Arithmetic circuit library

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Qiskit

Quantum arithmetic?

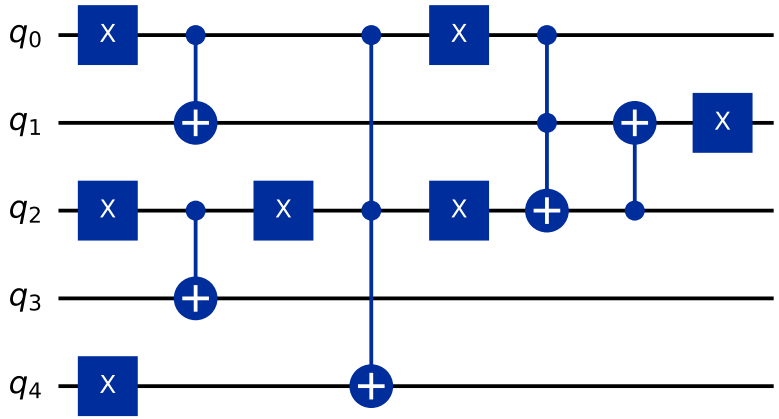
Reversible arithmetic operations:

$$|x\rangle|0\rangle \rightarrow |x\rangle|f(x)\rangle$$

E.g. addition

$$|x\rangle|y\rangle \mapsto |x+y\rangle|y\rangle$$

and others (multiplication, power, etc.)!

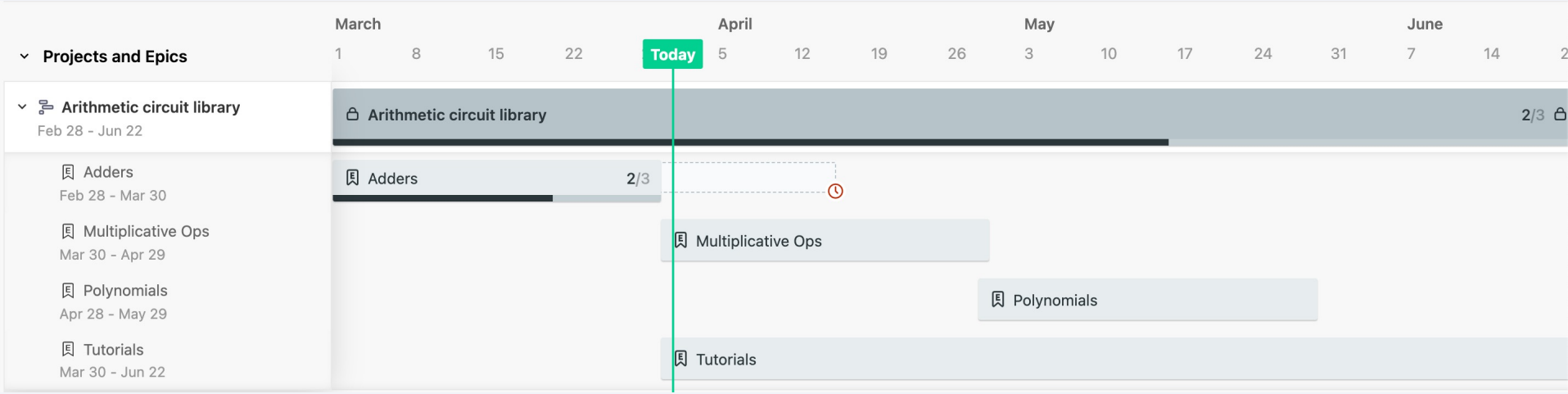


Why is this important?

Arithmetic operations are crucial subroutines for advanced algorithms.

With a library, we can investigate how algorithms scale in practice and optimize them!

Roadmap

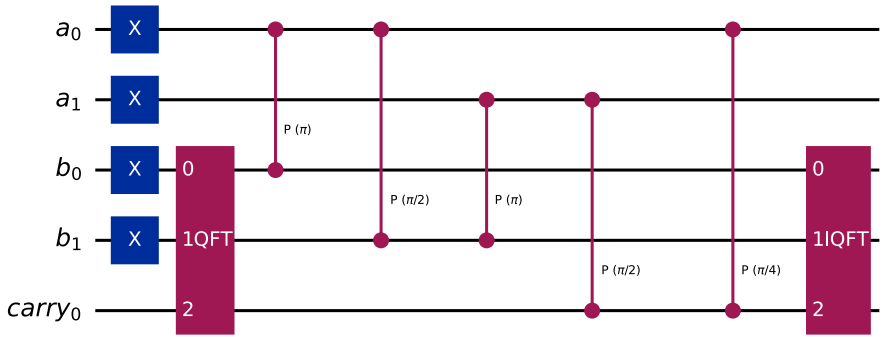


Example – QFT adder

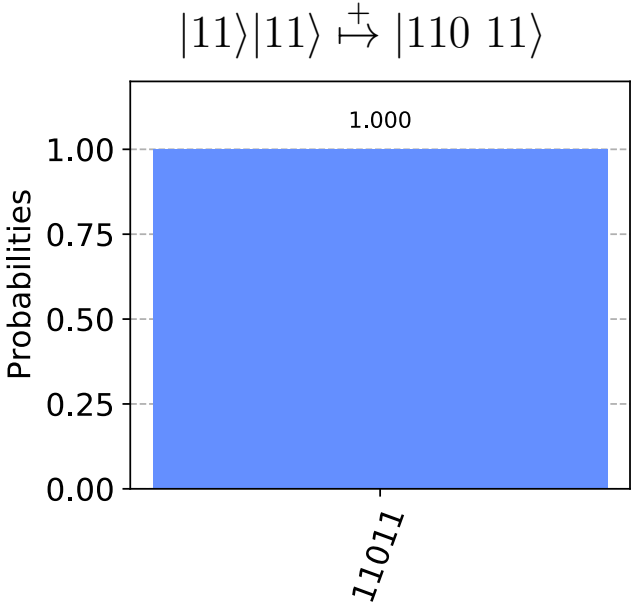
Code

```
from qiskit.circuit.library import QFTAdder

adder = QFTAdder(2)  # 2 bit numbers
# `numbers` prepares the values we add
qc = adder.compose(numbers, front=True)
```



Result



Ruiz-Perez et al (2017). arXiv:1411.5949