

Computational Models in Biology and Biochemistry

Bi023 Tutorial, Winter Term 2012

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Course Description

Computational models of biological systems have become more popular and more elaborate in recent years. They are not only an exciting area of research, but also a powerful tool for experimental biologists. In this course, we will examine various models and discuss their background, use and merit. We will also explore the methods and tools needed to construct such models. Each participant will be expected to prepare a Journal-Club like presentation and complete a small project, either alone or in groups.

Dates and Times

Organisational meeting: Wednesday, 4 January 2012, 4 pm, in Beckham Behavioural Biology 236.

If you cannot make it to that meeting, please e-mail me beforehand at mstefan@caltech.edu

Class times and place: to be confirmed

Grading and Requirements

Grading is pass/fail. The requirements for passing are

Attendance: Miss no more than two classes during the entire term

Presentation: Prepare one journal-club like presentation (see “Available Projects” below) - this can be done alone or in groups

Written work: Prepare a writing assignment related to the presentation (see “Available Projects” below) - this can be done alone or in groups

Preparation and class participation: Familiarise yourself with the topic of each session beforehand (reading material will be provided) and participate in discussions during classes

While grading is pass/fail, there will be a reward for the best projects, so there is an incentive to put in some extra work.

Students who foresee problems with fulfilling one of the requirements are encouraged to contact me well in advance in order to work out alternative arrangements.

Available Projects

Present a model from BioModels database (individual assignment)

BioModels database (<http://www.ebi.ac.uk/biomodels-main/>) is a repository of published models in computational biology. The assignment consists of choosing a model, and presenting it, taking care to discuss the biological background, the structure and idea behind the model, the most important results and potential future implications. A list of models to choose from will be handed out at the organisational meeting.

Presentation

The presentation should explain the model to your peers. Aside from a very good understanding of the paper explaining the model, this will require some additional research into the biological background, the modelling methodology used and the importance of the findings. The presentation should be about 20 to 30 minutes in length and should enable and stimulate your peers to participate in the ensuing discussion.

Written Work

The written part of the assignment consists of a short (1-2 pages) summary of the presentation. This should be completed at the same time, so it can be handed out on the day of the presentation. For inspiration, refer to the “Model of the Month” pages on <http://www.ebi.ac.uk/biomodels-main/modelmonth>.

Present alternative models of the same biological system (group assignment)

This is a group project consisting of choosing several models of the same biological system from BioModels database (<http://www.ebi.ac.uk/biomodels-main/>) and presenting them, discussing their respective merits and shortcomings, or outlining a development from simple to more complex models over time, as appropriate. As well as presenting the models themselves, this includes a presentation of the biological question the models aim to answer. A list of topics and models to choose from will be handed out at the organisational meeting. This being a group project, each individual will have less to do for the oral presentation. In exchange, the written assignment is a bit more demanding.

Presentation

The group presentation should explain both the biological background and all the models to your peers, and discuss how the different models relate to each other. The entire presentation should be about 30 minutes in length and should prepare the class for an ensuing discussion. How the presentation is divided up is up to you, but each person should participate, not only in preparing, but also in delivering the presentation.

Written Work

Combining and synthesising the knowledge the group members have gained about a biological system and the different approaches to modelling how it works, the group is asked to write a review paper on the issue. The review should contain a properly referenced introduction of the biological problem, a concise presentation of each of the model and a discussion detailing how they relate to each other, and maybe some future perspective. The writing assignment need not be ready at the time of the presentation; the deadline for handing it in is the last class session of term.

Present a modelling software or algorithm (individual assignment)

This is for participants who have some experience working with a particular modelling or simulation software who want to share their knowledge, or for those who would like to learn more about a particular simulation platform. This is a more technical topic, but could be combined with a biological topic of interest, which could serve as an example. A list of software packages will be provided at the organisational meeting, but participants are encouraged to contact me if their software of choice is not on the list.

Presentation

The presentation will take the form of a software tutorial, where the students talks the class through one or several worked examples, and be about 30 minutes in length. There will probably be less discussion in the end, but be prepared to be interrupted by questions during the course of the tutorial.

Written Work

The written work will consist in writing up the tutorial, either as a text file or, for instance, as a series of html pages to guide a potential user through the experience. It should be ready at the date of the presentation, to help guide the class through it.

Further Information

Further information about the course can be found on <http://www.its.caltech.edu/~mstefan/Bi023.html>