Algorithm implementations

Integration and Optimization

Fault Tolerance

Data Processing

Decomposition

Communication

+ *Fictionality*
+ *Security*
+ *Maintainability*
+ *Flexibility*   - *Performance*

[Process data in multi-stage for quantum - classical systems]

Pipe and Filter Pattern

+ *Performance*

[Manage quantum data and resource allocation on-demand]

Consumer Pattern

+ *Interoperability*
+ *Maintainability*
+ *Modularity*
+ *Security*

[Separate test logic from data to dynamically test various quantum states and operations]

DDT (Data Driven Testing)

+ *Modularity*   - *Performance*
+ *Interoperability* - *Maintainability*
+ *Scalability*   - *Cost*

[**Manage** data conversion, schema adaptation, and query execution between quantum data sources]

Mediator Wrapper Architecture

[Managing data conversion and query execution]

+ *Flexibility*

[Require broadcasting the quantum state to multiple quantum subsystems]

Quantum Broadcast Pattern

[Translate classical data (e.g., bits, strings, numbers) into quantum states]

+ Ease *Implementation*   - *Performance*
+ *Flexibility*   - *Scalability*

[Represent a data element in a quantum computer in order to perform calculations]

Basis Encoding Strategy

+ *Efficiency*   - *Flexibility*
+ *Interoperability*   - *Complexity*

[Represent a collection of data elements in a quantum computer in order to perform calculations]

Quantum Associative Memory (QuAM)

+ *Scalability*
+ *Flexibility*

Quantum Data Encoding

+ *Performance*   - *Implementation Complexity*
+ *Scalability*   - *Error*

[Encode data in a compact manner that do not require calculations]

Amplitude Encoding Strategy

+ *Performance*
+ *Low Gate Complexity*   - *Limited Capacity*

[Represent each data-point by a separate qubit]

Angle Encoding

+ *Efficiency*   - *Implementation Complexity*
+ *Scalability*   - *Latency Issues*

[Access data values randomly is necessary for the algorithm]

Quantum Random Access Memory (QRAM)

+ *Performance*   - *Reliability*
+ *Scalability*   - *Cost and Effort*

[Defines how and when quantum states are measured to extract classical data]

Measurement Pattern