

# QUANTUM COMPUTATIONAL LOGICS AND POSSIBLE APPLICATIONS

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ABSTRACT. In quantum computational logics *meanings* of sentences are identified with quantum information quantities: systems of *qubits* or, more generally, *mixtures* of systems of qubits. We consider two kinds of quantum computational semantics: 1) a *compositional* semantics, where the *meaning* of a compound sentence is determined by the meanings of its parts; 2) a *holistic* semantics, which makes essential use of the characteristic “holistic” features of the quantum-theoretic formalism. The compositional and the holistic semantics turn out to characterize the same logic. In this framework, one can introduce the notion of *quantum-classical truth table*, which corresponds to the most natural way for a quantum computer to calculate classical tautologies.

Quantum computational logics can be applied to investigate different kinds of semantic phenomena where *holistic*, *contextual* and *gestaltic* patterns play an essential role (from natural languages to musical compositions).

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