~~#qhack2022 → find teammates~~

Linear Growth of QC complexity
Jonas Haferkamp

Complexity = min N 2 local gates in decomposition of some U

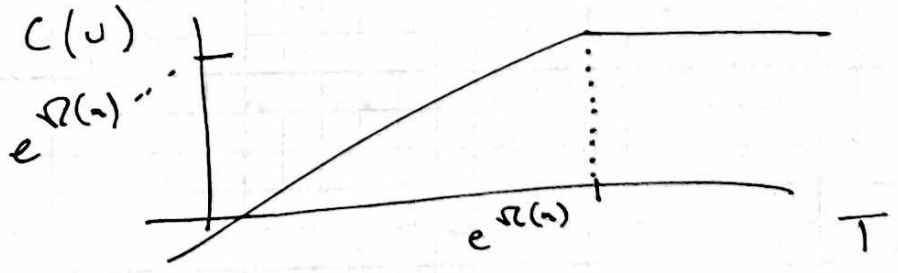
$C(U)$

extremely difficult to bound bc if find eventually reach $P = NP$

talk about: what we can expect from typical systems

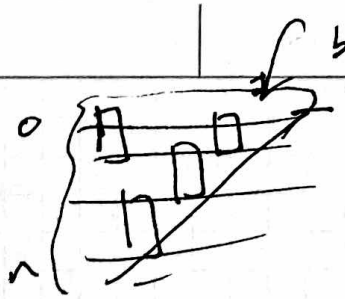
Brown + Susskind

what is $e^{\Omega(n)}$ ← CS lower bound / see Nielsen Chuang, ISP pf



linear growth beyond saturation of entanglement entropy

"Backboard ~~slide~~" ?
light cone



Cone of connection from a single qubit backward to all initial qubits in a circuit

~~Given~~ This provides a way to measure connectedness in the architecture & influences the expected bounds on complexity of a circuit

related to?

Every unitary can be implemented with $O(4^n)$ many gates

upper bound

Theorem

$$C(U) \geq \frac{T}{9} - \frac{n}{9}$$

T = number of disjoint backward lightcones in an architecture

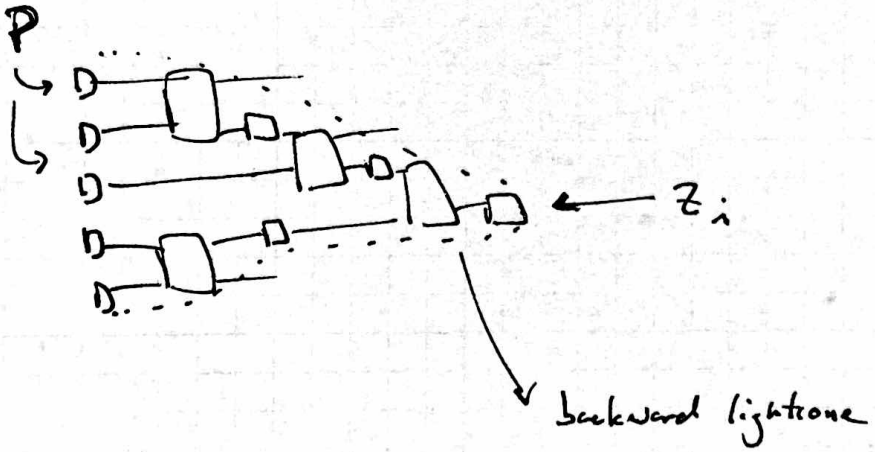
Until...
n gates grow and

$T \geq 4^n - 1$

Rank of a matrix = num of linearly independent rows or columns

"conjugate" a unitary operator...

** Every Pauli operator in a backward lightcone can be conjugated (commuted?) with Clifford group U gates such that the equivalent circuit can be written as a single Z_i gate



How do you commute P operators through a circuit?