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PHYSICS 847-3/492-3

Special Topics in Quantitative Biology

COURSE DESCRIPTION:

This course is intended to introduce molecular biology and genetics to those with a quantitative background. Topics covered will range from bio-polymers and their structure to biochemical networks. It will attempt to give a broad survey of current quantitative methods that are in use for analyzing biological data.

PREREQUISITES: PHYS 211, PHYS 221, or permission of the instructor

COURSE OUTLINE:

- 1) Introduction to molecular biology
- 2) Bio-polymers (DNA, RNA, Proteins)
- 3) Genetic networks and transcriptional logic
- 4) Biochemical circuits and cellular decision making
- 5) Noise in biological computational
- 6) Large-scale biological network analysis

GRADING:

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| ● Literature reading assignments | 30% |
| ● Problem Sets | 30% |
| ● Term project | 40% |

Text and support material: literature reading list to be distributed in class.

READING ASSIGNMENTS:

Approximately 10 questionnaires on the assigned reading. To be handed in before class on the paper discussion days – typically Friday.

PROBLEM SETS:

Three problem sets that will be based on lectures and reading material. One per month.

TERM PROJECT:

A project that applies quantitative methods to the study of a problem of biological significance. See the list of possible projects for ideas. In mid-october, please have a short summary (< 1 page) of your selected topic and a list of the key references. A thorough evaluation of the literature on a given topic and the implementation of some of the analysis presented in the papers is perfectly acceptable. I am expecting that most projects will simply explore an existing quantitative/computational model in some detail. You should be able to reproduce and fill in the details of a research paper(s). Carrying out experiments will be tricky as access to resources is currently limited.

The project is to be written up as a scientific report. The format for the report is the following: Introduction (literature review), Methods (details of the model), Results (presentation of the analysis), Discussion (what was learned), Bibliography. All ideas and text that are not your own must be cited and referenced. Wikipedia is not a source, it is a starting point. Do not plagiarize, it will not be tolerated. If you are unsure about how to cite or reference a source, please see me.

Grading of Project:

70% Written report

30% Class Presentation: 10-15 min talk, highlighting findings