

JOINT TUFTS/MIT COSMOLOGY SEMINAR

*General Relativity from Non-Equilibrium
Thermodynamics of Quantum Information*

Vitaly Vanchurin
U. Minnesota, Duluth

In this talk I will argue that general relativity can be viewed as a useful limit of quantum mechanics with many degrees of freedom, very much like thermodynamics is a useful limit of classical mechanics with many degrees of freedom. First, I will show how low-dimensional spaces (with non-trivial topology and non-flat geometry) can be used to approximate the entanglement structure of ket-vectors in very high-dimensional Hilbert spaces with a preferred tensor product factorization (e.g. many qubits). Secondly, I will construct statistical ensembles of the ket-vectors using spatially covariant dual field theories with a metric tensor playing the role of a conjugate thermodynamic variable to the so-called information tensor (which is related to both Fisher matrix and Fubini-Study metric). Thirdly, I will analyze evolution of the ensembles of ket-vectors to argue that an approximate space-time covariance of the dual field theories can be achieved if certain quantum computational complexities are minimized. And finally, I will show that minimization of a non-equilibrium entropy production can lead to the Einstein-Hilbert dynamics of the metric tensor for a particularly simple and highly symmetric form of the Onsager tensor.

Tuesday, October 31, 2017, 2:30 pm
574 Boston Ave, Room 316
Tufts University

Refreshments at 2:00 outside room 304