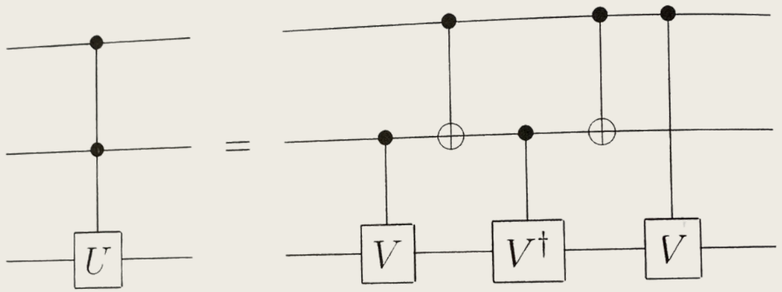
INTERACTIVE QUANTUM CIRCUIT

BROWN UNIVERSITY
IBM QUANTUM
HACKATHON

BY: COOPER, IFE,
EDWARD, AND ETHAN

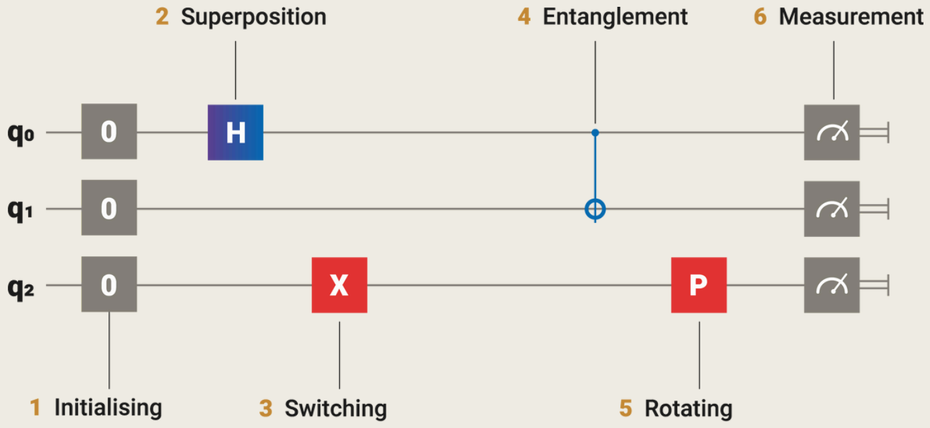
VIDEO

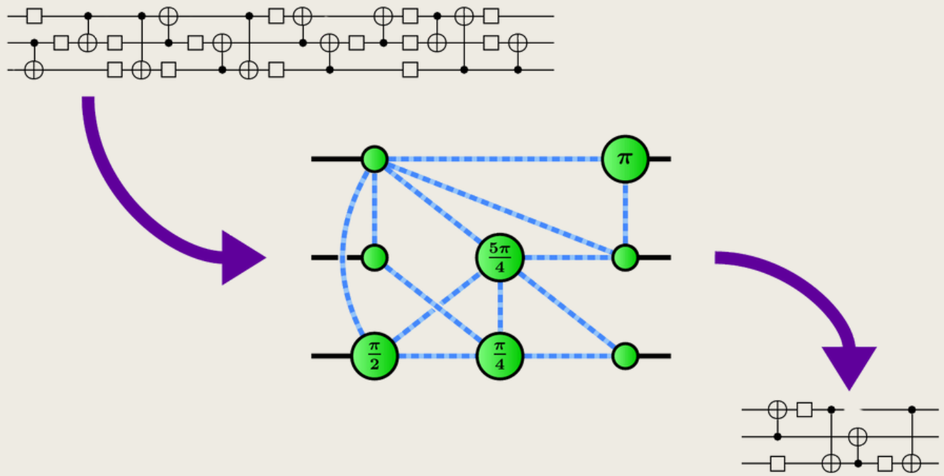
OUR PROBLEM



STANDARD GATE-BY-GATE DIAGRAMS (LINEAR WIRES + BOXES) SCALE POORLY AND HIDE STRUCTURAL PATTERNS:

- DENSE LOCAL GATE CLUSTERS (E.G., TROTTER STEPS) LOOK LIKE UNREADABLE BOXES.
- MULTI-QUBIT INTERACTIONS, LONG-RANGE ENTANGLEMENT, AND DEPTH TRADEOFFS ARE HARD TO SPOT.

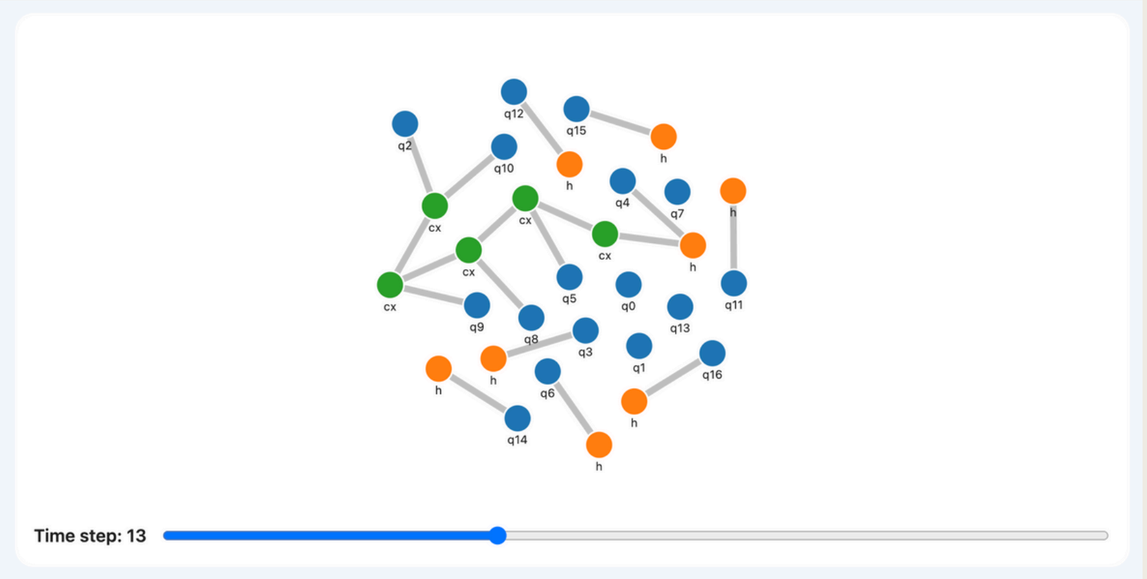




OUR IDEA

INTRODUCING CIRC-SPACE

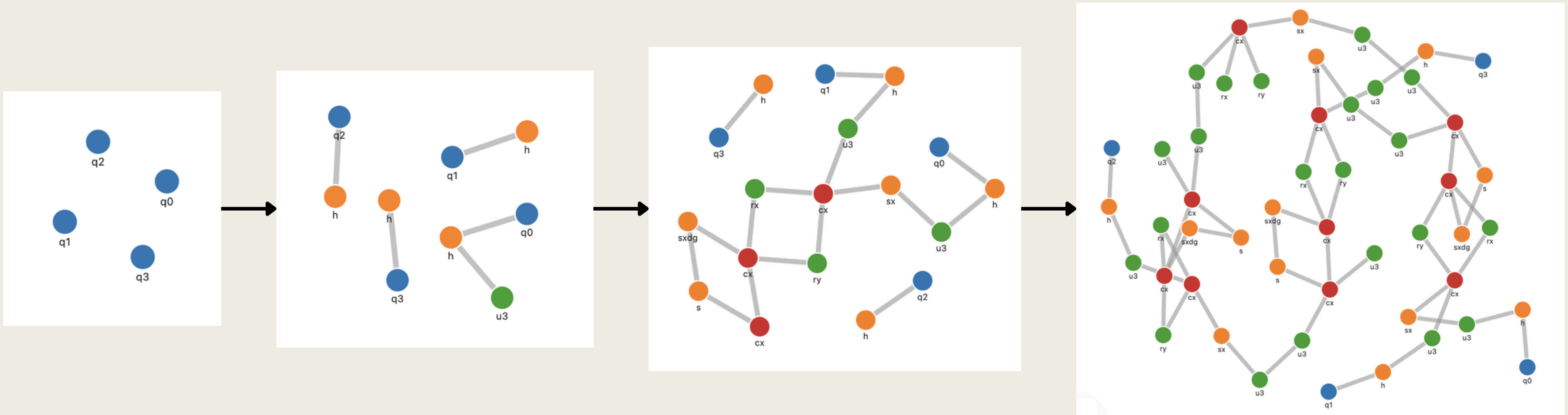
INSPIRED BY GRAPHICAL NEURAL NETWORKS WE REPRESENT STANDARD GATE-BY-GATE CIRCUITS AS GRAPHS



METHODOLOGY

(03)

- PARSE QASM FILES AND STORE RELEVANT OBJECTS IN JSON FOR EACH TIMESTAMP
- VERTICES REFLECT GATES AND QUBITS
- EDGES REFLECT AN OPERATION BETWEEN THE CONNECTED VERTICES



TOOLS

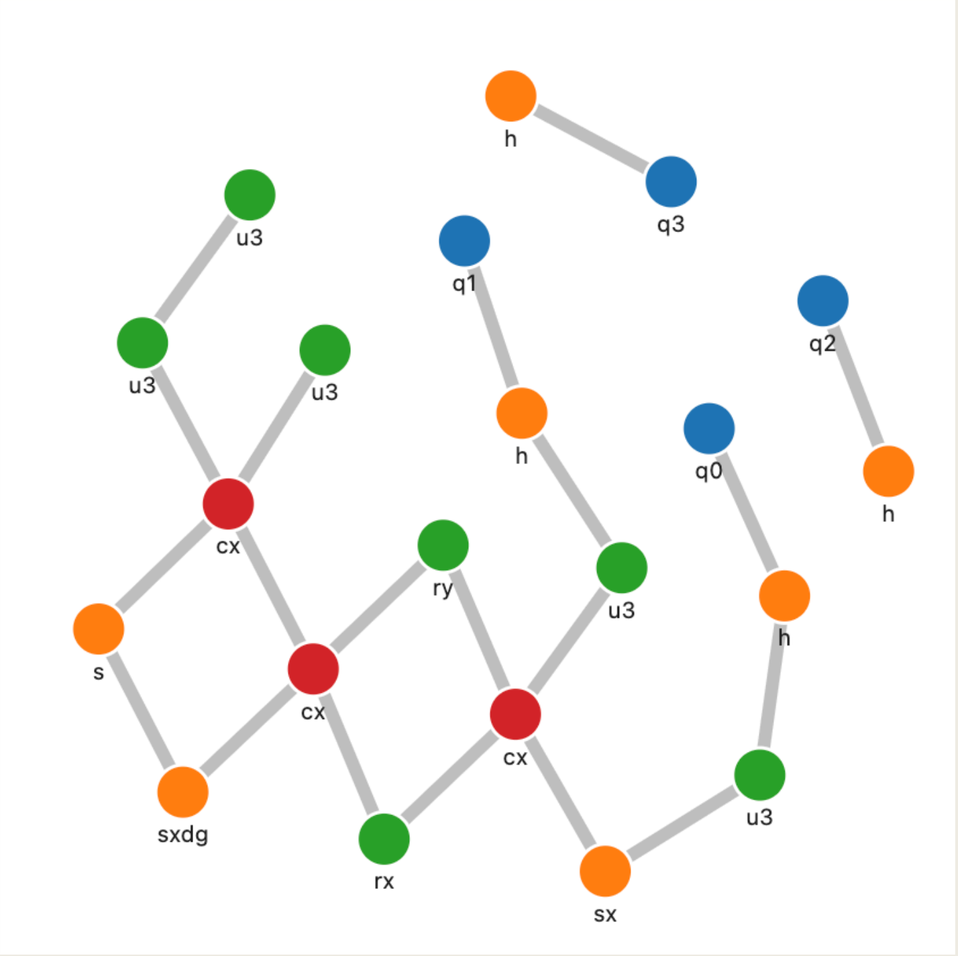
PURPOSE:	TOOL:	WHY:
PARSING	PYTHON QASM PARSER	EXTRACT QASM TOPOLOGY
GRAPHING	JAVASCRIPT	CONSTRUCT GRAPH AND INTERACTION FORCES
VISUALIZATION	HTML/CSS	PAINT TO CANVAS

(05)

VISUALIZATION DEMO

DISCUSSION

In today's technologically connected world, we have demonstrated a way to reflect the latest technology, quantum circuits, as interactive connected graphs, allowing for new visual insights and perspectives in the world of quantum computing



OTHER

GRAPHICAL AND INTLLIGENT DESIGN OF QUANTUM ALGORITHIM

- Graph Representation enforces a rigid logical structure to the quantum algorithm
- One can utilize the power of GenAI to generate quantum computing algorithm via QASM file
- With a writing, compiling, debugging, running on physical quantum computer,
  - we can train a LLM to vibe code for Quantum computing
  - discover new algorithm
- solve real world problems with power of both quantum computing and GenAI

WHAT'S NEXT FOR OUR GROUP

AS WE LOOK TO THE FUTURE, CIRC-SPACE IS EXCITED TO CONTINUE PUSHING BOUNDARIES IN QUANTUM CIRCUTS, CREATING CAMPAIGNS THAT NOT ONLY STAND OUT BUT TRULY CONNECT.

WHERE QUANTUM MEETS CREATIVITY — LET'S BUILD TOGETHER

BY: COOPER, IFE, EDWARD, AND ETHAN