



POLITECNICO
DI TORINO



Dipartimento di
Scienze Matematiche
G. L. Lagrange

ECCELLENZA 2018 • 2022

Seminario
on-line

Tuesday May 26, 2020 at 17:00

Hosted on: [Meet](#)

Daniele CAPPELLETTI

Postdoctoral fellow at ETH Zurich

Lyapunov Functions For Stochastic Reaction Networks

Prof. Bibbona introduces the seminar.

Abstract

Stochastic reaction networks are mathematical models used to describe the time evolution of chemical species counts. Despite their wide usage in active research areas such as natural and synthetic biology, epidemiology, and ecology, simple and relevant questions such as under what conditions a model converges to a stationary distribution are left unanswered. A typical strategy to study this issue makes use of the Foster-Lyapunov criteria introduced by Meyn and Tweedie. This approach is also encouraged by famous positive results in the deterministic modelling regime, which can be regarded to as a fluid limit of stochastic reaction networks: here, important stability results were obtained thanks to the study of Lyapunov functions (in the setting of ordinary differential equations). In his talk, Dr Cappelletti will give a brief overview of these methods and he will focus on recent results in the field. In particular, he will show how positive recurrence can be inferred for entire families of models, based on their graphical properties. He will then conclude by showing a novel computational framework to check for the existence of piecewise linear Foster-Lyapunov functions.

Biography

Daniele Cappelletti is a Postdoctoral fellow at the Department of Biosystems Science and Engineering of ETH Zurich. Here, he works in the Control Theory and Systems Biology Laboratory led by Prof. Mustafa Kahmmash. He was previously a Visiting assistant professor at the Department of Mathematics of the University of Wisconsin - Madison, where he worked with Prof. David Anderson and Prof. Thomas Kurtz.

He obtained my PhD at the University of Copenhagen, under the supervision of Prof. Carsten Wiuf.