Graduate Course in Bioinformatics and Computational Biomedicine

Overview

This course enables students to understand methods and approaches in current bioinformatics. Bioinformatics is, by nature, a multidisciplinary endeavor and techniques from many unrelated fields are merged to explore a greater whole. The theoretical bases of these methods are explained in detail, their limitations are examined and recent work to improve methodologies is reviewed. This course will consist of 15 lectures divided into three Modules. Each lecture is approximately 2-3 hours in duration (depending on the preference of the lecturer).

The first Module (history, techniques and statistics) establishes the theoretical framework for more advanced material covered in Modules 2 and 3. An introduction to the field and its history is presented, and those statistical techniques and computational algorithms that are pervasively used are extensively reviewed. At the end of this Module, students will have an overview of the field and will select a project, the results of which they will present as the last lecture of the course.

The second Module (RNA, DNA, proteins and genomes) covers classical bioinformatics. The impact on, and interplay between, bioinformatics and more traditional fields such as biochemistry, molecular and cell biology and physiology are developed. Basic knowledge of molecular biology is essential to understand the material presented in this Module. Although relevant topics in molecular biology will be briefly reviewed, this is NOT a molecular biology course. The purpose of this module is to convey the theory behind common bioinformatics methodologies and their application. Students will be exposed to many of the techniques that they will require to complete their project.
The final Module explores a systems view of biology and bioinformatics. Many of the properties of biological systems are not the consequence of any individual constituent, or a linear superimposition of their effects, but rather emerge from the assembly of those components and their interactions into a larger scale system. This module considers biological systems at multiple scales from individual molecular interactions through cells, tissues and organs, culminating in studies of the entire organism.

Course organizer: Dr. Lucy Skrabaneck (las2017@med.cornell.edu)