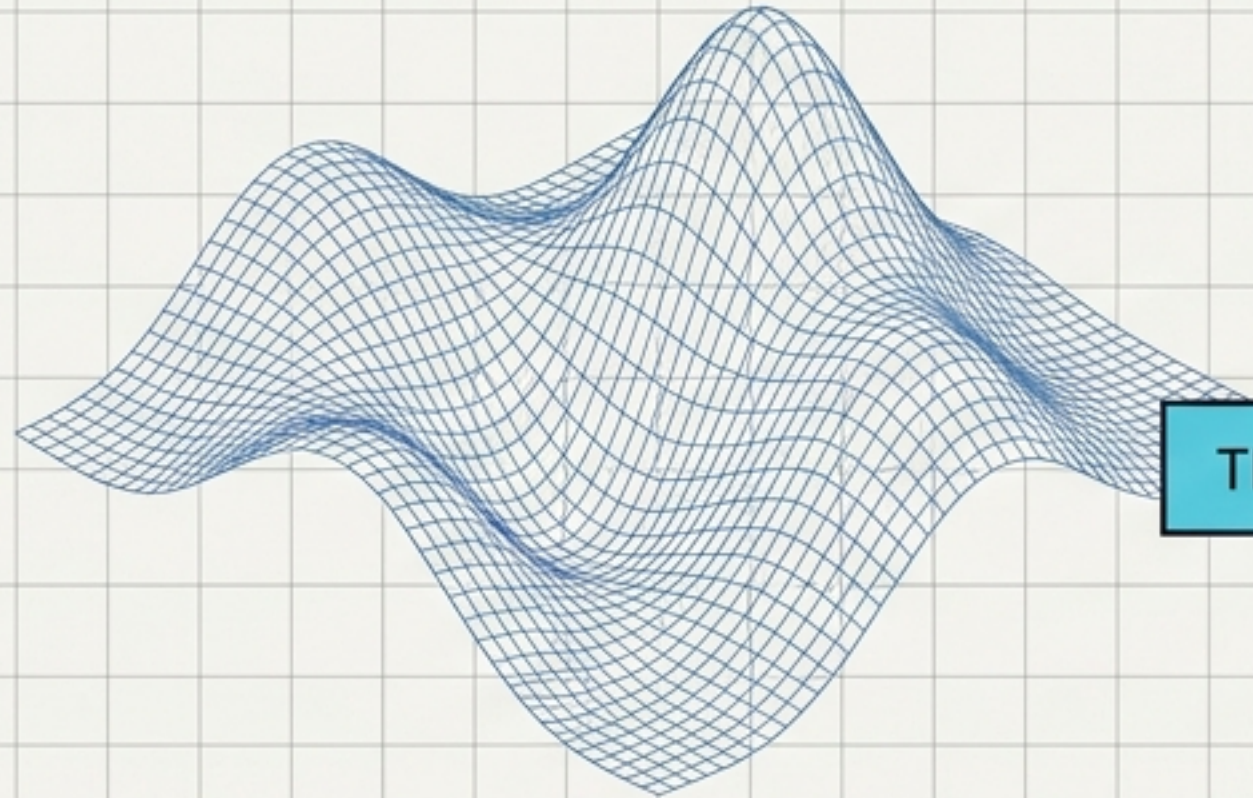


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IX. 

CONTINUOUS FIELDS



THE PROTOTYPE BRIDGE

Theoretical frameworks of scalar universe interactions (Ξ -scalar dynamics). Highly continuous, mathematically abstract, localized parameters and inter-system coupling.

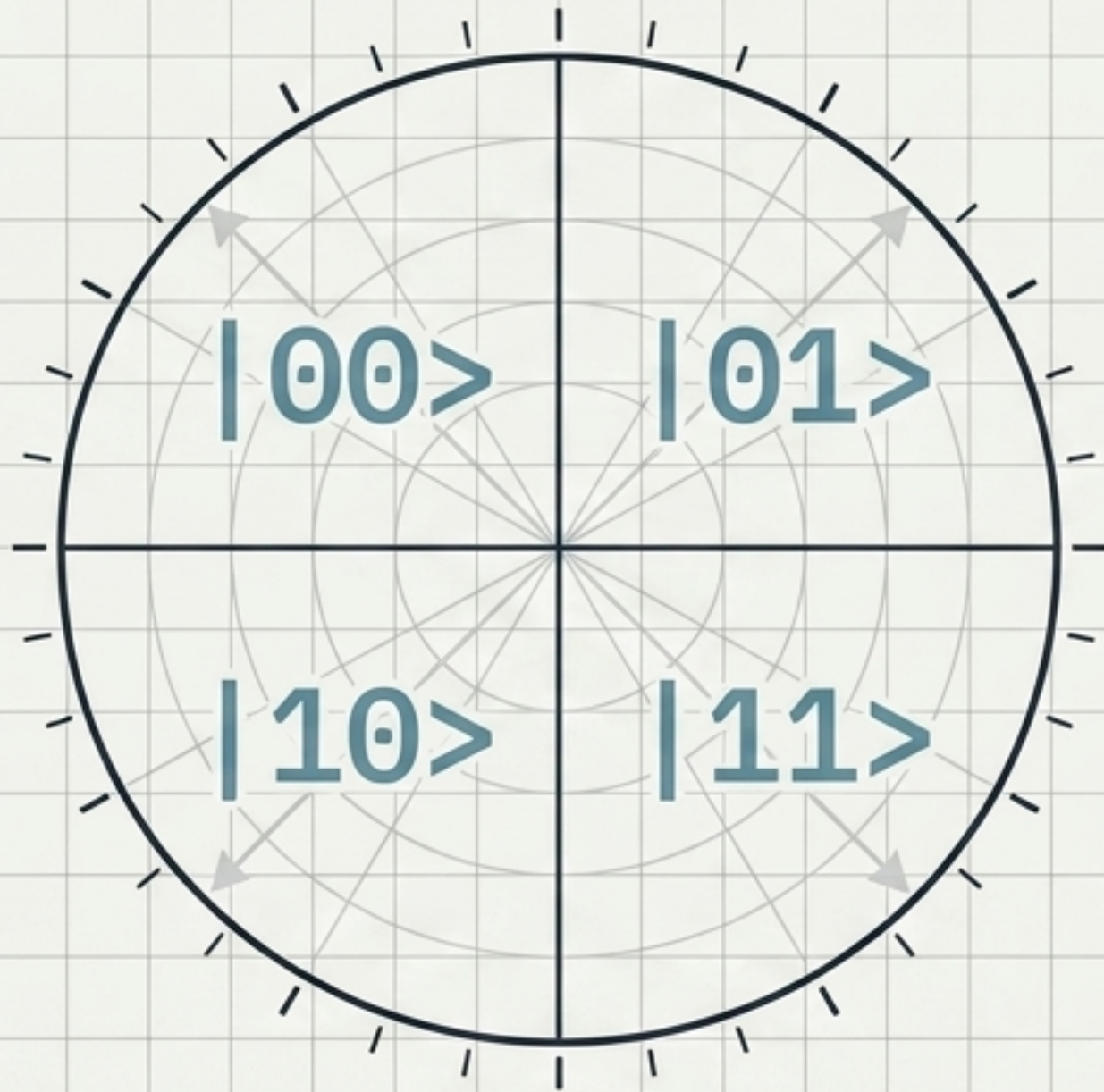
DISCRETE EXECUTION

H_{00}	H_{01}	H_{01}	H_{03}
H_{10}	H_{11}	H_{12}	H_{14}
H_{20}	H_{22}	H_{33}	H_{34}
H_{11}	H_{42}	H_{43}	H_{44}

Translation into discrete Hamiltonian matrix representations. Execution on modern N-qubit quantum hardware backends via unitary time-evolution.

OBJECTIVE: Map continuous variables onto a discrete Hilbert space to validate scalar dynamics on IBM Quantum Cloud.

ENCODING THE 2-QUBIT SYSTEM INTO HILBERT SPACE



System Size: $N = 2$ Qubits

Composite State Vector Equation:

$$|\psi(t)\rangle = c_0 |00\rangle + c_1 |01\rangle + c_2 |10\rangle + c_3 |11\rangle$$

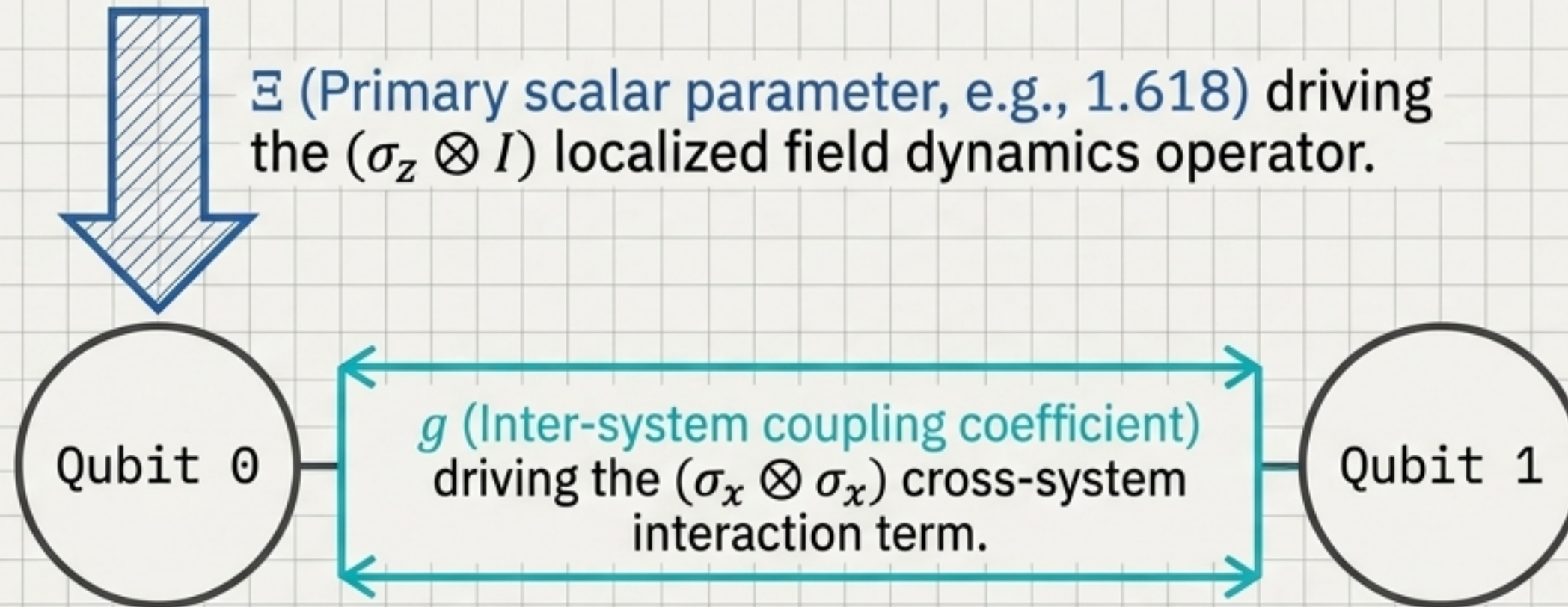
Constraint Rule:

$$\sum |c_i|^2 = 1 \text{ (for } i = 0 \text{ to } 3)$$

Before continuous scalar variables can be manipulated by quantum processing units (QPUs), they are structurally bound to the mathematical constraints of a 4-dimensional composite state vector.

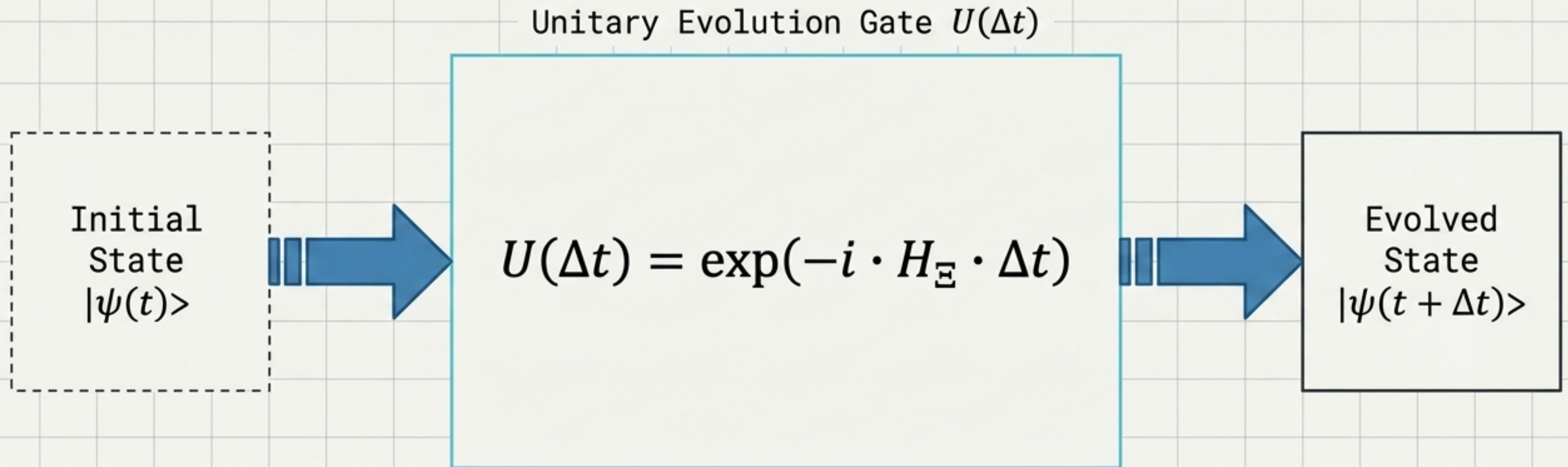
Deconstructing the Parameterized Scalar Hamiltonian (H_{Ξ})

$$H_{\Xi} = \Xi(\sigma_z \otimes I) + g(\sigma_x \otimes \sigma_x)$$



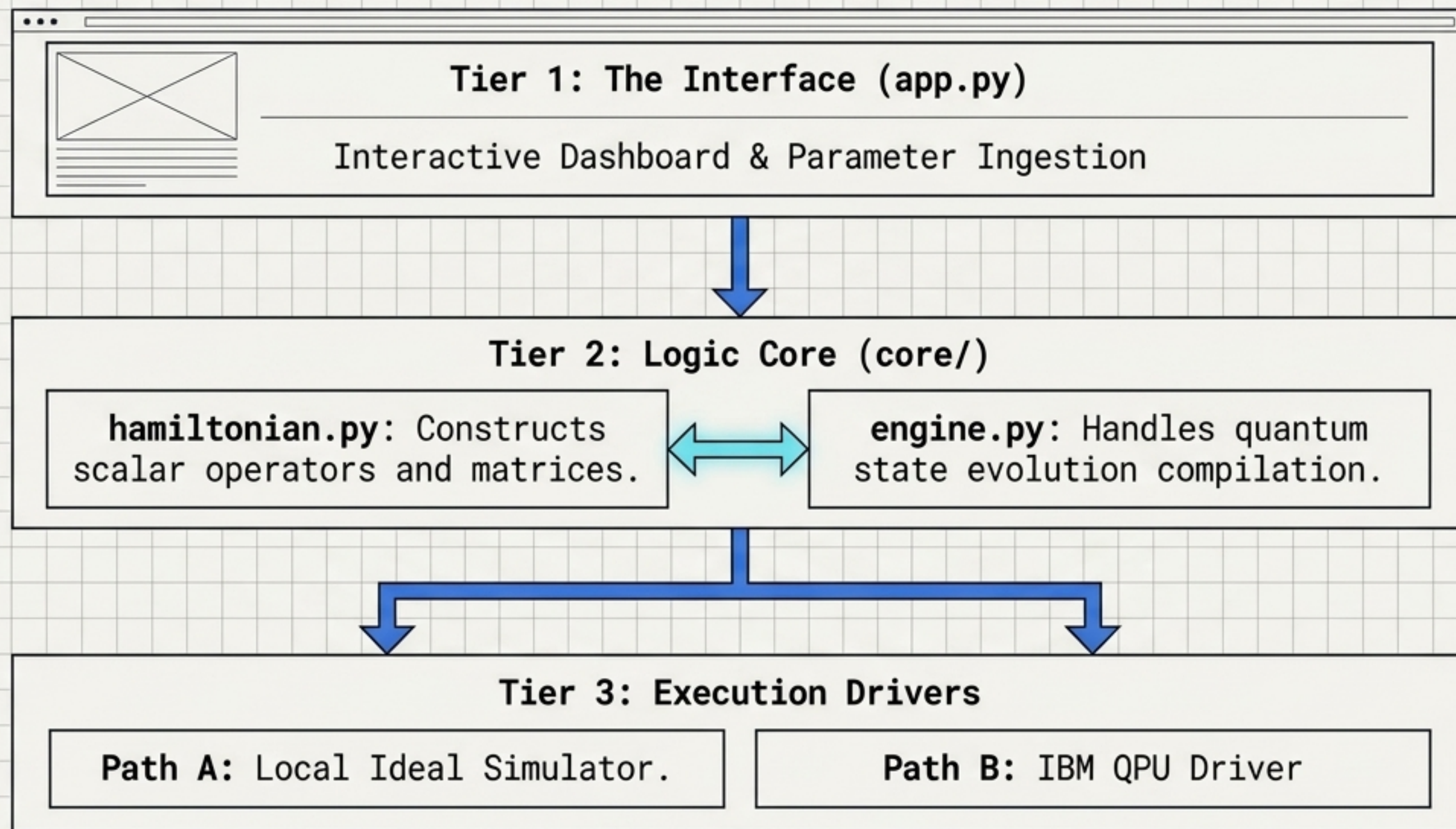
The continuous scalar metrics (Ξ, g) explicitly govern the local dynamics and entanglement generation within the discrete 2-qubit array through Pauli spin matrices.

Predicting the Shift via Unitary Time-Evolution



This mathematical mapping allows us to predict scalar shifts precisely. The next phase of the prototype translates this continuous exponential operator into executable Python matrices.

The Translation Pipeline: Software Architecture Overview



Directory Target: scalar_quantum_sim/ – Fully modular and deployable

Module 1 (The Builder): Constructing the Matrix Array

core/hamiltonian.py

```
def build_custom_operator(self, xi_scalar: float,  
coupling: float) -> np.ndarray:
```

```
    H_field = xi_scalar * np.kron(self.Z, self.I)
```

```
    H_interaction = coupling * np.kron(self.X, self.X)
```

```
    return H_field + H_interaction
```

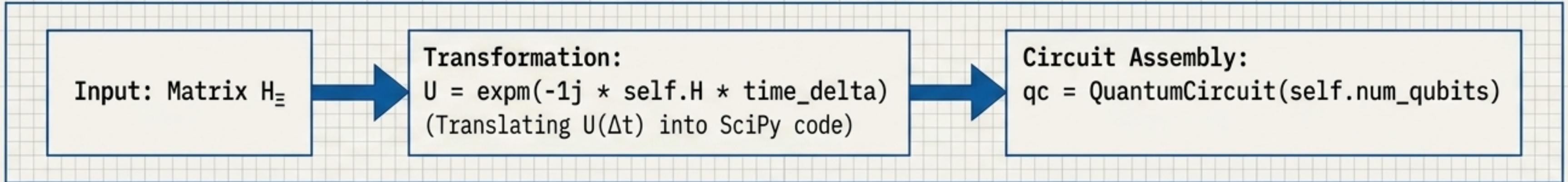
Direct translation of
the $(\sigma_z \otimes I)$ localized
operator.

Direct translation of the
 $(\sigma_x \otimes \sigma_x)$ cross-
system interaction.

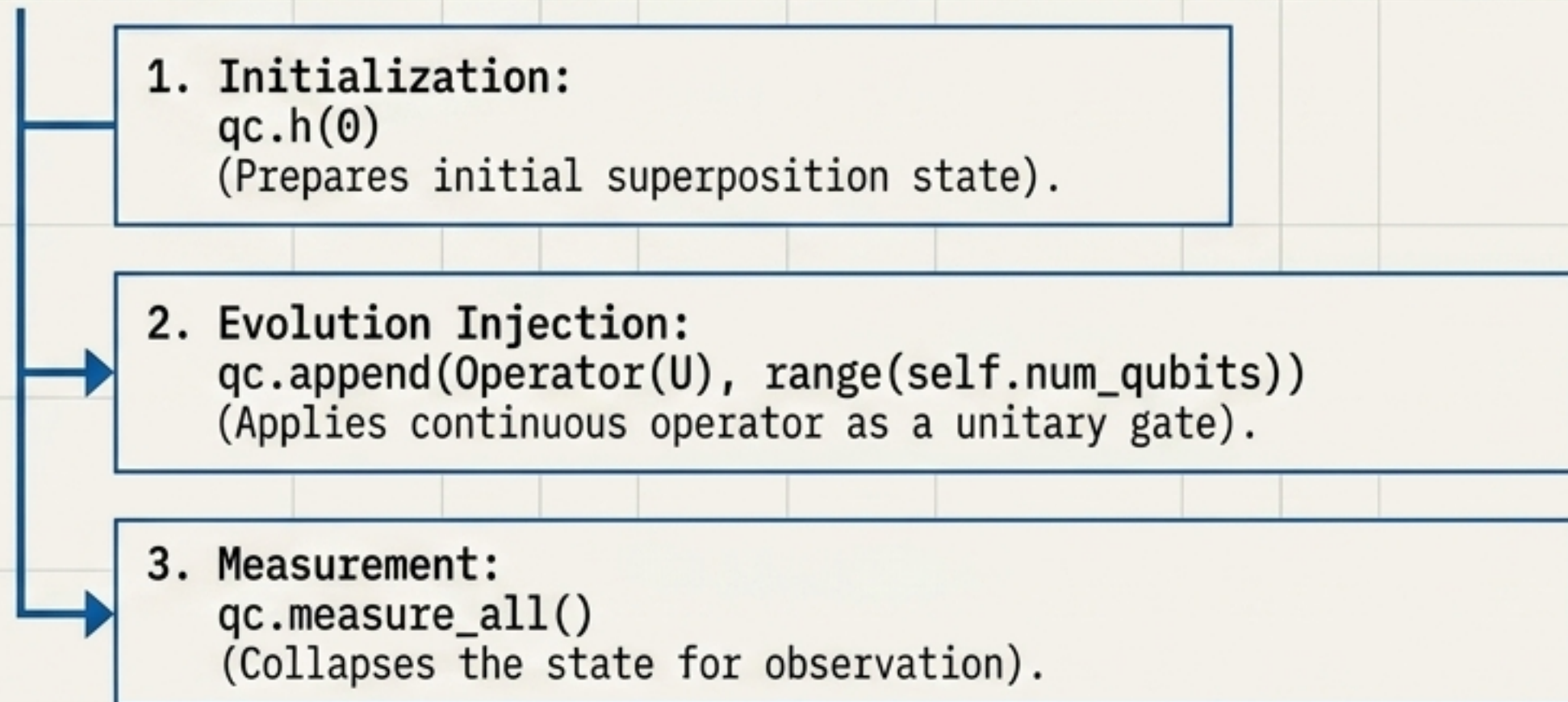
The Builder module ingests abstract scalar metrics and outputs a 4x4 complex matrix representation of H_{Ξ} using SciPy and NumPy.

Module 2 (The Engine): Synthesizing the Continuous Circuit

Core File: core/engine.py



Circuit Injection Breakdown



Execution Matrix: Routing the Simulation Target

Dimension	Local Simulator (Ideal)	Real IBM Quantum QPU
Methodology	<code>run_local_ideal()</code> via Statevector Evolution	<code>run_ibm_quantum()</code> via SamplerV2
Hardware utilized	Local CPU	Remote Quantum Processing Unit (e.g., <code>ibm_brisbane</code>)
Output State	Exact probabilities & comprehensive <code>statevector</code> data	Probabilistic output via <code>measured counts</code> across 1,024 shots
Execution Metrics	Instant evaluation	Returns specific <code>job_id</code> for cloud tracking
Primary Use Case	Algorithmic debugging & ideal mathematical baseline	Empirical validation on noisy, real-world hardware

Key Insight: The engine dynamically routes the synthesized continuous operators to either an ideal local baseline or remote IBM hardware, allowing for immediate empirical comparison.

The Dashboard UI: Interactive Parameter Control

System Control Panel

≡

Parameter (0.0 to 5.0) [2.5]

Coupling Coefficient g (0.0 to 2.0) [0.8]

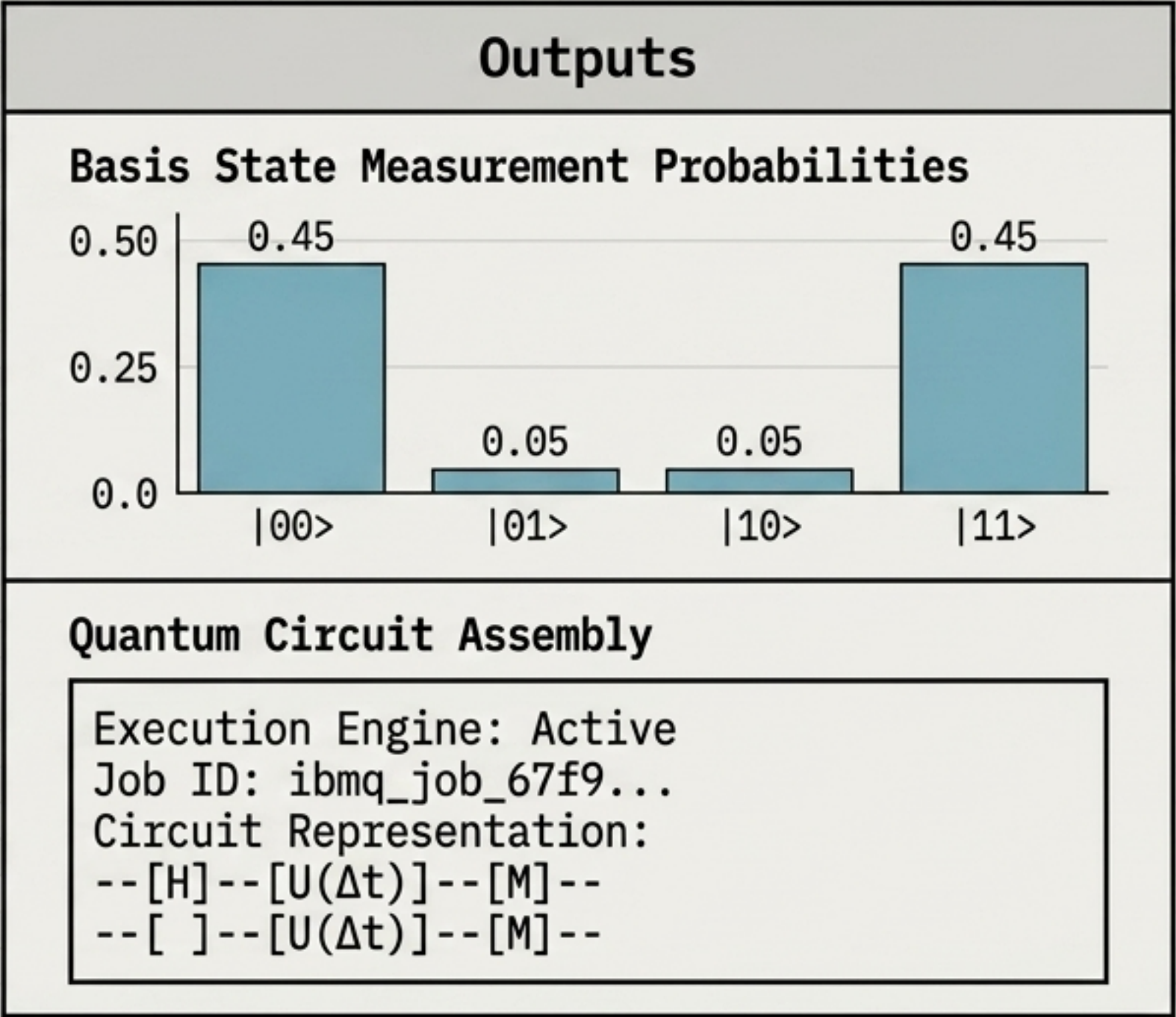
Evolution Delta t (0.1 to 10.0) [1.0]

Backend Mode selection (Local vs. IBM Quantum)

Local Simulator (Ideal) ▼

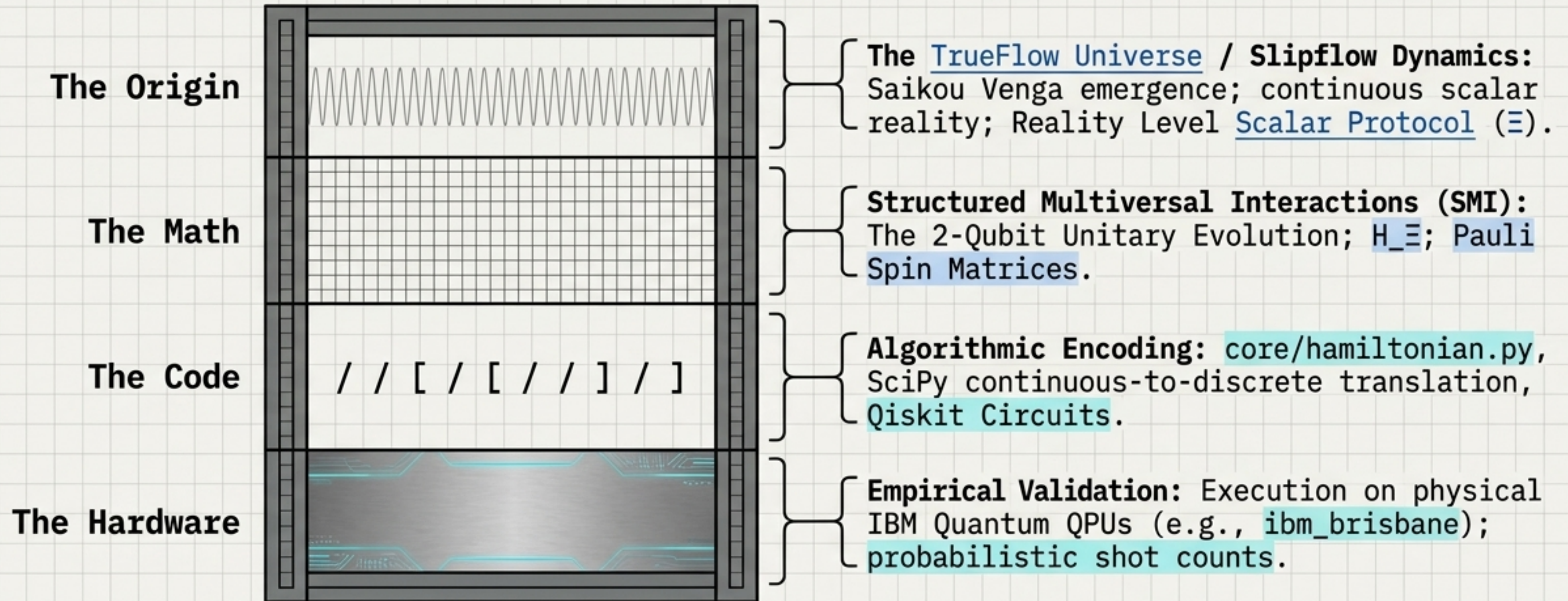
IBM Quantum API Token

Execute Simulation



The **Streamlit** GUI abstracts the execution pipeline, bridging continuous user inputs directly to the IBM runtime backend.

The Full Stack Reality: From Echo-Rift to Physical Qubit



This software prototype does not merely simulate theoretical lore—it forces continuous, multiversal concepts into discrete, [measurable reality](#) on [physical](#) quantum processors.

Sovereign Foundation & Deployment Protocol

Launch Instructions

```
> pip install qiskit qiskit-ibm-runtime  
scipy numpy pandas streamlit  
  
> streamlit run app.py
```

Sovereign IP & Licensing

IP Notice: All proprietary frameworks, SMI mechanics, and the Reality Level Scalar (Ξ) Protocol constitute prior art registered via immutable digital repositories.

Zenodo ID: sewellsmi

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