Reconfigurable quantum architecture and codes:
Implications on correctness, efficiency, and security

Yipeng Huang

Rutgers University

March 3, 2026

Reconfigurable quantum architecture and codes

How much farther to quantum chemistry?
- From hardware-efficient ansatzes to code-efficient ansatzes

Reconfigurable quantum codes
- Quantum ISAs with SIMD instructions

Reconfigurable quantum architectures
- Quantum FPGAs for spatial connectivity

Reconfigurable architectures and codes for quantum communications
- Under construction

Quantum chemistry: A benchmark for useful quantum computing

Killer apps

- Factoring
- Search
- Optimization
- Chemistry

Chemistry

- A molecule: has n electrons that represent n electrons
- Classical computer: $O(k^n)$ bits to represent n electrons
- Quantum computer: $O(n^p)$ qubits to represent n electrons

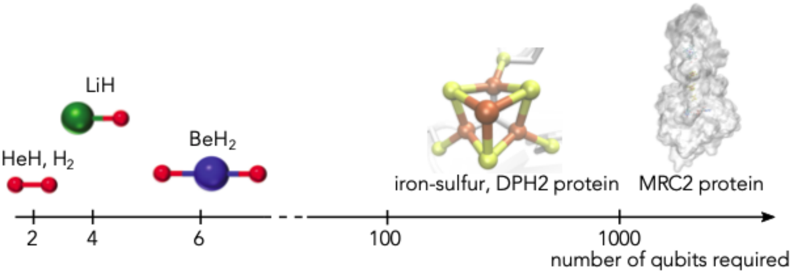


Figure: Credit [Moll et al., 2018].

How much farther to quantum chemistry?

The strategy of quantum chemistry

Use a trainable network to optimize for the ground state energy of a molecule.

The architecture of trainable networks has come a long way

1. Chemically accurate ansatzes
2. Hardware efficient ansatzes
3. Gradient maximizing ansatzes

How much more accurate does hardware need to be?

Our answer: 500× accuracy*

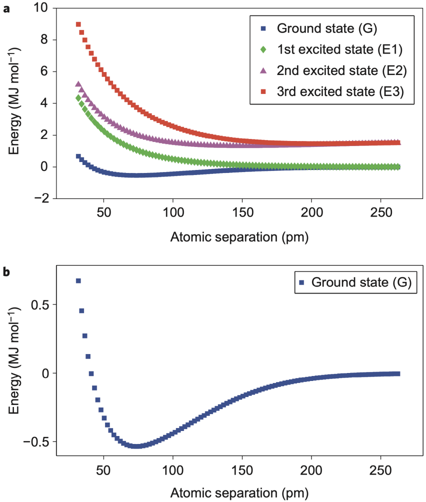


Figure: Credit [Lanyon et al., 2010].

Chemically accurate ansatzes

$$
\begin{aligned}
H = {} & h_0 I + h_1 Z_0 + h_2 Z_1 + h_3 Z_2 + h_4 Z_3 + \\
& h_5 Z_0 Z_1 + h_6 Z_0 Z_2 + \\
& h_7 Z_1 Z_2 + h_8 Z_0 Z_3 + \\
& h_9 Z_1 Z_3 + h_{10} Z_2 Z_3 + \\
& h_{11} Y_0 Y_1 X_2 X_3 + h_{12} X_0 Y_1 Y_2 X_3 + \\
& h_{13} Y_0 X_1 X_2 Y_3 + h_{14} X_0 X_1 Y_2 Y_3 .
\end{aligned}
$$

Figure: The goal is to make a quantum program that represents these component bases of a molecule's Hamiltonian. Credit [McArdle et al., 2020].

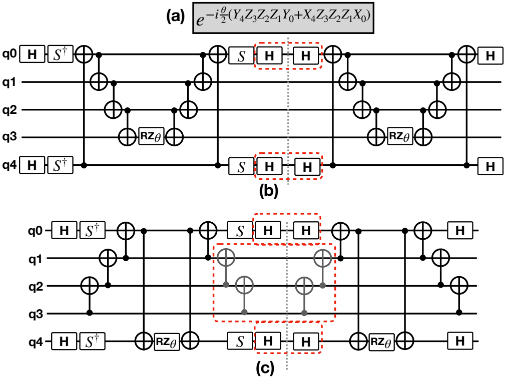


Figure: Key idea: While you are rotated into the configuration, pack in additional similar rotations.

Chemically accurate ansatzes

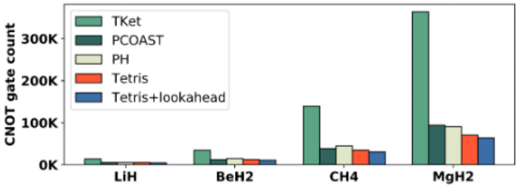
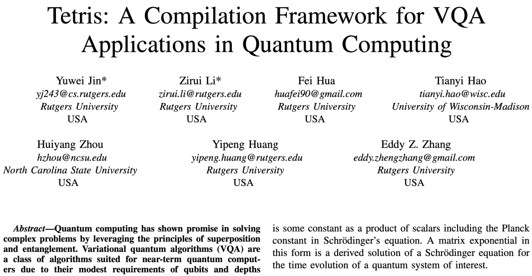


Figure: When running QC algorithms on hardware, reducing two-qubit gates is key.



Tetris: A Compilation Framework for VQA Applications in Quantum Computing

Yuwei Jin* yj243@cs.rutgers.edu Rutgers University USA
Zirui Li* zirui.li@rutgers.edu Rutgers University USA
Fei Hua huafei90@gmail.com Rutgers University USA
Tianyi Hao tianyi.hao@wisc.edu University of Wisconsin-Madison USA
Huiyang Zhou hzhou@ncsu.edu North Carolina State University USA
Yipeng Huang yipeng.huang@rutgers.edu Rutgers University USA
Eddy Z. Zhang eddy.zhengzhang@gmail.com Rutgers University USA

***Abstract*—Quantum computing has shown promise in solving complex problems by leveraging the principles of superposition and entanglement. Variational quantum algorithms (VQA) are a class of algorithms suited for near-term quantum computers due to their modest requirements of qubits and depths**

is some constant as a product of scalars including the Planck constant in Schrödinger's equation. A matrix exponential in this form is a derived solution of a Schrödinger equation for the time evolution of a quantum system of interest.

Figure: Distinguished artifact award at The International Symposium on Computer Architecture, 2024 [Jin, Li, et al., 2024].

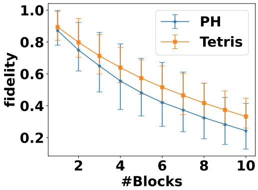


Figure: Fidelity for a fragment of LiH sim.

Hardware-efficient and gradient-maximizing ansatzes

Chemical ansatzes are too deep; use hardware-efficient ansatzes

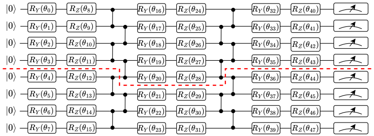


Figure: Key idea: Make sure that the two-qubit gate skeleton of your ansatz matches hardware topology.

Hardware-efficient ansatzes are untrainable; use gradient-maximizing ansatzes

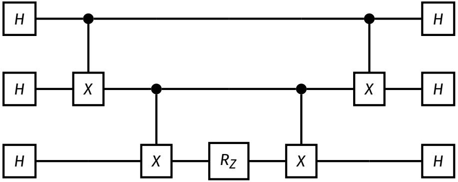
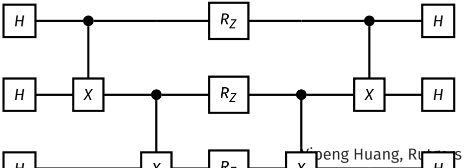


Figure: Key idea: Maximize parameter trainability, adding one layer to ansatz at a time.



How much farther to quantum chemistry?

The strategy of quantum chemistry

Use a trainable network to optimize for the ground state energy of a molecule.

The architecture of trainable networks has come a long way

1. Chemically accurate ansatzes
2. Hardware efficient ansatzes
3. Gradient maximizing ansatzes

How much more accurate does hardware need to be?

Our answer: 500× accuracy*

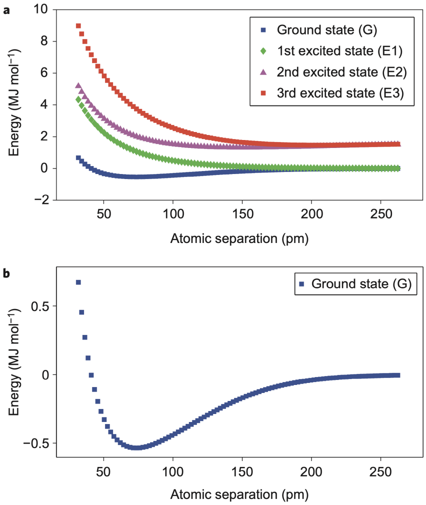


Figure: Credit [Lanyon et al., 2010].

Hardware needs to be 500× more accurate for quantum chemistry*

Gradient-maximizing ansatz studies did not account for hardware mapping and noise

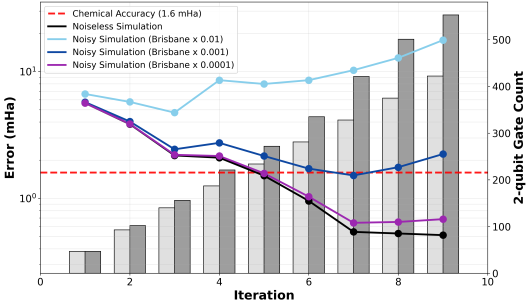


Figure: Key observation: Accounting for hardware mapping and noise, $10K\times$ improvement in HW accuracy needed.

By prioritizing hardware-efficient layers that have high gradient, hardware accuracy shortfall is 500×

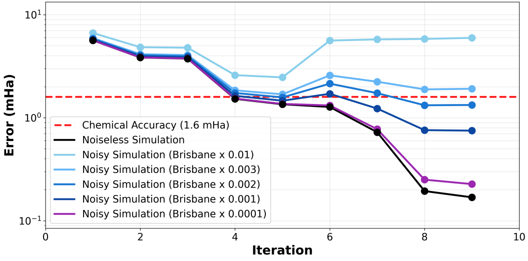


Figure: Key idea: Penalize layer choices that would have poor mapping to hardware, and therefore would have worse noise [Choi et al., under submission].

*Where to get 500$\times$ improvement for machinery running ansatzes?

Mainstream direction for fault-tolerant (FT) QC is surface codes

- 100s to 1000s of physical qubits per $k = 1$ singular logical qubit
- Arbitrarily low logical error rates (far beyond 500$\times$ for minimally useful QC)
- Clifford gates, such as CNOTs, are considered free, but T-gates cost resources
- Planar topology of physical qubits a must for superconducting chips

Reconfigurable quantum architecture and codes

How much farther to quantum chemistry?
From hardware-efficient ansatzes to code-efficient ansatzes

Reconfigurable quantum codes
Quantum ISAs with SIMD instructions

Reconfigurable quantum architectures
Quantum FPGAs for spatial connectivity

Reconfigurable architectures and codes for quantum communications
Under construction

Code-efficient, gradient-maximizing quantum ansatzes

Penalize on T-cost of ansatz layers

- In codes, arbitrarily precise rotations are not possible, but rather cost T-gates
- Analogous to how arbitrary CNOTs are not possible in hardware, but rather have a cost in routing

Hamiltonian simulation with Toffolis

- The literature observes that Toffoli gates are useful as an entangling gate for some quantum simulation [Mukhopadhyay et al., 2023]
- But what are the codes where Toffolis are native?

Reconfigurable quantum architecture and codes

How much farther to quantum chemistry?
From hardware-efficient ansatzes to code-efficient ansatzes

Reconfigurable quantum codes
Quantum ISAs with SIMD instructions

Reconfigurable quantum architectures
Quantum FPGAs for spatial connectivity

Reconfigurable architectures and codes for quantum communications
Under construction

A code system must be universal (not just stabilized or Clifford)

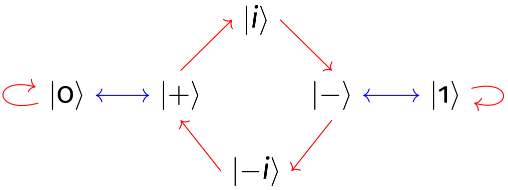
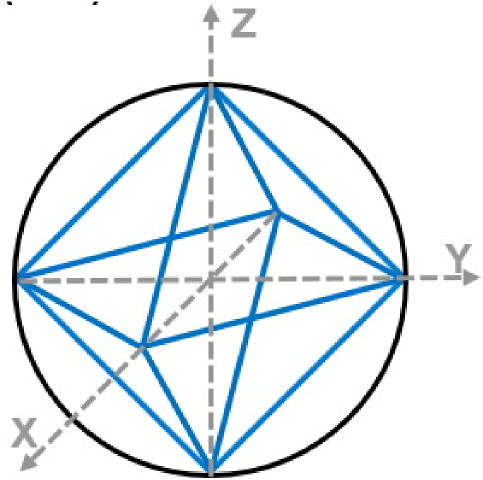


Figure: Illustration of the single qubit stabilizer states reachable using H and S. The arrows in blue represent applications of H, and those in red represent S.



Two routes to universal QC: Precision vs. parallelism

$\mathcal{C}_4$	$\sqrt{T}$	CT	CCS	$CCCZ$	$CCCCI$
$\mathcal{C}_3$	T	CS	CCZ	$CCCI$	
$\mathcal{C}_2$	S	CZ	CCI		
$\mathcal{C}_1$	Z	CI			
$\mathcal{C}_0$	I				
	1 qubit	2 qubit	3 qubit	4 qubit	5 qubit

Quantum Reed-Muller codes: Source of non-Clifford operations

$\mathcal{C}_4$	$\sqrt{T}$ $[[31, 1, 3]]$ $pQRM_5(1, 1)$	CT	CCS	$CCCZ$ $[[16, 4, 2]]$ $QRM_4(0, 1)$	$CCCCI$
$\mathcal{C}_3$	T $[[15, 1, 3]]$ $pQRM_4(1, 1)$	CS	CCZ $[[8, 3, 2]]$ $QRM_3(0, 1)$	$CCCI$	
$\mathcal{C}_2$	S $[[7, 1, 3]]$ $pQRM_3(1, 1)$	CZ $[[4, 2, 2]]$ $QRM_2(0, 1)$	CCI		
$\mathcal{C}_1$	Z $[[3, 1, 1]]$ $pQRM_2(1, 1)$	CI			
$\mathcal{C}_0$	I $[[1, 1, 1]]$ $pQRM_1(1, 1)$				
	1 qubit	2 qubit	3 qubit	4 qubit	5 qubit

Classical Reed-Muller codes: (Re)configurable rate and distance

1						
$RM(-1,0)$ $[1,0,\infty]$	$RM(0,0)$ $[1,1,1]$					
1	1					
$RM(-1,1)$ $[2,0,\infty]$	$RM(0,1)$ $[2,1,2]$	$RM(1,1)$ $[2,2,1]$				
1	2	1				
$RM(-1,2)$ $[4,0,\infty]$	$RM(0,2)$ $[4,1,4]$	$RM(1,2)$ $[4,3,2]$	$RM(2,2)$ $[4,4,1]$			
1	3	3	1			
$RM(-1,3)$ $[8,0,\infty]$	$RM(0,3)$ $[8,1,8]$	$RM(1,3)$ $[8,4,4]$	$RM(2,3)$ $[8,7,2]$	$RM(3,3)$ $[8,8,1]$		
1	4	6	4	1		
$RM(-1,4)$ $[16,0,\infty]$	$RM(0,4)$ $[16,1,16]$	$RM(1,4)$ $[16,5,8]$	$RM(2,4)$ $[16,11,4]$	$RM(3,4)$ $[16,15,2]$	$RM(4,4)$ $[16,16,1]$	
1	5	10	10	5	1	
$RM(-1,5)$ $[32,0,\infty]$	$RM(0,5)$ $[32,1,32]$	$RM(1,5)$ $[32,6,16]$	$RM(2,5)$ $[32,16,8]$	$RM(3,5)$ $[32,26,4]$	$RM(4,5)$ $[32,31,2]$	$RM(5,5)$ $[32,32,1]$
Trivial codes	*Repetition codes*	*Punctured Hadamard codes*	Self-dual codes	Extended H	Single parit	Universe c

Two-qubit quantum Reed-Muller "codes"

$RM(-1,1)$ $[2,0,\infty]$	1	$RM(0,1)$ $[2,1,2]$	1	$RM(1,1)$ $[2,2,1]$
$QRM_1(-1,-1)$ $[[2,0,1]]$ $S=\{Z_0,Z_1\}$ codeword= $\|0\rangle\,\|0\rangle$ logicals= $\emptyset$		$QRM_1(0,0)$ $[[2,0,2]]$ $S=\{Z_0Z_1,X_0X_1\}$ codeword= $\|\Phi^+\rangle$ logicals= $\emptyset$		$QRM_1(1,1)$ $[[2,0,1]]$ $S=\{X_0,X_1\}$ codeword= $\|+\rangle\,\|+\rangle$ logicals= $\emptyset$
	$QRM_1(-1,0)$ $[[2,1,1]]$ $S=\{Z_0Z_1\}$ logicals= $\{XX,Z,S,T,\ldots\}$		$QRM_1(0,1)$ $[[2,1,1]]$ $S=\{X_0X_1\}$ logicals= $\{ZZ,X,\sqrt{X},\sqrt[4]{X},\ldots$	
		$QRM_1(-1,1)$ $[[2,2,1]]$ $S=\emptyset$ logicals= $\{HH,Z,ZZ,SS,X,X$		

Four-qubit quantum Reed-Muller error (detection) codes

$RM(-1,2)$ $[4,0,\infty]$	1	$RM(0,2)$ $[4,1,4]$	2	$RM(1,2)$ $[4,3,2]$	1	$RM(2,2)$ $[4,4,1]$
$QRM_2(-1,-1)$ $[[4,0,1]]$ $S=$ $\{Z_0, Z_1, Z_2, Z_3\}$ codeword= $\|0\rangle\|0\rangle\|0\rangle\|0\rangle$ logicals= $\emptyset$	$QRM_1(-1,-1)$ $[[2,0,1]]$ $S=\{Z_0, Z_1\}$ codeword= $\|0\rangle\|0\rangle$ logicals= $\emptyset$	$QRM_2(0,0)$ $[[4,0,2]]$ $S=$ $\{Z_0Z_1, Z_1Z_2,$ Z_2Z_3, Z_3Z_0 $X_0X_1X_2X_3\}$ logicals= $\emptyset$	$QRM_1(0,0)$ $[[2,0,2]]$ $S=$ $\{Z_0Z_1, X_0X_1\}$ codeword= $\|\Phi^+\rangle$ logicals= $\emptyset$	$QRM_2(1,1)$ $[[4,0,2]]$ $S=\{Z_0Z_1Z_2Z_3,$ $X_0X_1, X_1X_2,$ $X_2X_3, X_3X_0\}$ logicals= $\emptyset$	$QRM_1(1,1)$ $[[2,0,1]]$ $S=\{X_0, X_1\}$ codeword= $\|+\rangle\|+\rangle$ logicals= $\emptyset$	$QRM_2(2,2)$ $[[4,0,1]]$ $S=$ $\{X_0, X_1, X_2, X_3\}$ codeword= $\|+\rangle\|+\rangle\|+\rangle\|+\rangle$ logicals= $\emptyset$
	$QRM_2(-1,0)$ $[[4,1,1]]$ $S=$ $\{Z_0Z_1, Z_1Z_2,$ $Z_2Z_3, Z_3Z_0\}$ logicals= $\{X^{\otimes 4}, Z, S, T, \ldots\}$	$QRM_1(-1,0)$ $[[2,1,1]]$ $S=\{Z_0Z_1\}$ logicals= $\{XX, Z, S, T, \ldots\}$	$QRM_2(0,1)$ $[[4,2,2]]$ $S=\{Z_0Z_1Z_2Z_3,$ $X_0X_1X_2X_3\}$ logicals= $\{H^{\otimes 4}, ZZ, S^{\otimes 4}, XX$	$QRM_1(0,1)$ $[[2,1,1]]$ $S=\{X_0X_1\}$ logicals= $\{ZZ, X, \sqrt{X}, \sqrt[4]{X}, .$	$QRM_2(1,2)$ $[[4,1,1]]$ $S=$ $\{X_0X_1, X_1X_2,$ $X_2X_3, X_3X_0\}$ logicals= $\{Z^{\otimes 4}, X, \sqrt{X}, \sqrt[4]{X}, \ldots\}$	
		$QRM_2(-1,1)$ $[[4,3,1]]$ $S=$ $\{Z_0Z_1Z_2Z_3\}$ logicals= $\{Z, ZZ, SS, S^{\otimes 4}, T$	$QRM_1(-1,1)$ $[[2,2,1]]$ $S=\emptyset$ logicals= $\{HH, Z, ZZ, SS, X, X$	$QRM_2(0,2)$ $[[4,3,1]]$ $S=$ $\{X_0X_1X_2X_3\}$ logicals= $\{ZZ, Z^{\otimes 4}, X, XX, \sqrt{X}\sqrt{X}, \sqrt{X}^{\otimes 4}, \sqrt[4]{X}^{\otimes 4}\}$		
			$QRM_2(-1,2)$ $[[4,4,1]]$ $S=\{\}$ logicals= $\{H, Z, ZZ, Z^{\otimes 4}, S^{\otimes 4}, X, XX, X^{\otimes 4}, \sqrt{X}^{\otimes 4}\}$			

Reconfigurable quantum codes for error-detected universal QC

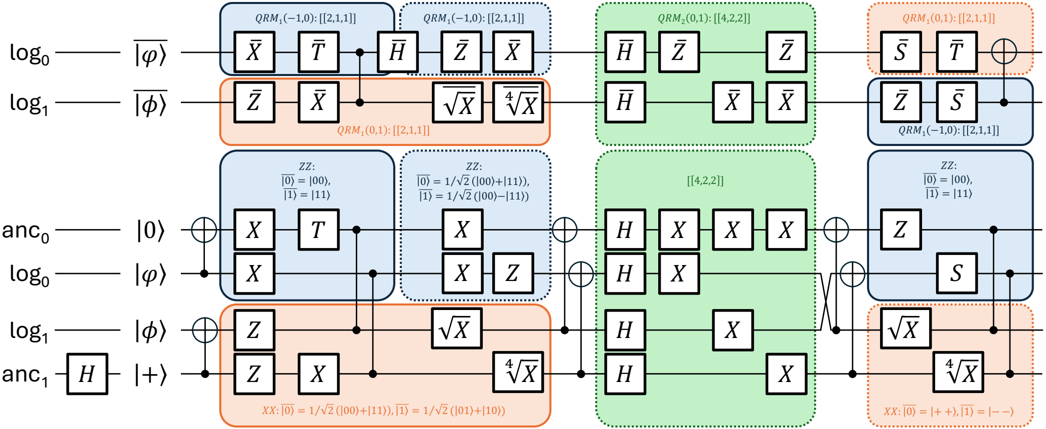


Figure: Code switching among [[4, 2, 2]] and [[2, 1, 1]] codes.

Reconfigurable quantum architecture and codes

How much farther to quantum chemistry?

From hardware-efficient ansatzes to code-efficient ansatzes

Reconfigurable quantum codes

Quantum ISAs with SIMD instructions

Reconfigurable quantum architectures

Quantum FPGAs for spatial connectivity

Reconfigurable architectures and codes for quantum communications

Under construction

16-qubit QRM: A quantum ISA with SIMD instructions

$RM(-1,4)$ $[16, 0, \infty]$	1	$RM(0,4)$ $[16, 1, 16]$	4	$RM(1,4)$ $[16, 5, 8]$	6	$RM(2,4)$ $[16, 11, 4]$	4	$RM(3,4)$ $[16, 15, 2]$	1	$RM(4,4)$ $[16, 16, 1]$
$QRM_4(-1,-1)$ $[[16, 0, 1]]$ $S:$ $16Z^{\otimes 1}$ logicals= $\emptyset$		$QRM_4(0,0)$ $[[16, 0, 2]]$ $S:$ $32Z^{\otimes 2}, 1X^{\otimes 16}$ logicals= $\emptyset$		$QRM_4(1,1)$ $[[16, 0, 4]]$ $S:$ $24Z^{\otimes 4}, 8X^{\otimes 8}$ logicals= $\emptyset$		$QRM_4(2,2)$ $[[16, 0, 4]]$ $S:$ $8Z^{\otimes 8}, 24X^{\otimes 4}$ logicals= $\emptyset$		$QRM_4(3,3)$ $[[16, 0, 2]]$ $S:$ $1Z^{\otimes 16}, 32X^{\otimes 2}$ logicals= $\emptyset$		$QRM_4(4,4)$ $[[16, 0, 1]]$ $S:$ $16X^{\otimes 1}$ logicals= $\emptyset$
	$QRM_4(-1,0)$ $[[16, 1, 1]]$ $S:$ $32Z^{\otimes 2}$ logicals= $\{Z, S, T, \ldots\}$		$QRM_4(0,1)$ $[[16, 4, 2]]$ $S:$ $24Z^{\otimes 4}, 1X^{\otimes}$ logicals= $\{Z^{\otimes 2}, S^{\otimes 4}$	$QRM_3(0,1)$ $[[8, 3, 2]]$ $S:$ $6Z^{\otimes 4}, 1X^{\otimes}$ logicals= $\{Z^{\otimes 2}, S^{\otimes 4}$	$QRM_4(1,2)$ $[[16, 6, 4]]$ $S:$ $8Z^{\otimes 8}, 8X^{\otimes}$ logicals= $\{H^{\otimes 16}, Z^{\otimes}$	$QRM_3(1,2)$ $[[8, 3, 2]]$ $S:$ $1Z^{\otimes 8}, 6X^{\otimes}$ logicals= $\{Z^{\otimes 4}\}$	$QRM_4(2,3)$ $[[16, 4, 2]]$ $S:$ $1Z^{\otimes 16}, 24X^{\otimes 4}$ logicals= $\{Z^{\otimes 8}\}$		$QRM_4(3,4)$ $[[16, 1, 1]]$ $S:$ $32X^{\otimes 2}$ logicals= $\{Z^{\otimes 16}\}$	
		$QRM_4(-1,1)$ $[[16, 5, 1]]$ logicals= $\{Z^{\otimes 1,2}, S^{\otimes 2,4}, T^{\otimes 4,8}, \sqrt{T}^{\otimes 8,16}, \sqrt[4]{T}^{\otimes 16}\}$		$QRM_4(0,2)$ $[[16, 10, 2]]$ logicals= $\{Z^{\otimes 2}, Z^{\otimes 4}$	$QRM_3(0,2)$ $[[8, 6, 2]]$ $S:$ $1Z^{\otimes 8}, 1X^{\otimes}$	$QRM_4(1,3)$ $[[16, 10, 2]]$ logicals= $\{Z^{\otimes 4}, Z^{\otimes 8}\}$		$QRM_4(2,4)$ $[[16, 5, 1]]$ logicals= $\{Z^{\otimes 8}, Z^{\otimes 16}\}$		
			$QRM_4(-1,2)$ $[[16, 11, 1]]$ logicals= $\{Z^{\otimes 1,2,4}, S^{\otimes 4,8,16}, T^{\otimes 16}\}$		$QRM_4(0,3)$ $[[16, 14, 2]]$ logicals= $\{H^{\otimes 16}, Z^{\otimes 2,4,8}, S^{\otimes 16}\}$		$QRM_4(1,4)$ $[[16, 11, 1]]$ logicals= $\{Z^{\otimes 4}, Z^{\otimes 8}, Z^{\otimes 16}\}$			
				$QRM_4(-1,3)$ $[[16, 15, 1]]$ logicals= $\{Z^{\otimes 1,2,4,8}, S^{\otimes 8,16}\}$		$QRM_4(0,4)$ $[[16, 15, 1]]$ logicals= $\{Z^{\otimes 2}, Z^{\otimes 4}, Z^{\otimes 8}, Z^{\otimes 16}\}$				
					$QRM_4(-1,4)$ $[[16, 16, 1]]$ logicals= $\{H,^{\otimes 16} Z, Z^{\otimes 2}, Z^{\otimes 4}, Z^{\otimes 8}, Z^{\otimes 16}, S^{\otimes 16}\}$					

Quantum Reed-Muller codes: Source of non-Clifford operations

$\mathcal{C}_4$	$\sqrt{T}$ $[[31, 1, 3]]$ $pQRM_5(1, 1)$	CT	CCS	$CCCZ$ $[[16, 4, 2]]$ $QRM_4(0, 1)$	$CCCCI$
$\mathcal{C}_3$	T $[[15, 1, 3]]$ $pQRM_4(1, 1)$	CS	CCZ $[[8, 3, 2]]$ $QRM_3(0, 1)$	$CCCI$	
$\mathcal{C}_2$	S $[[7, 1, 3]]$ $pQRM_3(1, 1)$	CZ $[[4, 2, 2]]$ $QRM_2(0, 1)$	CCI		
$\mathcal{C}_1$	Z $[[3, 1, 1]]$ $pQRM_2(1, 1)$	CI			
$\mathcal{C}_0$	I $[[1, 1, 1]]$ $pQRM_1(1, 1)$				
	1 qubit	2 qubit	3 qubit	4 qubit	5 qubit

What's the catch? Spatial dimension connectivity

$\mathcal{C}_4$	$\sqrt{T}$ $[[31, 1, 3]]$ 4-simplex (5-cell)	CT	CCS	$CCCZ$ $[[16, 4, 2]]$ 4-cube (hypercube)	$CCCCI$
$\mathcal{C}_3$	T $[[15, 1, 3]]$ 3-simplex (tetrahedron)	CS	CCZ $[[8, 3, 2]]$ 3-cube (cube)	$CCCI$	
$\mathcal{C}_2$	S $[[7, 1, 3]]$ 2-simplex (triangle)	CZ $[[4, 2, 2]]$ 2-cube (square)	CCI		
$\mathcal{C}_1$	Z $[[3, 1, 1]]$ 1-simplex (edge)	CI			
$\mathcal{C}_0$	I $[[1, 1, 1]]$ 0-simplex (point)				
	1 qubit	2 qubit	3 qubit	4 qubit	5 qubit

Reconfigurable quantum architecture and codes

How much farther to quantum chemistry?
- From hardware-efficient ansatzes to code-efficient ansatzes

Reconfigurable quantum codes
- Quantum ISAs with SIMD instructions

Reconfigurable quantum architectures
- Quantum FPGAs for spatial connectivity

Reconfigurable architectures and codes for quantum communications
- Under construction

Non-planar physical qubit connectivity unsuitable for planar chips

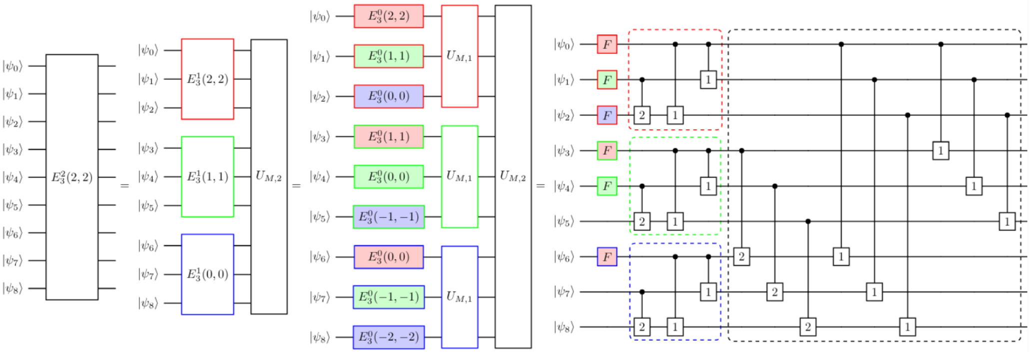


Figure: Quantum Reed-Muller codes have long-range, non-planar connectivity between physical qubits. But, the connectivity is hierarchical, recursive, and regular [Li, Kedia, Kabir, Lou, Huang, 2026].

NISQ hardware architectures offer reconfigurable connectivity

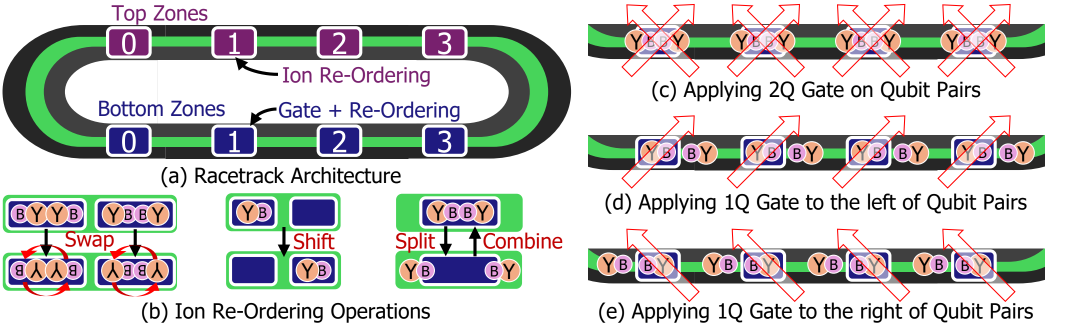


Figure: Outside of 2D superconducting chips intended for surface codes, other architectures such as trapped ion devices offer reconfigurable connectivity. By doing shuttling and hardware qubit swapping, connectivity can be rearranged [Jang et al., 2026].

QRM circuits compile to a sequence of swaps and movements

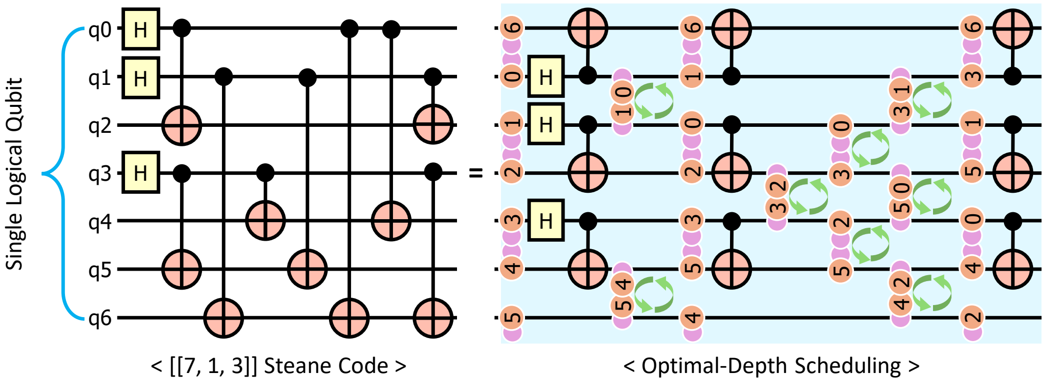


Figure: Encoding circuits (pictured here) and syndrome extraction circuits compile to a sequence of parallel gate application, local ion swapping, and global ion shuttling [Jang et al., 2026].

Reconfigurable quantum architecture and codes

How much farther to quantum chemistry?
- From hardware-efficient ansatzes to code-efficient ansatzes

Reconfigurable quantum codes
- Quantum ISAs with SIMD instructions

Reconfigurable quantum architectures
- Quantum FPGAs for spatial connectivity

Reconfigurable architectures and codes for quantum communications
- Under construction

Key idea: Ion shuttling paths can be optimized for hypercubes

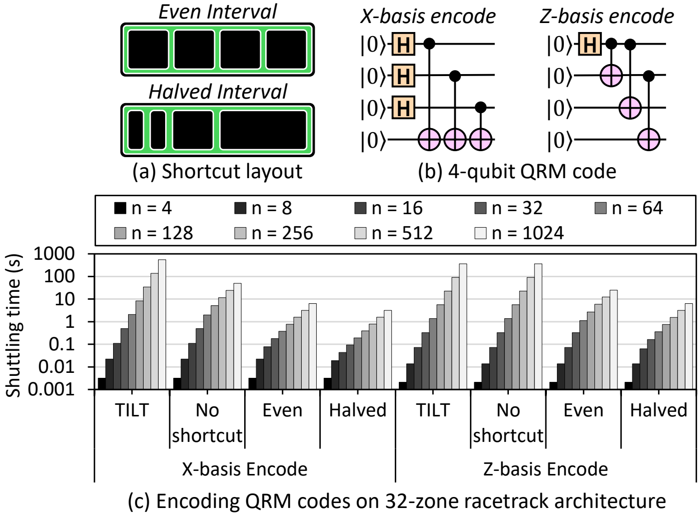


Figure: Comparing linear, loop, regular grid-like, and hierarchical grid-like ion shuttling paths for QRM encoding circuits [Jang et al., 2026].

Reconfigurable quantum architecture and codes

How much farther to quantum chemistry?
- From hardware-efficient ansatzes to code-efficient ansatzes

Reconfigurable quantum codes
- Quantum ISAs with SIMD instructions

Reconfigurable quantum architectures
- Quantum FPGAs for spatial connectivity

Reconfigurable architectures and codes for quantum communications
- Under construction

Reconfigurable quantum architecture and codes

How much farther to quantum chemistry?

From hardware-efficient ansatzes to code-efficient ansatzes

Reconfigurable quantum codes

Quantum ISAs with SIMD instructions

Reconfigurable quantum architectures

Quantum FPGAs for spatial connectivity

Reconfigurable architectures and codes for quantum communications

Under construction

Lanyon, B. P., Whitfield, J. D., Gillett, G. G., Goggin, M. E., Almeida, M. P., Kassal, I., Biamonte, J. D., Mohseni, M., Powell, B. J., Barbieri, M., Aspuru-Guzik, A., and White, A. G. (2010).
Towards quantum chemistry on a quantum computer.
Nature Chemistry, 2(2):106–111.

McArdle, S., Endo, S., Aspuru-Guzik, A., Benjamin, S. C., and Yuan, X. (2020).
Quantum computational chemistry.
Rev. Mod. Phys., 92:015003.

Moll, N., Barkoutsos, P., Bishop, L. S., Chow, J. M., Cross, A., Egger, D. J., Filipp, S., Fuhrer, A., Gambetta, J. M., Ganzhorn, M., Kandala, A., Mezzacapo, A., Müller, P., Riess, W., Salis, G., Smolin, J., Tavernelli, I., and Temme, K. (2018).
Quantum optimization using variational algorithms on near-term quantum devices.
Quantum Science and Technology, 3(3):030503.

Mukhopadhyay, P., Wiebe, N., and Zhang, H. T. (2023).
Synthesizing efficient circuits for hamiltonian simulation.
npj Quantum Information, 9(1):31.