

BIOINFORMATICS ALGORITHMS

UNIT - I

Algorithms and Complexity- Biological algorithms versus computer algorithms – The change problem –Correct versus Incorrect Algorithms – Recursive Algorithms – Iterative versus Recursive Algorithms – Big-O Notations – Algorithm Design Techniques.

UNIT - II

Molecular Biology Primer – Exhaustive Search – Mapping Algorithms – Motif-Search Trees – Finding Motifs – Finding a Median String – Greedy Algorithm – Genome Rearrangements – Sorting by Reversals – Approximation Algorithms – A Greedy Approach to Motif Finding.

UNIT - III

DNA Sequence comparison – Manhattan Tourist Problem – Edit Distance and Alignments – Longest Commons Subsequences – Global Sequence Alignment – Scoring Alignment – Local Sequence Alignment – Alignment with Gap Penalties – Multiple Alignment-Gene Predictions – Approaches to Gene Prediction - Spiced Alignment – Divide and Conquer Algorithms.

UNIT - IV

Graphs – Graphs and Genetics – DNA Sequencing – Shortest Superstring Problem – DNA arrays as an alternative sequencing techniques – Sequencing by Hybridization – Path Problems – Fragment assembly in DNA Sequencing – Protein Sequencing and Identification – The Peptide Sequencing Problem – Spectrum Graphs – Spectral Convolution and Alignment – Combinatorial Patter matching.

UNIT - V

Clustering and trees – Gene expression analysis – Hierarchical clustering-k-means clustering – Clustering and corrupted Cliques – Evolutionary Trees – Distance-based tree reconstruction – Reconstruction trees from additive matrices – Evolutionary trees and hierarchical clustering – Character-based tree reconstruction – Small and large Parsimony Problem – Hidden Markov Models- Randomized Algorithms.

Reference Books

1. Neil C. Jones and Pavel A. Pevzner, *An Introduction to Bioinformatics Algorithms*, MIT Press, First Indian Reprint 2005.
2. Gary Benson Roderic page (Eds), *Algorithms in Bioinformatics*, Springer International Edition, First Indian Reprint 2004.
3. Gusfields G, *Algorithms on strings, trees and sequences- Computer Science and Computational Biology*, Cambridge University Press 1997.