
Systems Biology I

Constraint-Based Reconstruction and Analysis

BIOINF 3371 (6 ECTS)

Overview

Genome sequences are available nowadays, which provide the basis to determine the biological components that make up a cell or an organism. Systems biology examines how these components interact and form networks, how they generate whole cell functions corresponding to observable phenotypes, and to which constraints they adhere. This lecture is an introduction to basic concepts of systems biology devoted to undergraduate students. It describes how to model networks, determine their properties, and relate these to phenotypic functions.

Goals

- Introduction to the fundamental concepts of biological networks, such as metabolic networks, transcriptional regulatory networks, and signaling networks
- Knowledge about the basic structure of systems biological models, biophysical and biochemical boundary conditions, and implicit assumptions
- Practical experience in creating and analyzing system biology models
- This lecture will be held in English to teach subject-specific terms.

Requirements

- Some knowledge of linear algebra and biochemistry
- Weekly participation within the tutorial
- Joint completion of a small project, documentation as scientific essay, and presentation of the project

Evaluation

- Assignments and the work on projects will be submitted in teams 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 deduct points or remove students from the course in the case of any misconduct.
- 50% of the achievable points in both assignments and the project are required for participation in the final exam. A bonus will be granted for the final exam for every point above 70%.
- The final exam will be conducted orally if the number of participants permits.

Winter Semester 2021/2022
Tuesday 14-16 and
Thursday 14-16 in Room A104

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Materials

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

Recommended literature:

1. Palsson. *Systems Biology: Constraint-based Reconstruction and Analysis*. Cambridge University Press, 2015.
2. Palsson. *Systems Biology: Properties of Reconstructed Networks*. Cambridge University Press, 2007.
3. Goodsell. *The Machinery of Life*. 2nd edition, Springer-Verlag, 2009.
4. Koolman and Roehm. *Color Atlas of Biochemistry*. Thieme, 2005.

Milestones

October 19th 2021

First lecture

October 26th 2021

First homework assignment due

November 30th 2021

Begin of project work

January 27th 2022

Submission of projects

February 10th 2022

Presentation of projects

February 28th – March 4th 2022

Oral exams
