Dynamic vs Unitary circuits

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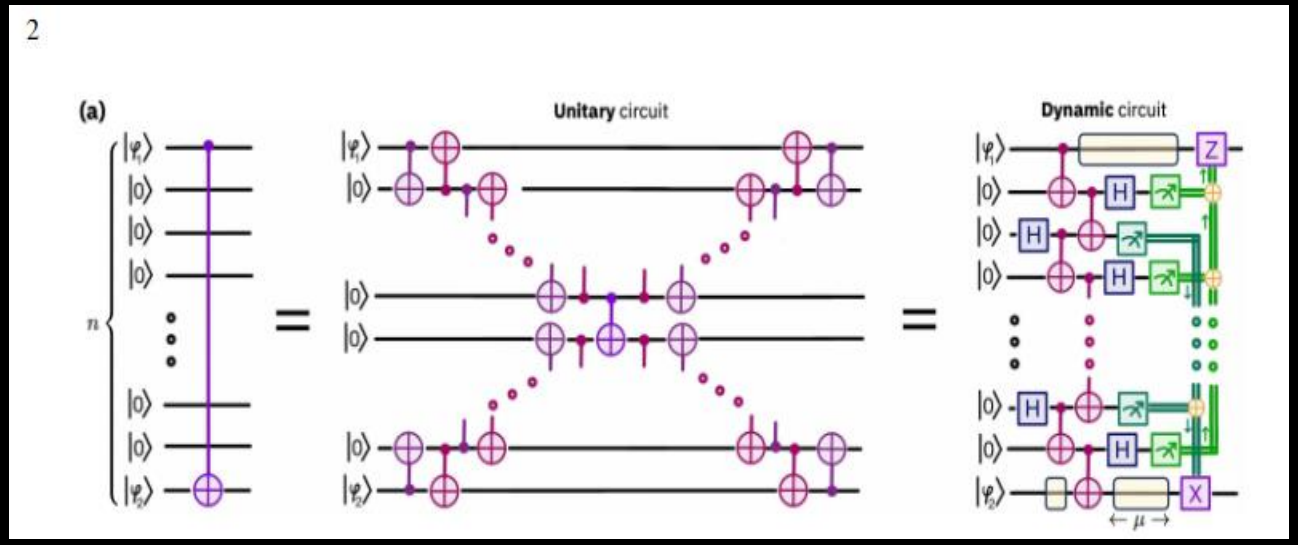
Outline

- Aim of the project
- Efficient long-range entanglement
- Efficient long-range entanglement results
- Randomized benchmarking
- Randomized benchmarking results
- References

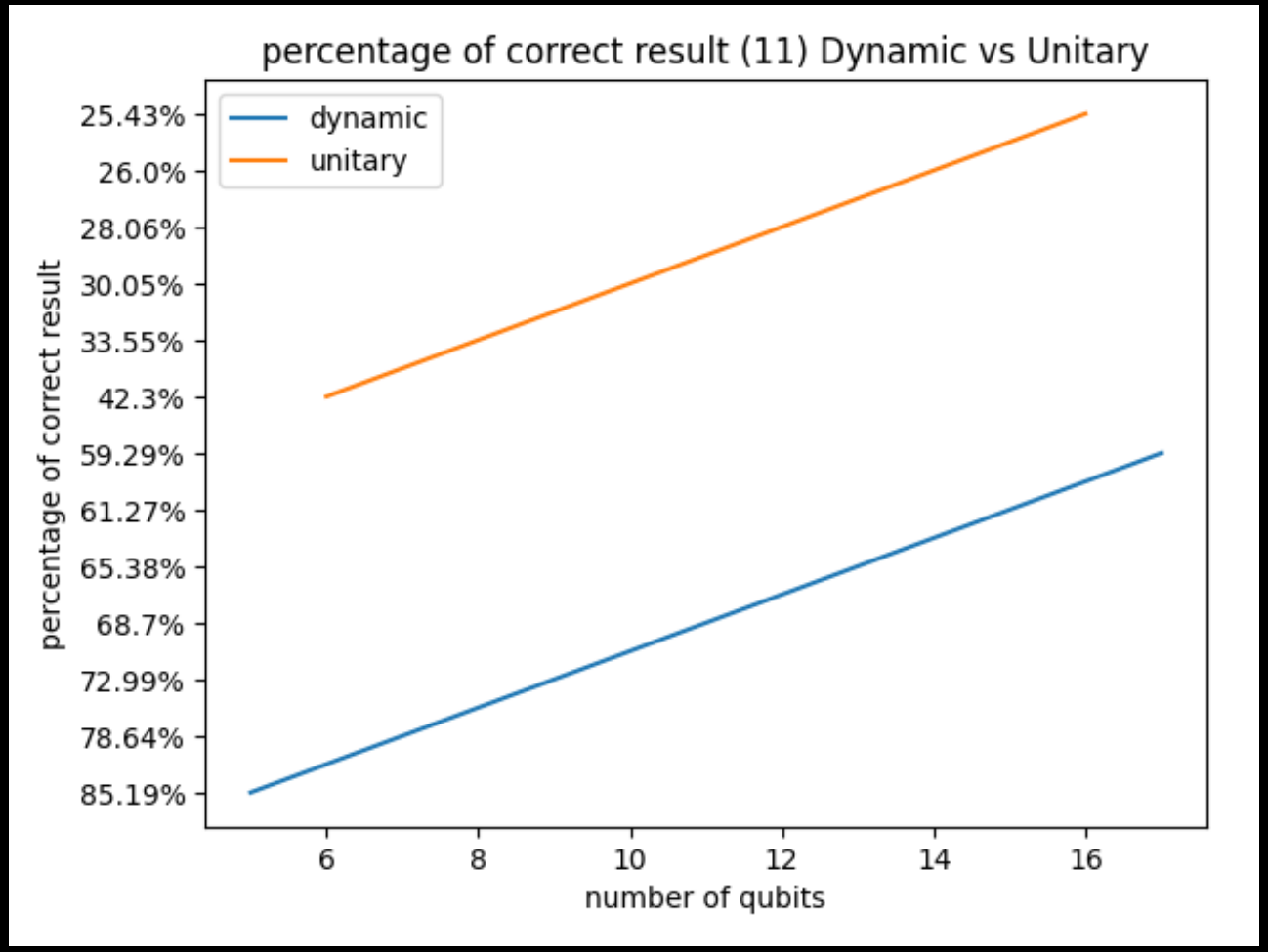
Aim of the project

- Find when dynamic circuits provide an advantage
- Add a tutorial with code about dynamic circuits
- Add a tutorial with code about randomized benchmarking

Efficient long-range entanglement



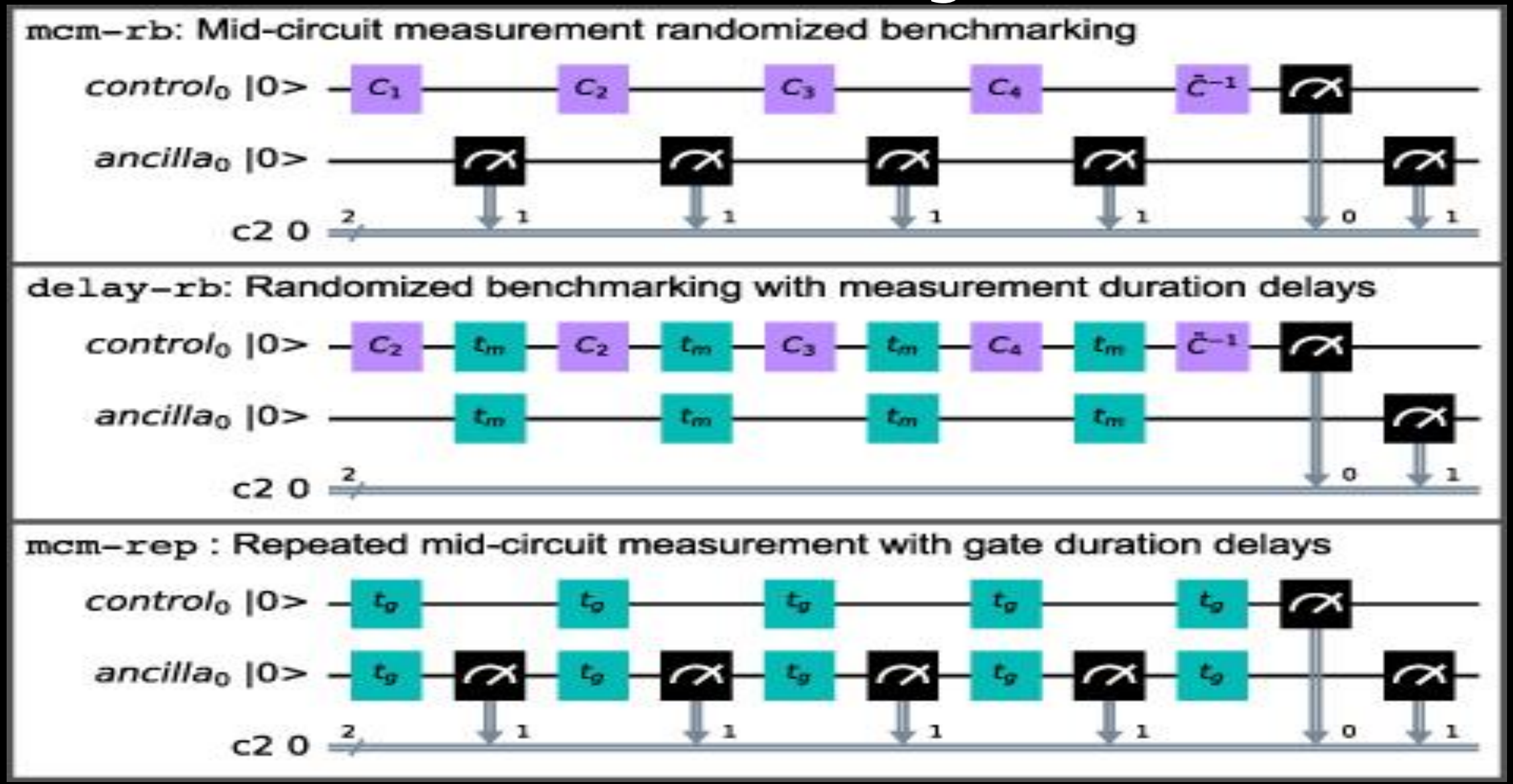
- CNOT Gate is used a lot
- long-range entanglement is hard.
- Better results will have great advantages on quantum algorithms



Efficient long-range entanglement results

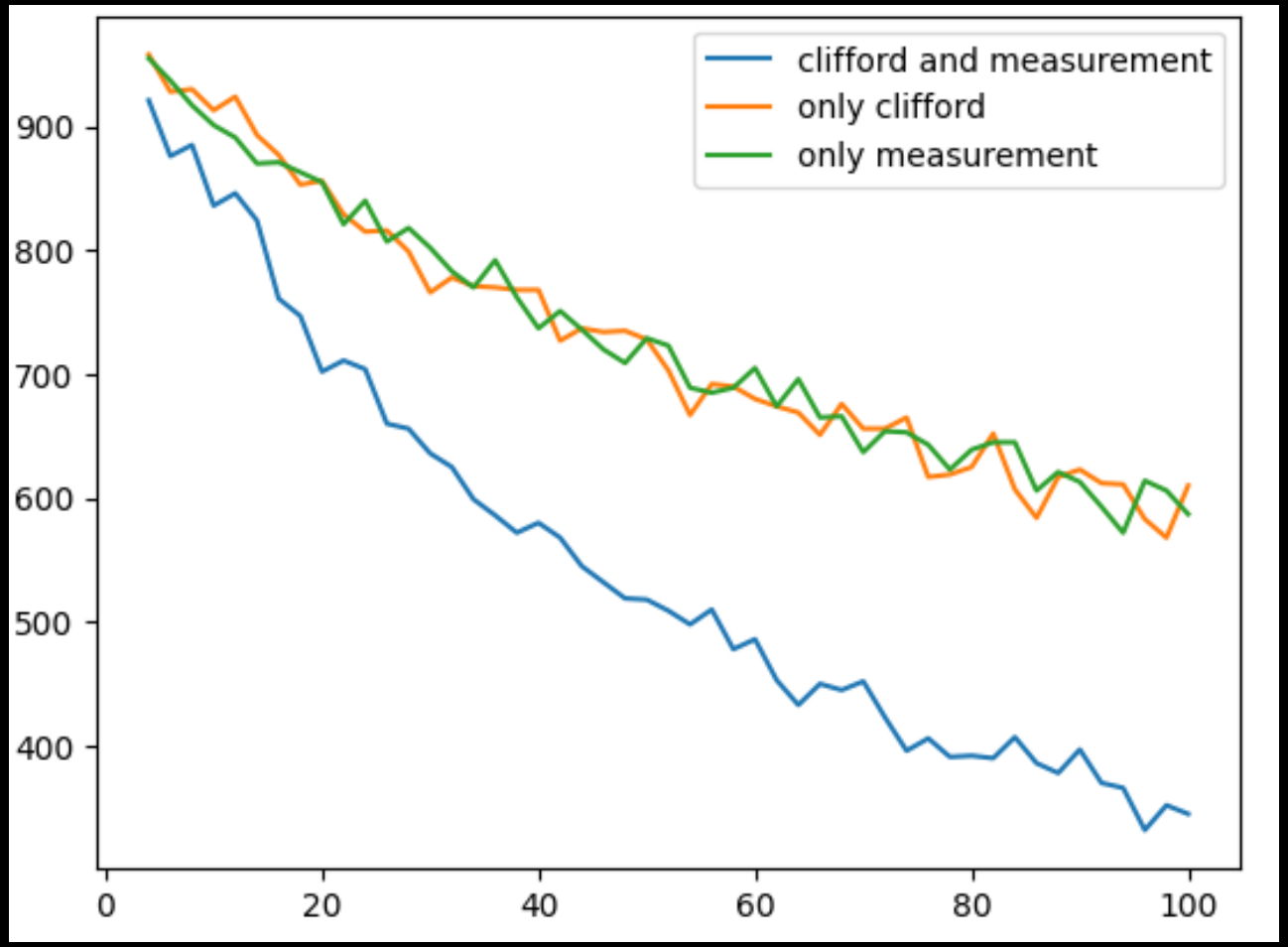
- measurement error: 0.005%
- CNOT gate error: 8%
- More than 40% better results

Randomized benchmarking



Randomized benchmarking results

- orange: q0 X gates, q1 identity gates
- green: q0 identity gates, q1 measurement gates
- blue: q0 X gates, q1 measurement gates
- q0: qubit 0
- q1: qubit 1



References:

- A randomized benchmarking suite for mid-circuit measurements: https://iopscience.iop.org/article/10.1088/1367-2630/ad0e19
- Qiskit documentation
- Efficient long-range entanglement using dynamic circuits: https://iopscience.iop.org/article/10.1088/1367-2630/ad0e19