Colloquium

MAX PLANCK INSTITUTE
FOR DYNAMICS AND
SELF-ORGANIZATION

Gravity & the Big Bang in the Context of Epidemics: How Mobility Impacts Epidemics and Vice Versa

Dr. Fakhteh Ghanbarnejad

Climate Resilience
Potsdam Institute for Climate Impact Research (PIK)
and
Department for Epidemiology
Helmholtz Centre for Infection Research
Braunschweig, Germany

The COVID-19 pandemic profoundly affected physical, social, and psychological health, altering population mobility patterns. Using aggregated mobility data from parks in Washington State, USA, we analyzed trends in park visitations before and during the pandemic. Our findings affirm the robustness of the gravity model in predicting park visitation behaviors across different spatial resolutions and socio-economic classes. High-income residents expanded their recreational activities both locally and beyond, while low-income residents limited their recreational choices [Communications Physics volume 7, Article number: 55 (2024)].

Moreover, we propose a mathematical framework for epidemic dynamics that incorporates intra-population and inter-population mobility within a metapopulation network. By linearizing this system, we can identify the epidemic's origin and initiation time, termed the "Big Bang." Introducing the concept of effective distance, our analysis shows a universal contagion geometry, validated by data from the COVID-19 pandemic and the H1N1 outbreak. This framework, requiring data on active cases and mobility, enhances our understanding of epidemic spread and informs public health policies to mitigate infectious diseases [arXiv:2405.03703v1].

Wednesday, June 5th, 2024 at 2:15 pm

MPI-DS, Prandtl Lecture Hall and
Zoom Meeting ID: 959 2774 3389
Passcode: 651129, direct link

Max Planck Institute for Dynamics and Self-Organization
Complex Systems Theory
Prof. Viola Priesemann
Email: viola.priesemann@ds.mpg.de
Am Faßberg 17, 37077 Göttingen, Germany