

CS181: Computational Molecular Biology

Course Information

- Instructor: Franco Preparata
- Time: Tuesday, Thursday at 10:30-11:50 am
- Location: CIT Room 345
- Textbook: Setubal, Meidanis. "Introduction to Computational Molecular Biology", PWS Publishing Company, Boston 1997.
- TA: Brendan Hickey (e-mail: cs181tas@cs.brown.edu)
- Additional information: Grading of the course is going to be based on the take home exams, the final exam and an optional final project. There are going to be five or six take home exams (one every about two weeks). Note that, although the textbook will be used as reference, some of the topics in the syllabus are not covered by the textbook. More details are going to be given in class.

Syllabus

- Introduction to Biology
 - Chemical components (nucleic acids, proteins)
 - Fundamental cell processes
 - Protein structure
 - Sequencing (and PCR)
- Elements of Computer Science
 - Algorithm presentation
 - Analysis - Asymptotics
 - Intractability
 - * NP-completeness
 - * Heuristics
- Pairwise Alignment
 - Global alignment
 - Local alignment
 - Open-ended alignment
 - Gap penalty
 - Saving space and time

- Multiple Alignment
 - Sum-of-Pairs approach
 - Star alignment, tree alignment
 - Consensus string
- Physical Mapping
 - Unique-probe mapping
PQ-tree algorithm
 - Non-unique-probe fingerprinting
- Gene Finding
 - Hidden Markov Models
 - Viterbi algorithm
- Bioinformatics Tools
 - Search (FAST, BLAST, PAM matrices)
 - Suffix-trees (Ukkonen algorithm)
- Microarrays
 - DNA chips, applications
 - Sequencing by hybridization
- Extra Topics
 - Phylogeny
 - RNA secondary structure
 - Elements of Protein Folding