TOWARDS QUANTUM COSMOLOGY ON QUANTUM COMPUTER

Speaker:
Danilo Artigas

1st year PhD student at the Jagiellonian University, Cracow, and the University Paris-Saclay, Paris. Member of the Quantum Cosmos Lab

ABSTRACT

This talk aims to present first results towards the use of quantum computers as „experiments setups" to test quantum cosmology. We will focus on the case of vacuum Universe with a compact phase space. The compactness ensures that the Hilbert space is finite dimensional, and allows us to describe dynamics in terms of spin variables. The usual cosmology with linear phase space is then recovered in the large spin limit. Quantum version of the model is solved explicitly for low spin values, employing the methods for constrained quantum systems. Furthermore, we propose to take advantage of the spin formulation for the purpose of simulating the system on universal quantum computers. This opens a possibility to investigate the large spin limit, and thus quantum cosmology with linear phase space, with the use of the future quantum processors. We hope that this direction will bring closer together the fields of quantum computing and quantum cosmology, with benefit for the both disciplines.

BIOGRAPHY

Danilo Artigas is a 1st year PhD student at the Jagiellonian University, Cracow, and the University Paris- Saclay, Paris. He is a member of the Quantum Cosmos Lab, a scientific group exploring the interface between quantum mechanics and gravitational physics. Danilo mostly focuses on quantum gravity and quantum cosmology, its possible empirical consequences and analog models. In particular, he is investigating a new approach, which generalizes field theories to the case non-linear phase spaces (in particular, compact). Based on this generalization, certain field theories can be formulated in terms of spin degrees of freedom, which enables to employ quantum computers as quantum simulators of such systems.

LOOKING FORWARD
TO SEEING YOU!

skoltech.ru/en