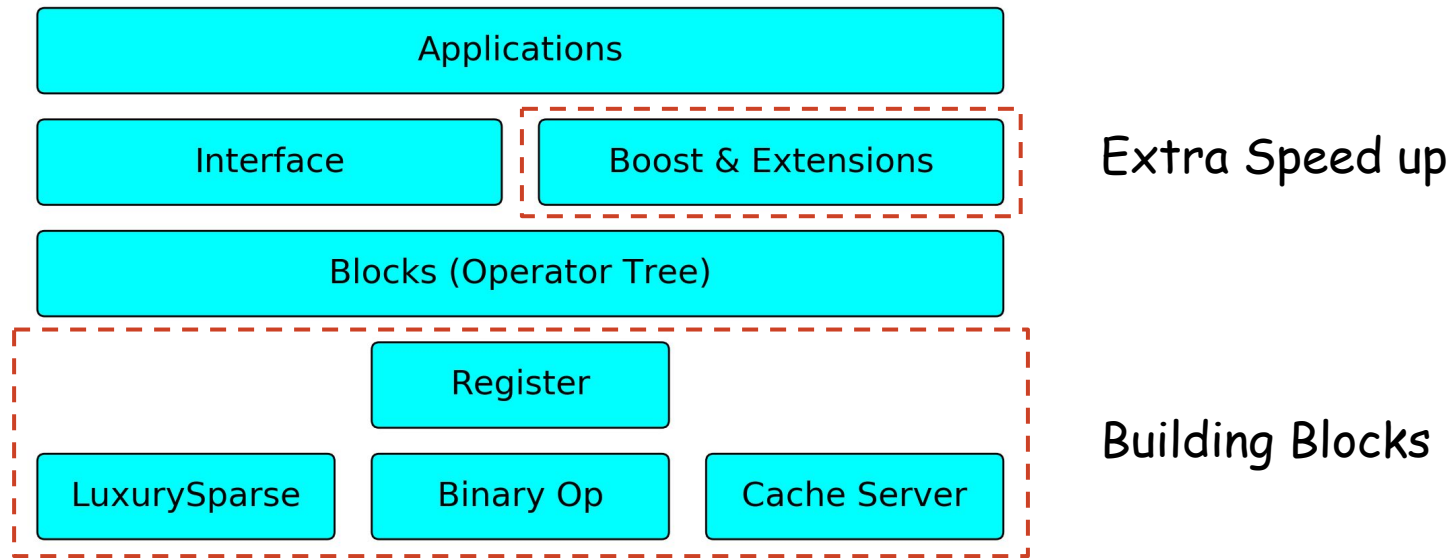


$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix}$$

controlled-phase



$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & i \end{bmatrix}$$





Hands on!