Abstract

Written for graduate students in the Chemical and Biological Sciences, *Foundations of Computational Biology with MATLAB programming* is a web-based course/book in which MATLAB is introduced and progressively developed as a programming and visualization tool in a variety of applications ranging from data analysis and simulation to the development of complex mathematical models in biology.

Learning Objectives:

At the end of the course students will:

* Understand the fundamental concepts of linear algebra: vectors, matrices, subspaces, transformations, factorizations, eigenvalues and eigenvectors, singular value decomposition. The course ends with selected topics of multilinear algebra (tensor algebra).
* Learn how to use the programming language of MATLAB to visualize data, solve numerical problems, and create algorithms.
* Understand key methods of data analysis: linear and non-linear least-squares methods, iterative methods for systems of linear equations, principal and independent component analysis, minimization techniques, linear programming.
* Understand methods for the simulation and analysis of cellular and subcellular functions: chemical and enzymatic reactions, molecular dynamics, metabolic networks.
* Learn the fundamentals of information theory and their application to bioinformatics.

Course Material Includes:

Syllabus

21 Chapters

17 Practice Assignments

Separate m-files for all the MATLAB scripts and functions used in the book

Separate m-files for all the Practice Assignments, with many assignments already solved

6 Toolboxes for specific applications described in the book

2 Tutorials on enzymatic and metabolic simulations