Bernoullis Tafelrunde

Graduate Student Seminar

Monday, 26 September 2022, 12:15-13:00
Hybrid seminar
Seminar room 05.002, Spiegelgasse 5

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Modelling Progressive Disease

Abstract

Progressive disease may be characterized by uncontrolled cellular growth and tissue spreading, advancing with time in scope and/or severity through various distinct states; well known examples are cancers and many neurodegenerative diseases.

To model such progression discrete-time Markov chains with stationary transition probabilities are commonly used. This allows to define (meta)stable patient (sub)populations over time, to investigate interventions or treatments, and to corroborate intervention in terms of therapy success and health economics. For this purpose some important properties of the corresponding Markov matrices will be discussed, including approaches to finding real world solutions. In addition, "backward learning" such matrices from available data will be demonstrated, as well as simulating the underlying stochastic processes.

Finally, to illustrate these different approaches at the crossroads of applied stochastics and data science, three distinct use cases from retinal degenerative disease, from Alzheimer's and from cervical cancer will be presented, as typically seen in an academic/industrial life science setting.

With a simulation presented by Patric Hammler (University of Berne).