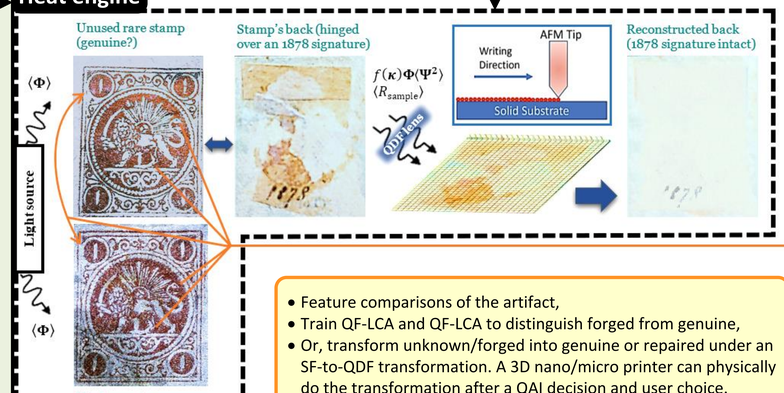
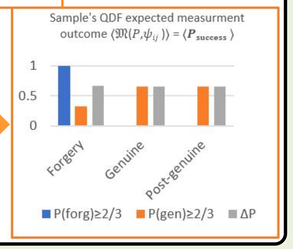
START → Event observation → Dataset processing → Sys. State Prediction → User/QAI Decision → HALT

Heat engine



- Feature comparisons of the artifact,
- Train QF-LCA and QF-LCA to distinguish forged from genuine,
- Or, transform unknown/forged into genuine or repaired under an SF-to-QDF transformation. A 3D nano/micro printer can physically do the transformation after a QAI decision and user choice.
- Report probability of forged $\mathcal{P}$ (forg) vs. genuine $\mathcal{P}$ (gen) between compared samples from the heat engine



QF-LCA Programs

QDF-LCode

I/O filename

r/w data

Internal-external DB

Ref. [5, Fig. 15], Ref. Figs. 1-3

Execute QAI program

QAI-LCode

I/O filename

QFLCC_Out

Output filename

Classification of resultant outputs from QI and IBMQ computers, and store results of this classification

⟨$\mathcal{P}_{distribute}$⟩ yields ⟨$\mathcal{P}_{success}$⟩ ≥ 2/3? — Yes / No

Is genuine? — Yes / No

Transform sample? — Yes / No

Record/report output state

QFLCode_Out

Output filename

Restart

Ref. [5, Sec. 4]

QF-LCA STEPS:

1- Apply QF-LCA to measure,
2- Process input dataset: **Input (⟨$\mathcal{P}$'⟩)** = 1 – 2/3 = 1/3 for $\mathcal{P}$(gen)
3- Predict output: **Output (Δ$\mathcal{P}$)** = [1 for $\mathcal{P}$(forg) – 1/3 for $\mathcal{P}$(gen)] = 2/3 transformed, genuine, or mixed?
4- Record/report output state

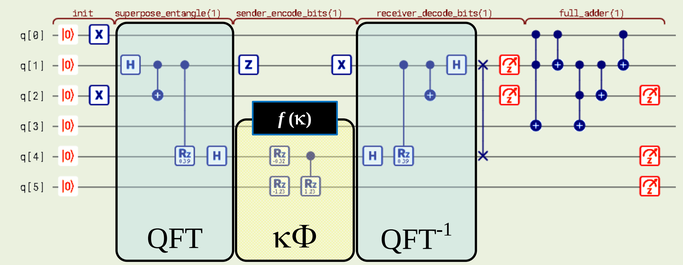
DATASET APPLICATION EXAMPLES:

- Simulate quantum systems in quantum field theory, such as particle interactions at CERN.
- Identify forged documents from genuine based on QDF $\mathcal{P}$'s as $\mathcal{P}_{distribute}$ yielding ⟨$\mathcal{P}_{success}$⟩ values on entangled particle samples.
- Reconstruct damaged DNA strands to predict a virus attack from QDF $\mathcal{P}$'s and correlation measures.
- Information retrieval based on entanglement entropy and correlation measures to recreate previous events.
- Simulate a decision-making quantum game (system). For example, a game participant Alice, Bob or Eve, exchanges information to achieve a ⟨$\mathcal{P}_{success}$⟩ ≥ 2/3 in winning a prize as a desired output state, Refs. [1, 4].

QF-LCA dataset generator and processor

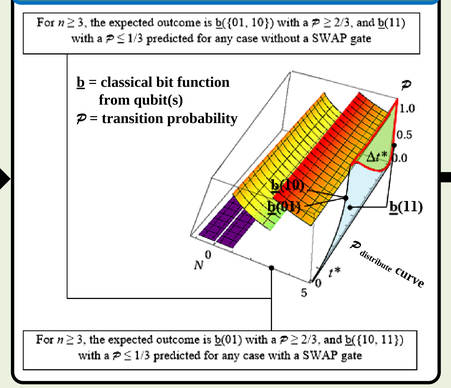
QDF circuit tested on *N*-qubit machines for simulating the Heat Engine — Ref. [1, lower Table 2, p.28]

QDF circuit's energy in/out from Heat Engine via QDF scalar transform for $N \geq 3$ particles; QDF is compatible with QFT and its inverse QFT^{-1} per measurement

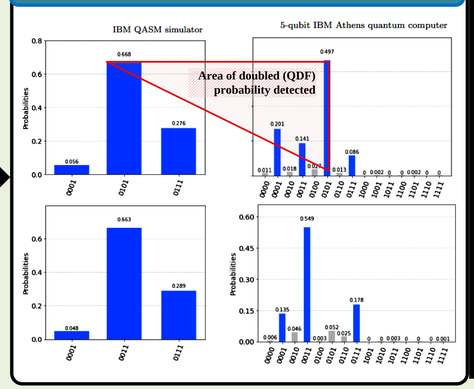


IN → Scalar κ function → OUT

Circuit measurement outcome at the Encoding Level for $N \geq 3$ particles, predicting QDF $\mathcal{P}$'s



Decoding measurement outcome as code samples with their *p*'s for $N \geq 1$ particle pairs



Analyzed OUTPUTS by QF-LCA

OBSERVER OUTPUTS:

- A quantum (light-particle) heat engine sampled particles from a physical system
- The heat engine entangled sampled particles at ultracold temperatures
- Entanglement was registered as qubits to predict a system state as a QDF dataset:
- Dataset shows QDF was formed doubling particle space in probability to its position
- QDF data provides information from entangled particles exchanged in the system
- Particle spin and position are predicted by sharing the QDF information as qubits
- QDF circuit counts the qubits as its dataset to predict states with high probability
- Dataset shows a QDF extra qubit complements the information on a hidden state
- QDF circuit found the hidden particle state relative to thermal events in the system

QAI decision-making by QF-LCC within QF-LCA

- Obtain an efficient system or a desired energy output by the dataset above to:
- create or reroute energy paths for those particles not participating in a thermal event to participate by focusing/defocusing the distribution of their states via QDF lenses in the system. This contributes to greater system efficiencies.

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ACRONYMS:

PT = phase transition
Q = quantum, **C** in **CPT** = classical
QDF = quantum double-field
QF-LCA = QDF lens coding algorithm
BEC = Bose-Einstein condensate
QAI = quantum artificial intelligence
QFT = quantum Fourier transform
QF-LCC = QF-LC classification
IEDB = internal-external database
ES = excites state **GS** = ground state
r/w = read/write

CONCLUSION:

QF-LCA is trained by QDF dataset from a QAI algorithm to make strong predictions after the expected success probability values of ⟨$\mathcal{P}$ success⟩ ≥ 2/3, to values close to 1, or near zero entropy as the system evolves in rerouting energy paths making particles to entangle, replicate, participate and contribute to greater system efficiencies, and/or field transform. Information retrieval and reconstruction of events based on entanglement entropy are examples from the QF-LCA dataset.