Introduction to Bioinformatics

One semester, 2 hours lectures 2 hours practicals per week. 2 midterm test, Oral or written exam.

Lectures

1) Introduction to bioinformatics
basic concepts, importance, interdisciplinary, core data-types

2) Molecular biology primer
DNA, gene, replication, transcription, translation, regulation, proteins

3) Algorithms and core operations
Algorithm analysis, representation, comparison, dotplots

4) Databases in bioinformatics
Database types, usage, file formats, NCBI, UniProt, Protein DataBase

5) Pairwise alignments
Edit distance, substitution matrix, significance of score, exhaustive/heuristic, global/local

6) Multiple alignments
Dinamic programming, progressive algorithm, scoring

7) Phylogenetics
Phylogenetic tree, terms, representation, tree building methods

8) Profile based methods
Multiple alignments in practice, regular expressions, Hidden Markov Models

9) Similarity search
Principles, heuristic search, FASTA, BLAST

10) The protein universe
Classification, protein groups, ranking based methods, class-annotated databases, clustering

11) Next-generation sequencing
Common aspects, steps of NGS, data store and analysis

Practical sessions

Introduction to Perl and Python
Programming Modules for bioinformatics
Dynamic programming
Software in bioinformatics: ClustalW, hmmer, JalView, BLAST, Phylip
Introduction to database searching
Algorithm Practice: Clustering, UPGMA