

Challenges For a Science of Cities

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Abstract

Challenges due to the rapid urbanization of the world range from an increasing dependence on energy to air pollution, socio-spatial inequalities and environmental and sustainability issues.

Modelling the structure and evolution of cities is therefore critical because policy makers need robust theories and new paradigms for mitigating these problems. Fortunately, the increased data available about urban systems opens the possibility of constructing a quantitative 'science of cities', with the aim of identifying and modelling essential phenomena.

Statistical physics plays a major role in this multi-disciplinary effort by bringing tools and concepts able to bridge theory and empirical results. I will first quickly discuss the state-of-the-art in city modeling and underline some critical theoretical problems. In order to illustrate how physics can help in understanding these complex systems, I will present some recent results about city growth and congestion in cities.

This will also give me the opportunity to discuss some challenges (such as understanding urban traffic, CO₂ emissions or energy use) that we will have to face in the near future.