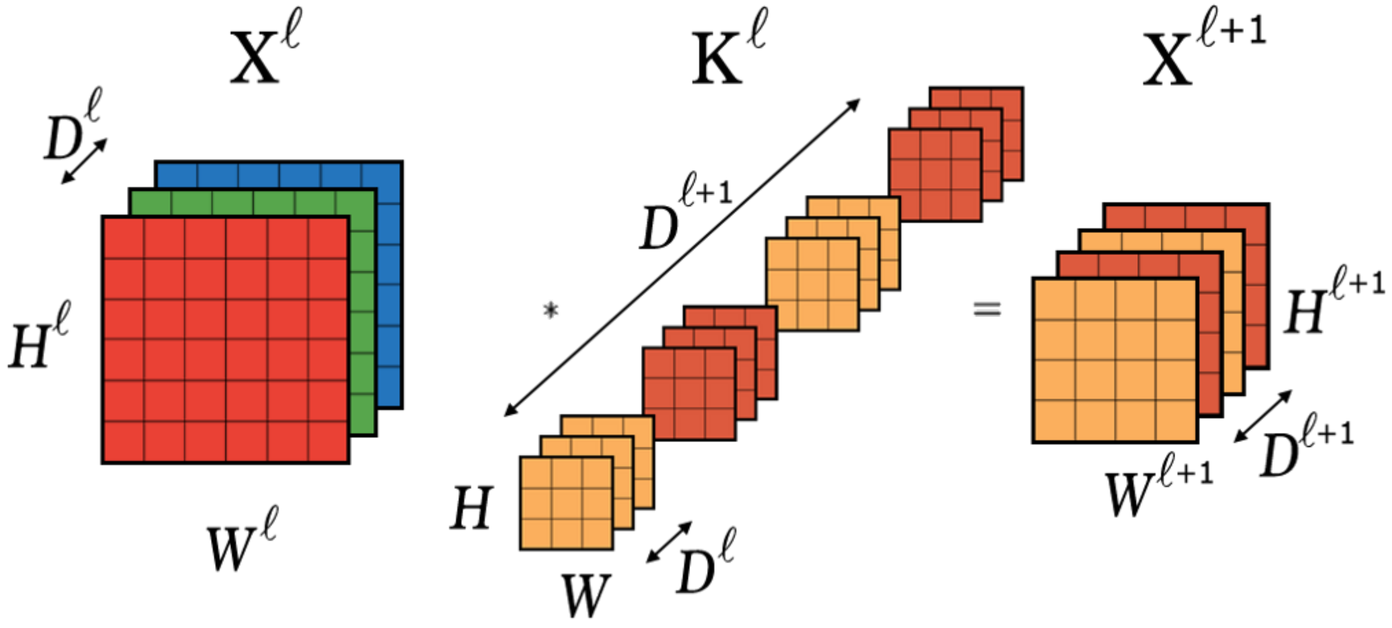
QCNN - Iordanis

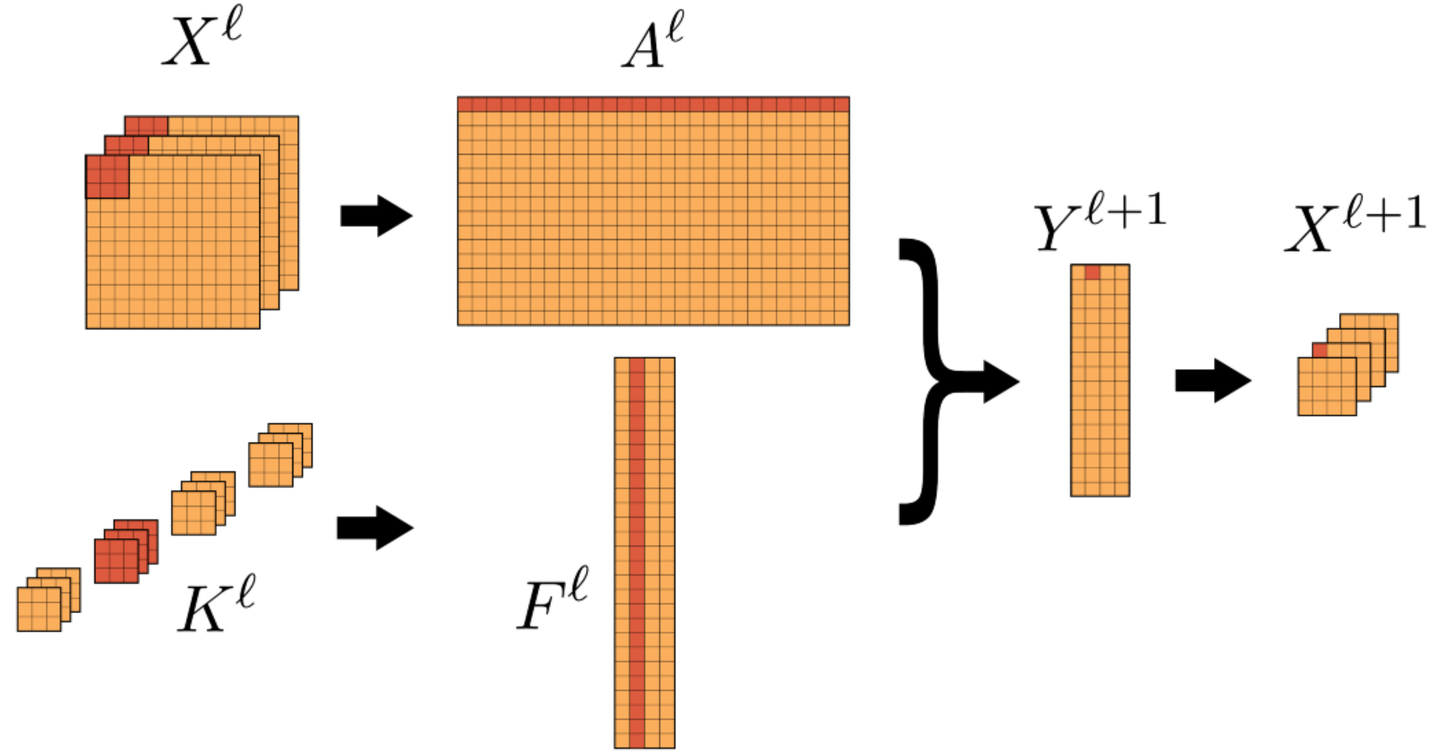
Main contributions

1. quantum version of convolutional product
2. Methods to implement non-linearities & pooling
3. New ways of doing tomography of states representing images



← Convolutional product

Convolutional product as matrix multiplication →



Algo → • Load all rows and columns in superposition

• Use quantum inner product estimation to approximate each pixel.

• Each pixel has an amplitude corresponding to the probability of it being seen

Running time →

Classical	Quantum
$\tilde{O}$ (Output size × kernel size)	$\tilde{O}$ ($1/\sigma$ × Output size) × (S)

Code →

- class QuantumSGD() →
- class ClassicalSGD() →
- class QCNN
  - get_noise_matrix
  - add gaussian noise
  - quantum sampling
  - forward.