
Systems Biology II: Simulation of Dynamic Network States

BIOINF 4394 (6 ECTS credits)

Overview

This class teaches how to apply methods from mathematical modeling to biological systems. Topics include creating models of biochemical reaction networks, simulation, and analysis of their dynamic responses as well as fundamental programming techniques for solving problems of systems biology using Python and Tellurium. Note that “Systems Biology I” covers distinct topics and is **not** a prerequisite for this class.

Goals

- Introduction to the fundamental concepts of biological networks
- Knowledge about biophysical and biochemical constraints and implicit assumptions, principles of enzyme catalysis, open and closed systems, effects of reversible reactions on the overall system as well as multiple time scales.
- Practical experience in deriving kinetic equations and the dynamic simulation of systems biology models as well as subsequent analysis

Requirements

- Weekly participation within the tutorial and the lecture discussion
- Joint completion of a small project, documentation as scientific essay, and presentation of the project.

Evaluation

- Assignments will have to be submitted in small groups of up to three students. Every team member must be able to demonstrate the results.
- Instructors will check for duplicate solutions and reserve the right to distribute points across all identical solutions.
- Students caught copying solutions can be excluded from the course!
- Work on projects will be in teams of two to three students.
- 50% of the achievable points in both assignments and the project are required for passing and participation in the final exam. Points achieved over 60% in assignments and projects will be added as bonus points to the final exam. Bonus points will improve the final exam grade up to 15% of the regular points in the final exam.
- The final exam will be a written test.

Summer Semester 2021
Tuesdays and Thursdays 14-16
(virtual)

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Materials

Slides and complementary material will be made available at the ILIAS page about this class.

Recommended literature:

- Palsson. Systems Biology: Simulation of Dynamic Network States. Cambridge University Press, 2011.
- Goodsell. The Machinery of Life. 2nd edition, Springer-Verlag, 2009.
- Koolman & Roehm. Color Atlas of Biochemistry. 2nd edition. Thieme-Verlag, 2005.

Milestones

April 20th 2021

First lecture

April 29nd 2021

First homework assignment due

July 6th 2021

Begin of project work

July 22nd 2021

Submission of projects

July 29th 2021

Presentation of projects

August 9th 2021

Final exam

September 29th 2021

Repetition exam
