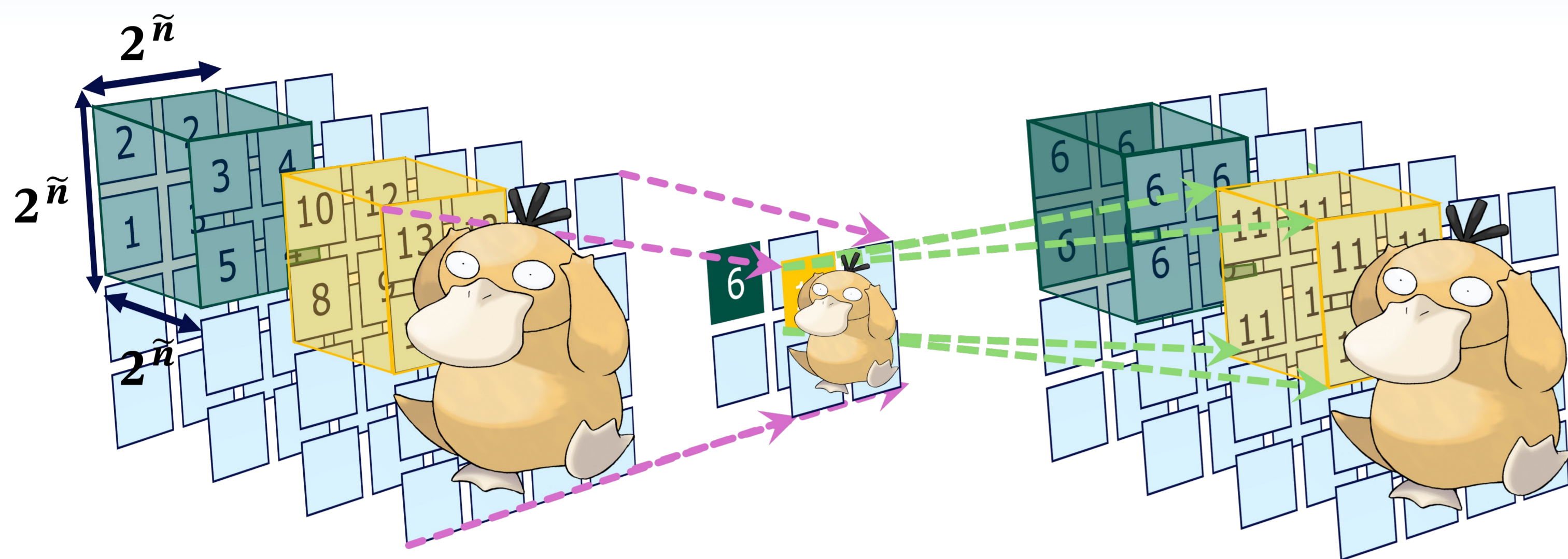


Quantum images and optical classifiers

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Can we use quantum mechanics to represent images?

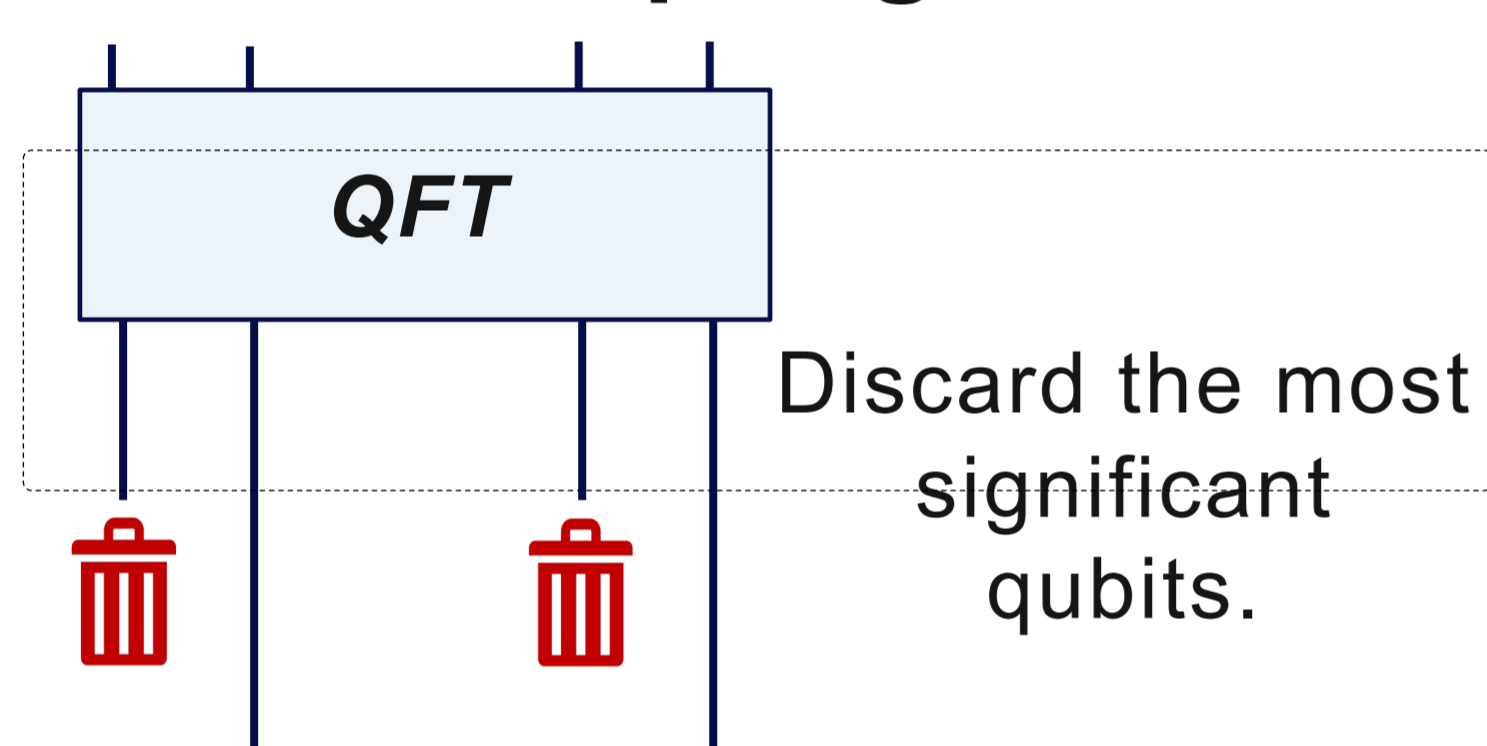


Sampling rates determine quality, fidelity and storage cost of the digital representation of a continuous process. Resampling adjusts a signal's resolution without re-acquisition, but is challenging for high-dimensional datasets.

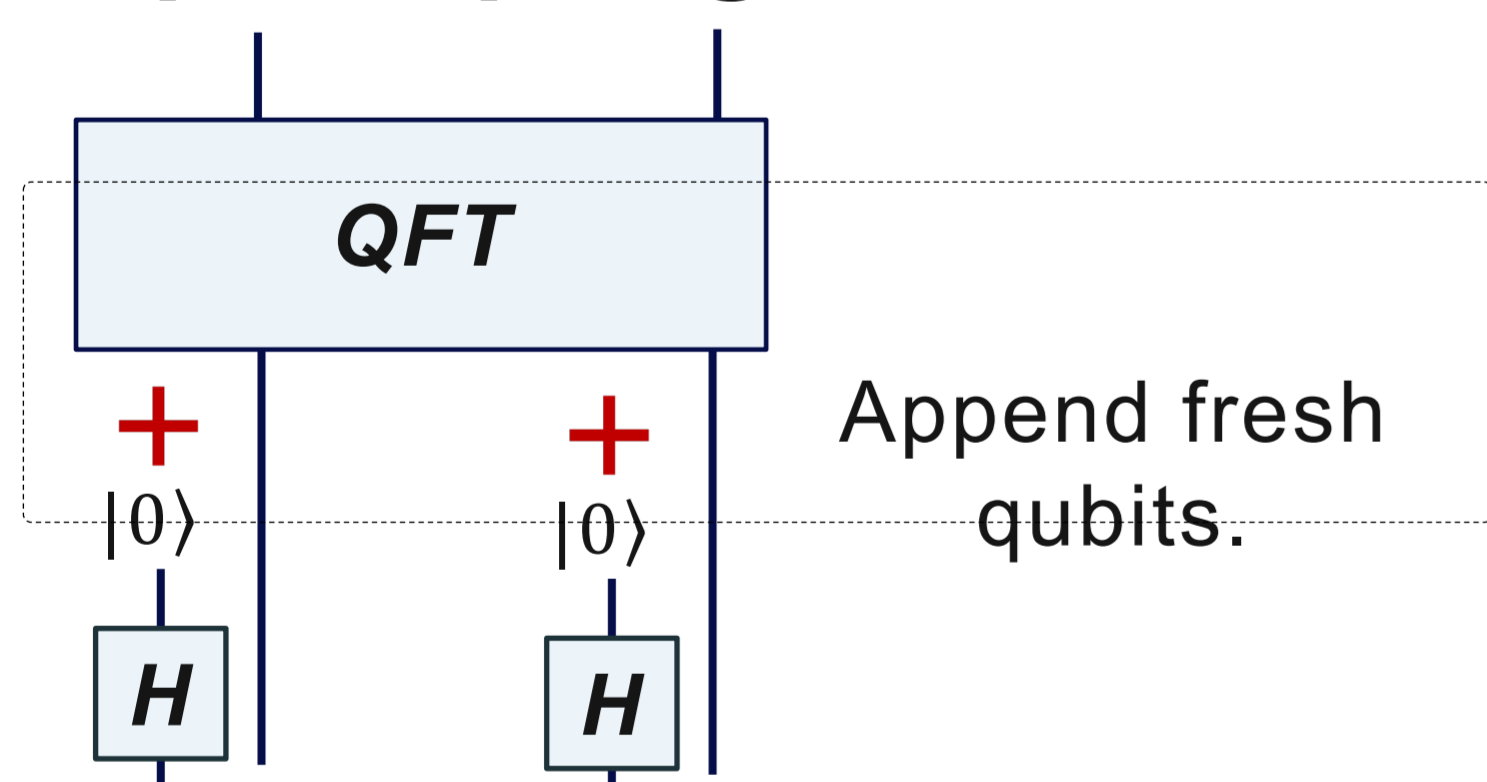
We introduce a toolset of quantum algorithms to resample data encoded in the probabilities of a quantum register.

We use the quantum Fourier transform to adjust the number of high-frequency encoding qubits.

Downsampling

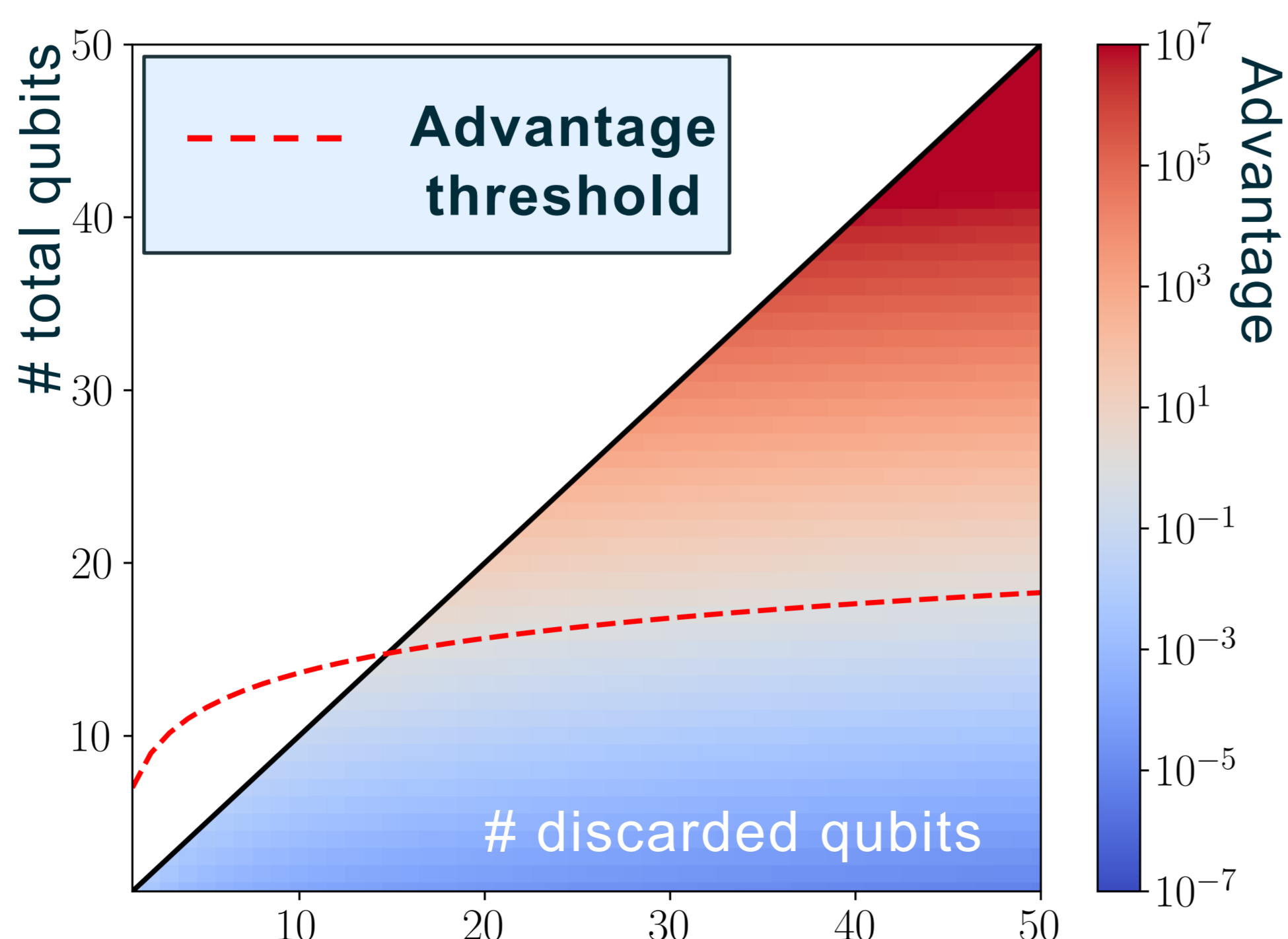


Upsampling



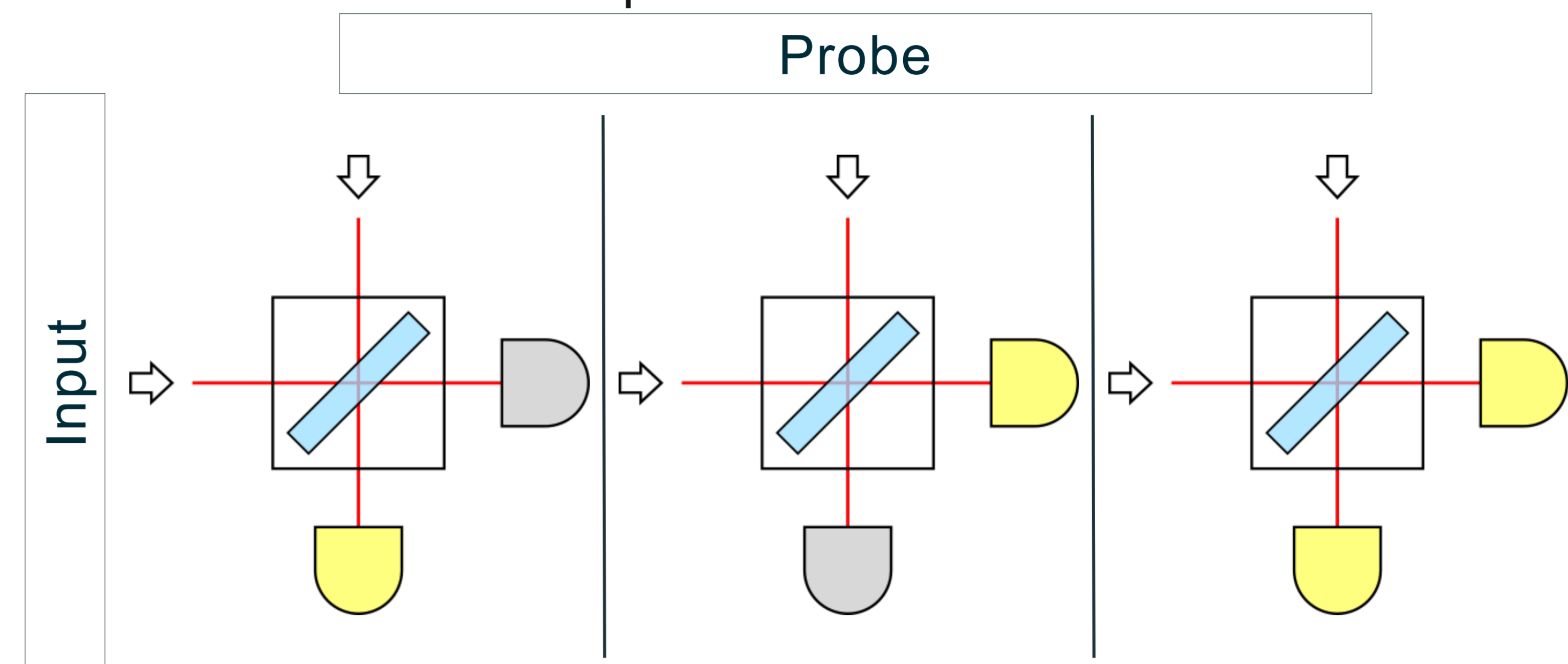
Exponentially faster in number of operations than classical FFT.

Output statistics increase the resource cost, although advantage is still possible, both as a standalone algorithm and as a subroutine.

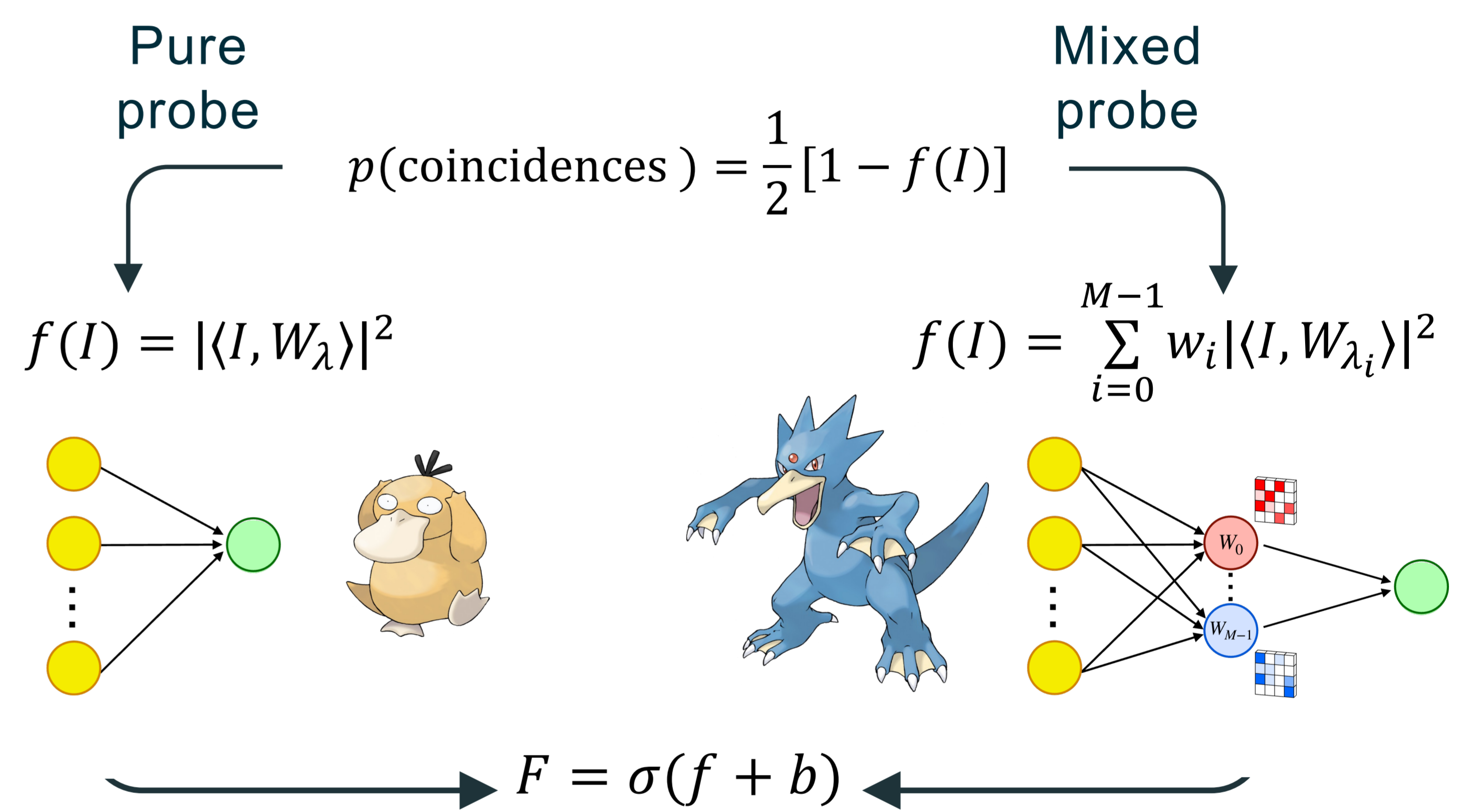


Can we classify an image with a single photon?

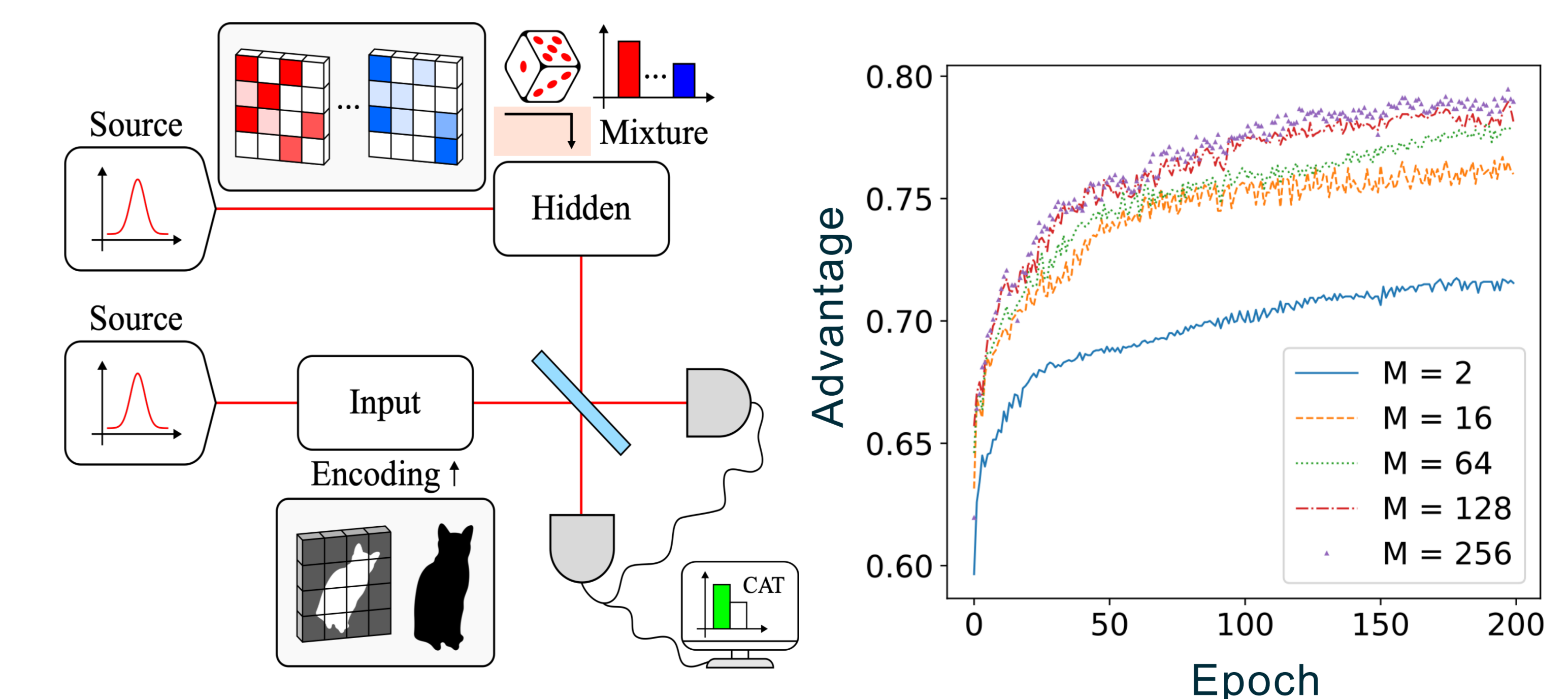
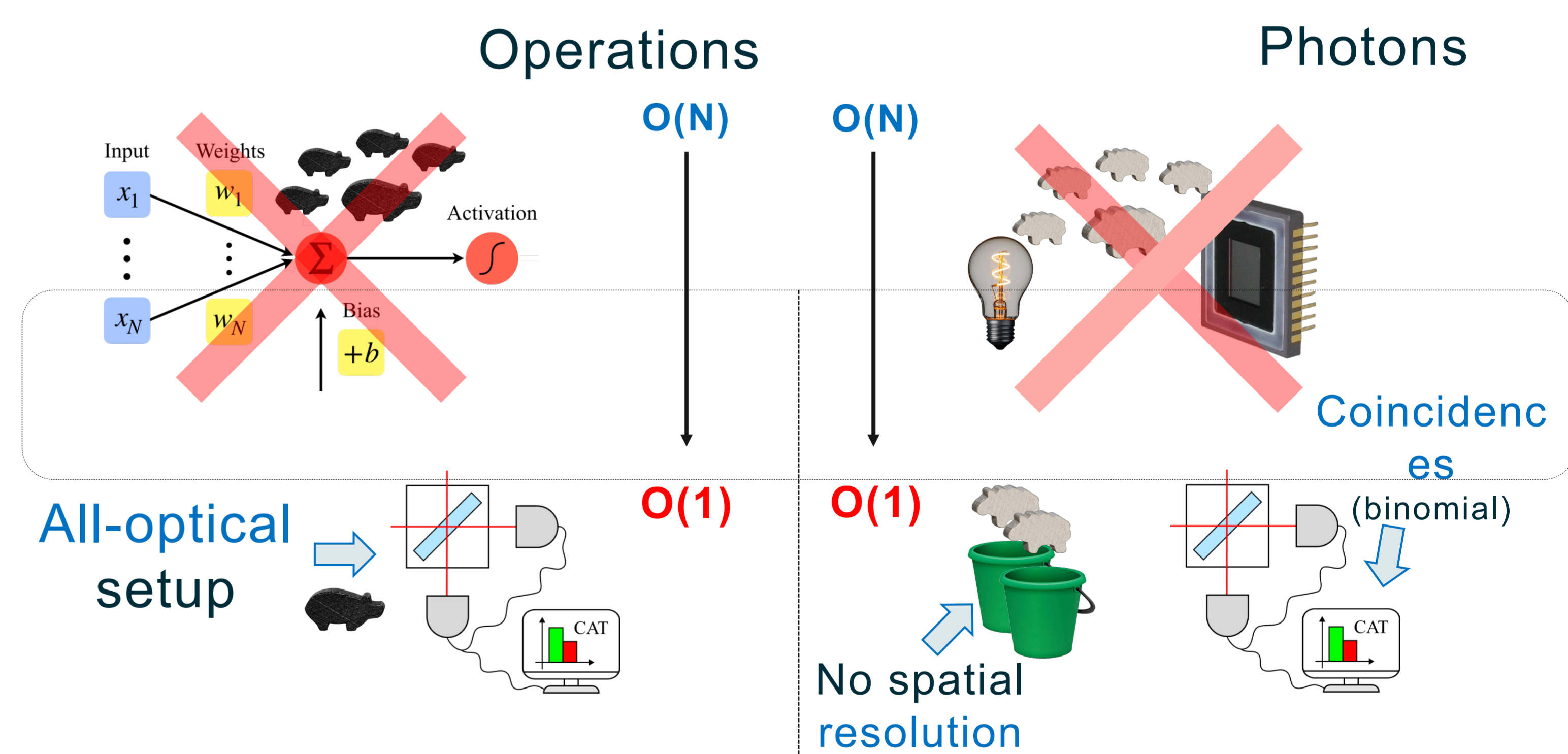
The probability that two photons exit a beam splitter in different modes depends on their distinguishability. Classification is achieved by measuring the rate of coincidences at the output.



We exploit the Hong-Ou-Mandel effect to build an optical neuron/shallow network.



Superexponential advantage both in operations and photons.



We test these architectures against state-of-the-art datasets, like MNIST and CIFAR10.

