Bioinformatics (recommended subject)

Gene sequencing techniques. Introduction to metagenomics. Microbial diversity. Gene and genome assembly techniques. Re-sequencing and de novo sequencing. Hashing techniques. The Burrows-Wheeler transform. Graph-theoretical methods in sequencing: Hamilton cycle, Euler and De Bruijn graphs.

The distance of sequences. Hamming and Levenshtein distances. Dynamic programming techniques. Subsequence-search: Knuth-Morris-Pratt and Boyer-Moore algorithms. Suffix trees and their uses. Sequence alignment: Needleman-Wunsch and Smith-Waterman algorithms. The BLAST and its clones.

From genes to proteins: gene annotation. Hidden Markov models. Introduction to the macromolecular structures. Protein-ligand docking: the importance and an energy-based approach. Local and global optimization. Protein-protein docking. Protein interaction networks and their analysis. Finding new protein targets. The structure of the human brain. Examination methods of the brain. The network of the brain: the braingraph.