Quantum Computing

FROM FEYNMAN AMPLITUDES TO QUBIT FLOWS, Lucian M. Ionescu, Department of Mathematics, Illinois State University, Normal IL 61790-4520, LMIones@ilstu.edu

The Feynman Path Integral model leading to the computation of the amplitude of probability of a quantum process, is based on an underlying ambient space-time.
This is the cause of major difficulties in QFT and renormalization, while opening the door for semi-classical interpretations of quantum mechanics, e.g. the Bohmian mechanics, which demise the new possibilities of the quantum world.

We present the Qubit Model of quantum computing, adapted to QFT and an invitation to develop Quantum Information Dynamics and Quantum Infotronics, as a natural solution of the above mentioned difficulties.
The Qubit Model is an ``upgrade" of the FPI where qubits, instead of complex amplitudes, are associated with the elementary transitions of a causal network structure, which is part of a graded resolution of finite type replacing the concept of ambient space-time.

The immediate consequence is a conceptual shift regarding the meaning of space and time (On The Arrow of Time, 0708.4180v2), as mere dual computational resources, serial and parallel. In particular, the arrow of time has both a natural interpretation, as well as a precise mathematical formulation in the framework of tensor categories with duality: Feynman categories and their representations, the Feynman Processes.