Summary of Extracted Quantum Concepts (Pre-Classification)

This document summarizes the raw quantum concepts automatically extracted from the source code of the Qiskit, PennyLane, and Classiq frameworks. These concepts were identified by the `src/core_concepts/identify_*.py` scripts and serve as the input for the manual pattern classification step.

Pattern Coverage Analysis

This analysis compares the quantum patterns found in the three frameworks against the base list of 59 patterns from `quantum_patterns.json`.

Coverage: 25.4% (15/59 base patterns found)

Framework Pattern Distribution

Framework	Patterns Found
Classiq	21
PennyLane	20
Qiskit	13

Complete List of Patterns Found

Classiq Patterns

Pattern	Concepts
Amplitude Amplification	

Pattern	Concepts

	`open_library.functions.amplitude_amplification.amplitude_amplifi`
	`open_library.functions.amplitude_amplification.exact_amplitude_a`
	`open_library.functions.grover.grover_diffuser` (+2 more)

Basis Change	`open_library.functions.discrete_sine_cosine_transform.qct_qst_ty`
	`open_library.functions.discrete_sine_cosine_transform.qct_qst_ty`
	`open_library.functions.discrete_sine_cosine_transform.qct_type2`

Circuit Construction Utility	`open_library.functions.modular_exponentiation.multiswap`, `open_library.functions.utility_functions.apply_to_all`
Controlled Linear Rotation	`open_library.functions.linear_pauli_rotation.linear_pauli_rotati`
Creating Entanglement	`open_library.functions.state_preparation.prepare_bell_state`, `open_library.functions.state_preparation.prepare_ghz_state`

Data Encoding	`open_library.functions.state_preparation.inplace_prepare_complex`
	`open_library.functions.state_preparation.prepare_complex_amplitu`
	`open_library.functions.state_preparation.prepare_exponential_sta`

Dynamic Circuit	`open_library.functions.utility_functions.switch`
Function Table	`open_library.functions.lookup_table.span_lookup_table`
Grover	`open_library.functions.grover.grover_search`
Hamiltonian Simulation	`qmod.builtins.functions.exponentiation.suzuki_trotter`
Initialization	`open_library.functions.state_preparation.prepare_basis_state`, `open_library.functions.state_preparation.prepare_dicke_state`, `open_library.functions.state_preparation.prepare_dicke_state_unc` more)
	`open_library.functions.lcu.lcu`, `open_library.functions.lcu.lcu_p`

Pattern	Concepts
Linear Combination of Unitaries	
Oracle	`open_library.functions.grover.phase_oracle`
Phase Shift	`open_library.functions.qsvt.projector_controlled_double_phase`, `open_library.functions.qsvt.projector_controlled_phase`
Quantum Amplitude Estimation	`open_library.functions.amplitude_estimation.amplitude_estimation`
Quantum Approximate Optimization Algorithm (QAOA)	`open_library.functions.qaoa_penalty.qaoa_cost_layer`, `open_library.functions.qaoa_penalty.qaoa_layer`, `open_library.functions.qaoa_penalty.qaoa_mixer_layer` (+1 more)
Quantum Arithmetic	`open_library.functions.modular_exponentiation.c_modular_multiply` `open_library.functions.modular_exponentiation.cc_modular_add`, `open_library.functions.modular_exponentiation.inplace_c_modular_` more)
Quantum Phase Estimation (QPE)	`open_library.functions.qpe.qpe`, `open_library.functions.qpe.qpe_f`
Quantum Singular Value Transformation	`open_library.functions.qsvt.qsvt`, `open_library.functions.qsvt.qs` `open_library.functions.qsvt.qsvt_lcu` (+2 more)
SWAP Test	`open_library.functions.swap_test.swap_test`
Variational Quantum	`open_library.functions.hea.full_hea`

Pattern	Concepts
Algorithm (VQA)	

PennyLane Patterns

Pattern	Concepts
Amplitude Amplification	`pennylane.templates.subroutines.amplitude_amplification.Amplitud`
Basis Change	`pennylane.templates.state_preparations.superposition.Superpositi` `pennylane.templates.subroutines.aqft.AQFT`, `pennylane.templates.s`
Circuit Construction Utility	`pennylane.templates.subroutines.basis_rotation.BasisRotation`, `pennylane.templates.subroutines.permute.Permute`, `pennylane.templates.swapnetworks.ccl2.TwoLocalSwapNetwork`
Data Encoding	`pennylane.templates.embeddings.amplitude.AmplitudeEmbedding`, `pennylane.templates.embeddings.angle.AngleEmbedding`, `pennylane.templates.embeddings.basis.BasisEmbedding` (+6 more)
Grover	`pennylane.templates.subroutines.grover.GroverOperator`, `pennylane.templates.subroutines.reflection.Reflection`
Hamiltonian Simulation	`pennylane.templates.subroutines.approx_time_evolution.ApproxTime` `pennylane.templates.subroutines.commuting_evolution.CommutingEvo` `pennylane.templates.subroutines.qdrift.QDrift` (+2 more)
Initialization	`pennylane.templates.state_preparations.arbitrary_state_preparati` `pennylane.templates.state_preparations.basis_qutrit.QutritBasisS` `pennylane.templates.state_preparations.cosine_window.CosineWindo`
Linear Combination of Unitaries (LCU)	`pennylane.templates.subroutines.fable.FABLE`
Oracle	

Pattern	Concepts
	`pennylane.templates.subroutines.gqsp.GQSP`, `pennylane.templates.subroutines.qubitization.Qubitization`, `pennylane.templates.subroutines.select.Select` (+1 more)
Phase Shift	`pennylane.templates.subroutines.flip_sign.FlipSign`
Quantum Amplitude Estimation (QAE)	`pennylane.templates.subroutines.qmc.QuantumMonteCarlo`
Quantum Approximate Optimization Algorithm (QAOA)	`pennylane.templates.embeddings.qaoaembedding.QAOAEmbedding`
Quantum Arithmetic	`pennylane.templates.subroutines.adder.Adder`, `pennylane.templates` `pennylane.templates.subroutines.multiplier.Multiplier` (+6 more)
Quantum Neural Network (QNN)	`pennylane.templates.layers.cv_neural_net.CVNeuralNetLayers`, `pennylane.templates.subroutines.interferometer.Interferometer`, `pennylane.templates.tensornetworks.mera.MERA` (+2 more)
Quantum Phase Estimation (QPE)	`pennylane.templates.subroutines.controlled_sequence.ControlledSe` `pennylane.templates.subroutines.qpe.QuantumPhaseEstimation`
Quantum Singular Value Transformation (QSVT)	`pennylane.templates.subroutines.qsvt.QSVT`
SWAP Test	`pennylane.templates.subroutines.hilbert_schmidt.HilbertSchmidt`, `pennylane.templates.subroutines.hilbert_schmidt.LocalHilbertSchm`

Pattern	Concepts
Schmidt Decomposition	`pennylane.templates.state_preparations.mottonen.MottonenStatePre` `pennylane.templates.subroutines.arbitrary_unitary.ArbitraryUnita`
Variational Quantum Algorithm (VQA)	`pennylane.templates.layers.basic_entangler.BasicEntanglerLayers`, `pennylane.templates.layers.gate_fabric.GateFabric`, `pennylane.templates.layers.random.RandomLayers` (+2 more)

Variational Quantum Eigensolver (VQE)	`pennylane.templates.layers.particle_conserving_u1.ParticleConser`
	`pennylane.templates.layers.particle_conserving_u2.ParticleConser`
	`pennylane.templates.subroutines.all_singles_doubles.AllSinglesDo`

Qiskit Patterns

Pattern	Concepts
Basis Change	`basis_change.qft.QFT`, `basis_change.qft.QFTGate`, `data_preparation.state_preparation.UniformSuperpositionGate`
Circuit Construction Utility	`blueprintcircuit.BlueprintCircuit`, `generalized_gates.diagonal.Diagonal`, `generalized_gates.diagonal.DiagonalGate` (+23 more)
Data Encoding	`data_preparation.pauli_feature_map.PauliFeatureMap`, `data_preparation.pauli_feature_map.z_feature_map`, `data_preparation.pauli_feature_map.zz_feature_map`
Grover	`grover_operator.GroverOperator`
Hamiltonian Simulation	`hamiltonian_gate.HamiltonianGate`, `pauli_evolution.PauliEvolutionGate`
Initialization	`data_preparation.initializer.Initialize`, `data_preparation.state_preparation.StatePreparation`, `graph_state.GraphState` (+1 more)
Oracle	

Pattern	Concepts
	`bit_flip_oracle.BitFlipOracleGate`, `fourier_checking.FourierChecking`, `hidden_linear_function.HiddenLinearFunction` (+2 more)
Quantum Approximate Optimization Algorithm (QAOA)	`n_local.qaoa_ansatz.QAOAAnsatz`
Quantum Arithmetic	`arithmetic.adders.adder.Adder`, `arithmetic.adders.adder.FullAdderGate`, `arithmetic.adders.adder.HalfAdderGate` (+23 more)
Quantum Logical Operators	`boolean_logic.quantum_and.AND`, `boolean_logic.quantum_and.AndGate`, `boolean_logic.quantum_or.OR` (+2 more)
Quantum Phase Estimation (QPE)	`phase_estimation.PhaseEstimation`
Variational Quantum Algorithm (VQA)	`n_local.efficient_su2.EfficientSU2`, `n_local.evolved_operator_ansatz.EvolvedOperatorAnsatz`, `n_local.excitation_preserving.ExcitationPreserving` (+4 more)
Variational Quantum Eigensolver (VQE)	`n_local.evolved_operator_ansatz.hamiltonian_variational_ansatz`

Missing Patterns

The following 44 patterns from the base list were not found in any of the three frameworks:

- Ad-hoc Hybrid Code Execution
- Alternating Operator Ansatz (AOA)
- Amplitude Encoding
- Angle Encoding
- Basis Encoding
- Biased Initial State
- Chained Optimization
- Circuit Cutting
- Classical-Quantum Interface
- Error Correction
- Gate Cut
- Gate Error Mitigation
- Hadamard Test
- Hybrid Module
- Matrix Encoding
- Mid-Circuit Measurement
- Orchestrated Execution
- Post-Selective Measurement
- Pre-Trained Feature Extractor
- Pre-deployed Execution
- Prioritized Execution
- Quantum Application Archive
- Quantum Application Testing
- Quantum Associative Memory (QuAM)
- Quantum Circuit Translator
- Quantum Classification
- Quantum Clustering
- Quantum Fourier Transformation

- Quantum Hardware Selection
- Quantum Kernel Estimator (QKE)
- Quantum Module
- Quantum Module Template
- Quantum Random Access Memory (QRAM) Encoding
- Quantum-Classic Split
- Readout Error Mitigation
- Speedup via Verifying
- Standalone Circuit Execution
- Uncompute
- Unified Execution
- Unified Observability
- Uniform Superposition
- Variational Parameter Transfer
- Warm Start
- Wire Cut

New Patterns Created

The following 13 patterns were found in the frameworks but are not in the base list:

Basis Change

Observed in:

- **Classiq**: 8 concepts
- `open_library.functions.discrete_sine_cosine_transform.qct_qst_type1`
- `open_library.functions.discrete_sine_cosine_transform.qct_qst_type2`
- `open_library.functions.discrete_sine_cosine_transform.qct_type2`
- `open_library.functions.discrete_sine_cosine_transform.qst_type2`
- `open_library.functions.qaoa_penalty.qaoa_init`
- `open_library.functions.qft_functions.qft`
- `open_library.functions.qft_functions.qft_no_swap`
- `open_library.functions.utility_functions.hadamard_transform`

- **PennyLane**: 3 concepts
- `pennylane.templates.state_preparations.superposition.Superposition`
- `pennylane.templates.subroutines.aqft.AQFT`
- `pennylane.templates.subroutines.qft.QFT`
- **Qiskit**: 3 concepts
- `basis_change.qft.QFT`
- `basis_change.qft.QFTGate`
- `data_preparation.state_preparation.UniformSuperpositionGate`

Circuit Construction Utility

Observed in:

- **Classiq**: 2 concepts
- `open_library.functions.modular_exponentiation.multiswap`
- `open_library.functions.utility_functions.apply_to_all`
- **PennyLane**: 3 concepts
- `pennylane.templates.subroutines.basis_rotation.BasisRotation`
- `pennylane.templates.subroutines.permute.Permute`
- `pennylane.templates.swapnetworks.ccl2.TwoLocalSwapNetwork`
- **Qiskit**: 26 concepts
- `blueprintcircuit.BlueprintCircuit`
- `generalized_gates.diagonal.Diagonal`
- `generalized_gates.diagonal.DiagonalGate`
- `generalized_gates.gms.GMS`
- `generalized_gates.gms.MSGate`
- `generalized_gates.gr.GR`
- `generalized_gates.gr.GRX`
- `generalized_gates.gr.GRY`
- `generalized_gates.gr.GRZ`
- `generalized_gates.isometry.Isometry`
- `generalized_gates.linear_function.LinearFunction`
- `generalized_gates.mcg_up_to_diagonal.MCGupDiag`

- `generalized_gates.mcmt.MCMTGate`
- `generalized_gates.mcmt.MCMTVChain`
- `generalized_gates.pauli.PauliGate`
- `generalized_gates.permutation.Permutation`
- `generalized_gates.permutation.PermutationGate`
- `generalized_gates.rv.RVGate`
- `generalized_gates.uc.UCGate`
- `generalized_gates.uc_pauli_rot.UCPauliRotGate`
- `generalized_gates.ucrz.UCRZGate`
- `generalized_gates.unitary.UnitaryGate`
- `iqp.IQP`
- `iqp.random_iqp`
- `overlap.UnitaryOverlap`
- `quantum_volume.QuantumVolume`

Controlled Linear Rotation

Observed in:

- **Classiq**: 1 concepts
- `open_library.functions.linear_pauli_rotation.linear_pauli_rotations`

Data Encoding

Observed in:

- **Classiq**: 6 concepts
- `open_library.functions.state_preparation.inplace_prepare_complex_amplitudes`
- `open_library.functions.state_preparation.prepare_complex_amplitudes`
- `open_library.functions.state_preparation.prepare_exponential_state`
- `open_library.functions.state_preparation.prepare_linear_amplitudes`
- `open_library.functions.variational.encode_in_angle`
- `open_library.functions.variational.encode_on_bloch`
- **PennyLane**: 9 concepts
- `pennylane.templates.embeddings.amplitude.AmplitudeEmbedding`

- `pennylane.templates.embeddings.angle.AngleEmbedding`
- `pennylane.templates.embeddings.basis.BasisEmbedding`
- `pennylane.templates.embeddings.displacement.DisplacementEmbedding`
- `pennylane.templates.embeddings.iqp.IQPEmbedding`
- `pennylane.templates.embeddings.squeezing.SqueezingEmbedding`
- `pennylane.templates.state_preparations.qrom_state_prep.QROMStatePreparation`
- `pennylane.templates.subroutines.prepselprep.PrepSelPrep`
- `pennylane.templates.subroutines.qrom.QROM`
- **Qiskit**: 3 concepts
- `data_preparation.pauli_feature_map.PauliFeatureMap`
- `data_preparation.pauli_feature_map.z_feature_map`
- `data_preparation.pauli_feature_map.zz_feature_map`

Hamiltonian Simulation

Observed in:

- **Classiq**: 1 concepts
- `qmod.builtins.functions.exponentiation.suzuki_trotter`
- **PennyLane**: 5 concepts
- `pennylane.templates.subroutines.approx_time_evolution.ApproxTimeEvolution`
- `pennylane.templates.subroutines.commuting_evolution.CommutingEvolution`
- `pennylane.templates.subroutines.qdrift.QDrift`
- `pennylane.templates.subroutines.trotter.TrotterProduct`
- `pennylane.templates.subroutines.trotter.TrotterizedQfunc`
- **Qiskit**: 2 concepts
- `hamiltonian_gate.HamiltonianGate`
- `pauli_evolution.PauliEvolutionGate`

Linear Combination of Unitaries

Observed in:

- **Classiq**: 2 concepts
- `open_library.functions.lcu.lcu`

- `open_library.functions.lcu.lcu_pauli`

Linear Combination of Unitaries (LCU)

Observed in:

- **PennyLane**: 1 concepts
- `pennylane.templates.subroutines.fable.FABLE`

Quantum Amplitude Estimation

Observed in:

- **Classiq**: 1 concepts
- `open_library.functions.amplitude_estimation.amplitude_estimation`

Quantum Amplitude Estimation (QAE)

Observed in:

- **PennyLane**: 1 concepts
- `pennylane.templates.subroutines.qmc.QuantumMonteCarlo`

Quantum Arithmetic

Observed in:

- **Classiq**: 6 concepts
- `open_library.functions.modular_exponentiation.c_modular_multiply`
- `open_library.functions.modular_exponentiation.cc_modular_add`
- `open_library.functions.modular_exponentiation.inplace_c_modular_multiply`
- `open_library.functions.modular_exponentiation.modular_exp`
- `open_library.functions.modular_exponentiation.qft_space_add_const`
- `open_library.functions.utility_functions.modular_increment`
- **PennyLane**: 9 concepts
- `pennylane.templates.subroutines.adder.Adder`
- `pennylane.templates.subroutines.mod_exp.ModExp`
- `pennylane.templates.subroutines.multiplier.Multiplier`

- `pennylane.templates.subroutines.out_adder.OutAdder`
- `pennylane.templates.subroutines.out_multiplier.OutMultiplier`
- `pennylane.templates.subroutines.out_poly.OutPoly`
- `pennylane.templates.subroutines.phase_adder.PhaseAdder`
- `pennylane.templates.subroutines.semi_adder.SemiAdder`
- `pennylane.templates.subroutines.temporary_and.TemporaryAND`
- **Qiskit**: 26 concepts
- `arithmetic.adders.adder.Adder`
- `arithmetic.adders.adder.FullAdderGate`
- `arithmetic.adders.adder.HalfAdderGate`
- `arithmetic.adders.adder.ModularAdderGate`
- `arithmetic.adders.cdkm_ripple_carry_adder.CDKMRippleCarryAdder`
- `arithmetic.adders.draper_qft_adder.DraperQFTAdder`
- `arithmetic.adders.vbe_ripple_carry_adder.VBERippleCarryAdder`
- `arithmetic.exact_reciprocal.ExactReciprocal`
- `arithmetic.exact_reciprocal.ExactReciprocalGate`
- `arithmetic.functional_pauli_rotations.FunctionalPauliRotations`
- `arithmetic.integer_comparator.IntegerComparator`
- `arithmetic.integer_comparator.IntegerComparatorGate`
- `arithmetic.linear_amplitude_function.LinearAmplitudeFunctionGate`
- `arithmetic.linear_pauli_rotations.LinearPauliRotationsGate`
- `arithmetic.multipliers.hrs_cumulative_multiplier.HRSCumulativeMultiplier`
- `arithmetic.multipliers.multiplier.MultiplierGate`
- `arithmetic.multipliers.rg_qft_multiplier.RGQFTMultiplier`
- `arithmetic.piecewise_chebyshev.PiecewiseChebyshevGate`
- `arithmetic.piecewise_linear_pauli_rotations.PiecewiseLinearPauliRotationsGate`
- `arithmetic.piecewise_polynomial_pauli_rotations.PiecewisePolynomialPauliRotati`
- `arithmetic.polynomial_pauli_rotations.PolynomialPauliRotations`
- `arithmetic.polynomial_pauli_rotations.PolynomialPauliRotationsGate`
- `arithmetic.quadratic_form.QuadraticFormGate`
- `arithmetic.weighted_adder.WeightedAdder`
- `arithmetic.weighted_adder.WeightedSumGate`

- `boolean_logic.inner_product.InnerProductGate`

Quantum Logical Operators

Observed in:

- **Qiskit**: 5 concepts
- `boolean_logic.quantum_and.AND`
- `boolean_logic.quantum_and.AndGate`
- `boolean_logic.quantum_or.OR`
- `boolean_logic.quantum_xor.BitwiseXorGate`
- `boolean_logic.quantum_xor.random_bitwise_xor`

Quantum Singular Value Transformation

Observed in:

- **Classiq**: 5 concepts
- `open_library.functions.qsvt.qsvt`
- `open_library.functions.qsvt.qsvt_inversion`
- `open_library.functions.qsvt.qsvt_lcu`
- `open_library.functions.qsvt.qsvt_lcu_step`
- `open_library.functions.qsvt.qsvt_step`

Quantum Singular Value Transformation (QSVT)

Observed in:

- **PennyLane**: 1 concepts
- `pennylane.templates.subroutines.qsvt.QSVT`

Qiskit Concepts

Concept Name
`/qiskit/qiskit.circuit.library.arithmetic.adders.adder.Adder`

Concept Name
/qiskit/qiskit.circuit.library.arithmetic.adders.adder.HalfAdderGate
/qiskit/qiskit.circuit.library.arithmetic.adders.adder.ModularAdderGate
/qiskit/qiskit.circuit.library.arithmetic.adders.adder.FullAdderGate
/qiskit/qiskit.circuit.library.arithmetic.adders.cdkm_ripple_carry_adder.CDKMRi
/qiskit/qiskit.circuit.library.arithmetic.adders.draper_qft_adder.DraperQFTAdde
/qiskit/qiskit.circuit.library.arithmetic.adders.vbe_ripple_carry_adder.VBERipp
/qiskit/qiskit.circuit.library.arithmetic.exact_reciprocal.ExactReciprocal
/qiskit/qiskit.circuit.library.arithmetic.exact_reciprocal.ExactReciprocalGate
/qiskit/qiskit.circuit.library.arithmetic.functional_pauli_rotations.Functional
/qiskit/qiskit.circuit.library.arithmetic.integer_comparator.IntegerComparator

Concept Name
/qiskit/qiskit.circuit.library.arithmetic.integer_comparator.IntegerComparatorG
/qiskit/qiskit.circuit.library.arithmetic.linear_amplitude_function.LinearAmpli
/qiskit/qiskit.circuit.library.arithmetic.linear_pauli_rotations.LinearPauliRot
/qiskit/qiskit.circuit.library.arithmetic.multipliers.hrs_cumulative_multiplier
/qiskit/qiskit.circuit.library.arithmetic.multipliers.multiplier.MultiplierGate
/qiskit/qiskit.circuit.library.arithmetic.multipliers.rg_qft_multiplier.RGQFTMu
/qiskit/qiskit.circuit.library.arithmetic.piecewise_chebyshev.PiecewiseChebyshe
/qiskit/qiskit.circuit.library.arithmetic.piecewise_linear_pauli_rotations.Piec
/qiskit/ qiskit.circuit.library.arithmetic.piecewise_polynomial_pauli_rotations.Piecewise
/qiskit/qiskit.circuit.library.arithmetic.polynomial_pauli_rotations.Polynomial
/qiskit/qiskit.circuit.library.arithmetic.polynomial_pauli_rotations.Polynomial

Concept Name
/qiskit/qiskit.circuit.library.arithmetic.quadratic_form.QuadraticFormGate
/qiskit/qiskit.circuit.library.arithmetic.weighted_adder.WeightedAdder
/qiskit/qiskit.circuit.library.arithmetic.weighted_adder.WeightedSumGate
/qiskit/qiskit.circuit.library.basis_change.qft.QFT
/qiskit/qiskit.circuit.library.basis_change.qft.QFTGate
/qiskit/qiskit.circuit.library.bit_flip_oracle.BitFlipOracleGate
/qiskit/qiskit.circuit.library.blueprintcircuit.BlueprintCircuit
/qiskit/qiskit.circuit.library.boolean_logic.inner_product.InnerProductGate
/qiskit/qiskit.circuit.library.boolean_logic.quantum_and.AND
/qiskit/qiskit.circuit.library.boolean_logic.quantum_and.AndGate
/qiskit/qiskit.circuit.library.boolean_logic.quantum_or.OR

Concept Name
/qiskit/qiskit.circuit.library.boolean_logic.quantum_xor.BitwiseXorGate
/qiskit/qiskit.circuit.library.boolean_logic.quantum_xor.random_bitwise_xor
/qiskit/qiskit.circuit.library.data_preparation.pauli_feature_map.z_feature_map
/qiskit/qiskit.circuit.library.data_preparation.pauli_feature_map.zz_feature_ma
/qiskit/qiskit.circuit.library.data_preparation.initializer.Initialize
/qiskit/qiskit.circuit.library.data_preparation.pauli_feature_map.PauliFeatureM
/qiskit/qiskit.circuit.library.data_preparation.pauli_feature_map.self_product
/qiskit/qiskit.circuit.library.data_preparation.state_preparation.StatePreparat
/qiskit/qiskit.circuit.library.data_preparation.state_preparation.UniformSuperp
/qiskit/qiskit.circuit.library.fourier_checking.FourierChecking
/qiskit/qiskit.circuit.library.generalized_gates.diagonal.Diagonal
/qiskit/qiskit.circuit.library.generalized_gates.diagonal.DiagonalGate
/qiskit/qiskit.circuit.library.generalized_gates.gms.GMS
/qiskit/qiskit.circuit.library.generalized_gates.gms.MSGate

Concept Name
/qiskit/qiskit.circuit.library.generalized_gates.gr.GR
/qiskit/qiskit.circuit.library.generalized_gates.gr.GRX
/qiskit/qiskit.circuit.library.generalized_gates.gr.GRY
/qiskit/qiskit.circuit.library.generalized_gates.gr.GRZ
/qiskit/qiskit.circuit.library.generalized_gates.isometry.Isometry
/qiskit/qiskit.circuit.library.generalized_gates.linear_function.LinearFunction
/qiskit/qiskit.circuit.library.generalized_gates.mcg_up_to_diagonal.MCGupDiag
/qiskit/qiskit.circuit.library.generalized_gates.mcmt.MCMTGate
/qiskit/qiskit.circuit.library.generalized_gates.mcmt.MCMTVChain
/qiskit/qiskit.circuit.library.generalized_gates.pauli.PauliGate
/qiskit/qiskit.circuit.library.generalized_gates.permutation.Permutation

Concept Name
/qiskit/qiskit.circuit.library.generalized_gates.permutation.PermutationGate
/qiskit/qiskit.circuit.library.generalized_gates.rv.RVGate
/qiskit/qiskit.circuit.library.generalized_gates.uc.UCGate
/qiskit/qiskit.circuit.library.generalized_gates.uc_pauli_rot.UCPauliRotGate
/qiskit/qiskit.circuit.library.generalized_gates.ucrz.UCRZGate
/qiskit/qiskit.circuit.library.generalized_gates.unitary.UnitaryGate
/qiskit/qiskit.circuit.library.graph_state.GraphState
/qiskit/qiskit.circuit.library.graph_state.GraphStateGate
/qiskit/qiskit.circuit.library.grover_operator.GroverOperator
/qiskit/qiskit.circuit.library.hamiltonian_gate.HamiltonianGate
/qiskit/qiskit.circuit.library.hidden_linear_function.HiddenLinearFunction
/qiskit/qiskit.circuit.library.iqp.IQP

Concept Name
/qiskit/qiskit.circuit.library.iqp.random_iqp
/qiskit/qiskit.circuit.library.n_local.efficient_su2.EfficientSU2
/qiskit/qiskit.circuit.library.n_local.evolved_operator_ansatz.hamiltonian_vari
/qiskit/qiskit.circuit.library.n_local.evolved_operator_ansatz.EvolvedOperatorA
/qiskit/qiskit.circuit.library.n_local.excitation_preserving.ExcitationPreservi
/qiskit/qiskit.circuit.library.n_local.n_local.NLocal
/qiskit/qiskit.circuit.library.n_local.pauli_two_design.PauliTwoDesign
/qiskit/qiskit.circuit.library.n_local.qaoa_ansatz.QAOAAnsatz
/qiskit/qiskit.circuit.library.n_local.real_amplitudes.RealAmplitudes
/qiskit/qiskit.circuit.library.n_local.two_local.TwoLocal
/qiskit/qiskit.circuit.library.overlap.UnitaryOverlap

Concept Name
/qiskit/qiskit.circuit.library.pauli_evolution.PauliEvolutionGate
/qiskit/qiskit.circuit.library.phase_estimation.PhaseEstimation
/qiskit/qiskit.circuit.library.phase_oracle.PhaseOracle
/qiskit/qiskit.circuit.library.phase_oracle.PhaseOracleGate
/qiskit/qiskit.circuit.library.quantum_volume.QuantumVolume

PennyLane Concepts

Concept Name
/pennylane/pennylane.templates.embeddings.amplitude.AmplitudeEmbedding
/pennylane/pennylane.templates.embeddings.angle.AngleEmbedding
/pennylane/pennylane.templates.embeddings.basis.BasisEmbedding
/pennylane/pennylane.templates.embeddings.displacement.DisplacementEmbedding
/pennylane/pennylane.templates.embeddings.iqp.IQPEmbedding
/pennylane/pennylane.templates.embeddings.qaoaembedding.QAOAEmbedding

Concept Name
`/pennylane/pennylane.templates.embeddings.squeezing.SqueezingEmbedding`
`/pennylane/pennylane.templates.layers.basic_entangler.BasicEntanglerLayers`
`/pennylane/pennylane.templates.layers.cv_neural_net.CVNeuralNetLayers`
`/pennylane/pennylane.templates.layers.gate_fabric.GateFabric`
`/pennylane/pennylane.templates.layers.particle_conserving_u1.ParticleConserving`
`/pennylane/pennylane.templates.layers.particle_conserving_u2.ParticleConserving`

Concept Name
/pennylane/pennylane.templates.layers.random.RandomLayers
/pennylane/pennylane.templates.layers.simplified_two_design.SimplifiedTwoDesign
/pennylane/pennylane.templates.layers.strongly_entangling.StronglyEntanglingLay
/pennylane/ pennylane.templates.state_preparations.arbitrary_state_preparation.ArbitrarySta
/pennylane/pennylane.templates.state_preparations.basis_qutrit.QutritBasisState
/pennylane/pennylane.templates.state_preparations.cosine_window.CosineWindow
/pennylane/pennylane.templates.state_preparations.mottonen.MottonenStatePrepara
/pennylane/pennylane.templates.state_preparations.qrom_state_prep.QROMStatePrep
/pennylane/pennylane.templates.state_preparations.state_prep_mps.MPSPrep
/pennylane/pennylane.templates.state_preparations.superposition.Superposition

Concept Name
/pennylane/pennylane.templates.subroutines.amplitude_amplification.AmplitudeAmp
/pennylane/pennylane.templates.subroutines.aqft.AQFT
/pennylane/pennylane.templates.subroutines.arbitrary_unitary.ArbitraryUnitary
/pennylane/pennylane.templates.subroutines.arithmetic.adder.Adder
/pennylane/pennylane.templates.subroutines.arithmetic.mod_exp.ModExp
/pennylane/pennylane.templates.subroutines.arithmetic.multiplier.Multiplier
/pennylane/pennylane.templates.subroutines.arithmetic.out_adder.OutAdder
/pennylane/pennylane.templates.subroutines.arithmetic.out_multiplier.OutMultipl
/pennylane/pennylane.templates.subroutines.arithmetic.out_poly.OutPoly
/pennylane/pennylane.templates.subroutines.arithmetic.phase_adder.PhaseAdder
/pennylane/pennylane.templates.subroutines.arithmetic.semi_adder.SemiAdder
/pennylane/pennylane.templates.subroutines.arithmetic.temporary_and.TemporaryAN
/pennylane/pennylane.templates.subroutines.controlled_sequence.ControlledSequen

Concept Name
/pennylane/pennylane.templates.subroutines.fable.FABLE
/pennylane/pennylane.templates.subroutines.flip_sign.FlipSign
/pennylane/pennylane.templates.subroutines.gqsp.GQSP
/pennylane/pennylane.templates.subroutines.grover.GroverOperator
/pennylane/pennylane.templates.subroutines.hilbert_schmidt.HilbertSchmidt
/pennylane/pennylane.templates.subroutines.hilbert_schmidt.LocalHilbertSchmidt
/pennylane/pennylane.templates.subroutines.interferometer.Interferometer
/pennylane/pennylane.templates.subroutines.permute.Permute
/pennylane/pennylane.templates.subroutines.prepselprep.PrepSelPrep
/pennylane/pennylane.templates.subroutines.qchem.all_singles_doubles.AllSingles
/pennylane/pennylane.templates.subroutines.qchem.basis_rotation.BasisRotation

Concept Name
`/pennylane/pennylane.templates.subroutines.qchem.fermionic_double_excitation.FermionicDoubl`
`/pennylane/pennylane.templates.subroutines.qchem.fermionic_single_excitation.FermionicSingl`
`/pennylane/pennylane.templates.subroutines.qchem.kupccgsd.kUpCCGSD`
`/pennylane/pennylane.templates.subroutines.qchem.uccsd.UCCSD`
`/pennylane/pennylane.templates.subroutines.qft.QFT`
`/pennylane/pennylane.templates.subroutines.qmc.QuantumMonteCarlo`
`/pennylane/pennylane.templates.subroutines.qpe.QuantumPhaseEstimation`

Concept Name
/pennylane/pennylane.templates.subroutines.qrom.QROM
/pennylane/pennylane.templates.subroutines.qsvt.QSVT
/pennylane/pennylane.templates.subroutines.qubitization.Qubitization
/pennylane/pennylane.templates.subroutines.reflection.Reflection
/pennylane/pennylane.templates.subroutines.select.Select
/pennylane/pennylane.templates.subroutines.select_pauli_rot.SelectPauliRot
/pennylane/pennylane.templates.subroutines.time_evolution.approx_time_evolution.ApproxTimeE
/pennylane/pennylane.templates.subroutines.time_evolution.commuting_evolution.CommutingEvo
/pennylane/pennylane.templates.subroutines.time_evolution.qdrift.QDrift
/pennylane/pennylane.templates.subroutines.time_evolution.trotter.TrotterProduc

Concept Name
/pennylane/pennylane.templates.subroutines.time_evolution.trotter.TrotterizedQf
`/pennylane/pennylane.templates.swapnetworks.ccl2.TwoLocalSwapNetwork`
/pennylane/pennylane.templates.tensornetworks.mera.MERA
`/pennylane/pennylane.templates.tensornetworks.mps.MPS`
/pennylane/pennylane.templates.tensornetworks.ttn.TTN

Classiq Concepts

Concept Name
`/classiq/ open_library.functions.amplitude_amplification.amplitude_amplification`
`/classiq/ open_library.functions.amplitude_amplification.exact_amplitude_amplification`
`/classiq/open_library.functions.amplitude_estimation.amplitude_estimation`

Concept Name
/classiq/open_library.functions.discrete_sine_cosine_transform.qct_qst_type1
/classiq/open_library.functions.discrete_sine_cosine_transform.qct_qst_type2
/classiq/open_library.functions.discrete_sine_cosine_transform.qct_type2
/classiq/open_library.functions.discrete_sine_cosine_transform.qst_type2
/classiq/open_library.functions.grover.phase_oracle

Concept Name
/classiq/open_library.functions.grover.reflect_about_zero
/classiq/open_library.functions.grover.grover_diffuser
/classiq/open_library.functions.grover.grover_operator
/classiq/open_library.functions.grover.grover_search
/classiq/open_library.functions.hea.full_hea
/classiq/open_library.functions.lcu.lcu

Concept Name	
`/classiq/open_library.functions.lcu.lcu_pauli`	
`/classiq/open_library.functions.linear_pauli_rotation.linear_pauli_rotations`	
`/classiq/open_library.functions.lookup_table.span_lookup_table`	
`/classiq/open_library.functions.modular_exponentiation.qft_space_add_const`	

Concept Name	
`/classiq/open_library.functions.modular_exponentiation.cc_modular_add`	
`/classiq/open_library.functions.modular_exponentiation.c_modular_multiply`	
`/classiq/open_library.functions.modular_exponentiation.multiswap`	

Concept Name	
/classiq/ open_library.functions.modular_exponentiation.inplace_c_modular_multiply	
/classiq/open_library.functions.modular_exponentiation.modular_add_qft_space	
/classiq/open_library.functions.modular_exponentiation.modular_multiply	

Concept Name
`/classiq/open_library.functions.modular_exponentiation.inplace_modular_multiply`
`/classiq/open_library.functions.modular_exponentiation.modular_exp`
`/classiq/open_library.functions.qaoa_penalty.qaoa_mixer_layer`
`/classiq/open_library.functions.qaoa_penalty.qaoa_cost_layer`
`/classiq/open_library.functions.qaoa_penalty.qaoa_layer`

Concept Name
/classiq/open_library.functions.qaoa_penalty.qaoa_init
/classiq/open_library.functions.qaoa_penalty.qaoa_penalty
/classiq/open_library.functions.qft_functions.qft_no_swap
/classiq/open_library.functions.qft_functions.qft
/classiq/open_library.functions.qpe.qpe_flexible

Concept Name
`/classiq/open_library.functions.qpe.qpe`
`/classiq/open_library.functions.qsvt.qsvt_step`
`/classiq/open_library.functions.qsvt.qsvt`

Concept Name
/classiq/open_library.functions.qsvt.projector_controlled_phase
/classiq/open_library.functions.qsvt.qsvt_inversion
/classiq/open_library.functions.qsvt.projector_controlled_double_phase
/classiq/open_library.functions.qsvt.qsvt_lcu_step

Concept Name
/classiq/open_library.functions.qsvt.qsvt_lcu
/classiq/open_library.functions.qsvt.gqsp

Concept Name
/classiq/ open_library.functions.state_preparation.prepare_uniform_trimmed_state
/classiq/ open_library.functions.state_preparation.prepare_uniform_interval_state
/classiq/open_library.functions.state_preparation.prepare_ghz_state
/classiq/open_library.functions.state_preparation.prepare_exponential_state
/classiq/open_library.functions.state_preparation.prepare_bell_state

Concept Name
/classiq/open_library.functions.state_preparation.inplace_prepare_int
/classiq/open_library.functions.state_preparation.prepare_int
/classiq/open_library.functions.state_preparation.inplace_prepare_complex_amplitudes
/classiq/open_library.functions.state_preparation.prepare_complex_amplitudes

Concept Name	
`/classiq/open_library.functions.state_preparation.prepare_dicke_state_unary_input`	
`/classiq/open_library.functions.state_preparation.prepare_dicke_state`	
`/classiq/open_library.functions.state_preparation.prepare_basis_state`	
`/classiq/open_library.functions.state_preparation.prepare_linear_amplitudes`	
`/classiq/open_library.functions.state_preparation.inplace_prepare_sparse_amplitudes`	

Concept Name	
/classiq/open_library.functions.state_preparation.prepare_sparse_amplitudes	
/classiq/open_library.functions.swap_test.swap_test	
/classiq/open_library.functions.utility_functions.apply_to_all	
/classiq/open_library.functions.utility_functions.hadamard_transform	
/classiq/open_library.functions.utility_functions.modular_increment	

Concept Name	
`/classiq/open_library.functions.variational.encode_in_angle`	
`/classiq/open_library.functions.variational.encode_on_bloch`	
`/classiq/qmod.builtins.functions.exponentiation.suzuki_trotter`	