

# Networks, classical and quantum

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## Abstract

During the past 20 years, networks gained an increasing interest not only in physics but also in most other areas of science (cell biology, evolutionary biology, semantics, informatics, the neural sciences, economy, sociology, etc.). Dynamics *on* networks as well as the dynamics *of* networks became an almost independent subject in most of these areas. In physics, it is particularly the transport of energy or information on such networks, which is of importance.

The first part of my lecture will consist of an elementary introduction to fundamental concepts of graph theory and network theory, with an emphasis on algebraic methods in this field. I will then describe classical and quantum random walks on graphs, explain the similarities but also the differences between these two types of propagation. If possible (within the given time frame), I will briefly introduce other types of network dynamics, like e.g. neural networks. In the final part of my lecture I intend to give a brief introduction to random matrix theory, its relation to random graphs, and how it can be applied in physics.