

Seminar: Mathematical Methods in (Medical) Systems Biology

BIOINF 4393 (3 ECTS credit)

Winter Semester 2018
Wednesday 14-16 in Room A302,
Sand 14

Instructors:
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Overview

This seminar will focus on the key concepts of computational, mathematical, and statistical models used in cancers and their medicine, and help students learn how mathematical models help us understand the progress of cancer. Papers used in this seminar provide biological background and describe the development of both classical mathematical models and more recent representations of biological processes. Therefore, students will explore existing mathematical models and learn to deal with the key parameters involved in modeling, and the impact of changes in these parameters to discuss how they are related to cure, prevention or policy-making at large. Through discussions of published papers, students will learn how to critically evaluate a modeling paper and how to communicate modeling results to readers of scientific journals. The seminar will be useful for students who plan to use experimental techniques as their approach in the laboratory and employ computational modeling as a tool to draw deeper understanding of experiments.

Goals

- Knowledge about the fundamental concepts of biological networks, basic structure of systems biological models and analyzing complex biological systems by using mathematical and scientific skills through published papers.
- Have knowledge and understanding of how to formulate mathematical models of cellular processes, biochemical reactions and estimate their model parameters.
- Be knowledgeable of the main areas in cancers where mathematical modeling has contributed to our understanding in how to read a mathematical modeling paper in all its aspects (methods, results, discussion).

Requirements

- Some knowledge of linear algebra and biochemistry
- Deep understanding and presentation of published papers by students
- Documentation as scientific essay through their presentation

Evaluation

- Grading based on how to present, visualizing, language, content, readability, final submitted writing paper
- Points achieved above will be added to points based on activity, getting over view in other topics, participation in other presentations during the seminar

Materials

Published papers will be made available at the ILIAS page about this class.

Recommended literature:

- Pálsson. Systems Biology: Properties of Reconstructed Networks. Cambridge University Press, 2007.
- Pálsson. Systems Biology: Constraint-based Reconstruction and Analysis. Cam Univ. Press, 2015.
- Goodsell. The Machinery of Life. 2nd edition, Springer-Verlag, 2009.
- Koolman & Roehm. Color Atlas of Biochemistry. Thieme, 2005.
- More references will be introduced in the seminar

Milestones

October 17th 2018

Introduction

November 7th 2018

First presentation by students

February 6th 2019

Last presentation