

Evolutionary Algorithms in Bioinformatics

Unit 1:

Exact matching: basic algorithms, fundamental preprocessing - Exact matching algorithms; Boyer-Moore and Knuth-Morris-Pratt - Exact set matching; keyword trees; linear-time construction of suffix trees - Applications of suffix trees; Decision and G-tries, Design strategies.

Unit 2:

Introduction to Evolutionary Computation Techniques: Heuristic Algorithms: Hill Climbing, Simulated Annealing, Tabu Search - Neural Networks, Fuzzy Logic. Metaheuristic Algorithms: Genetic Algorithms, Evolutionary Strategies - Particle Swarm Optimization - Ant Colony Optimization - Artificial Immune Systems - Other Metaheuristics: Harmony Search, Honey-Bee Optimization, Memetic Algorithms, Co-Evolution, Multi-Objective Optimization, Artificial Life - Hybrid Techniques.

Unit 3:

Heuristic alignment methods: BLAST/FASTA and the statistics of local alignments - sequence alignment - Definition, scoring, techniques - Aligners for protein sequence alignment - Motif finding in DNA and proteins - Using Genetic Algorithms for Pair-wise and Multiple Sequence Alignments.

Unit 4:

Programming Strategies: Genetic programming, Evolutionary programming. Microarray Data with Evolutionary Algorithms: Introduction - k-means techniques miner software - Protein Folding: Protein Computer model, Application of Evolutionary Computation to Protein Folding with Specialized Operators.

Unit 5:

Evolutionary Computation and Fractal Visualization of Sequence Data: Introduction to Evolutionary Computation, IFSSs, chaos automata. Discovery of Genetic and Environmental interaction Data using Evolutionary Computation: Feature phase, Clustering Phase, Experimental Design.

References:

1. Gary B. Fogel and David W. Corne "Evolutionary Computation in Bioinformatics", Morgan Kaufmann Publishers.
2. Dan Gusfield, "Algorithms on strings, trees and sequences (Computational biology)", Cambridge university press, 1997.
3. Neil C. Jones and Pavel A. Pevzner, "An introduction to bioinformatics algorithms", MIT Press, 2004.
4. N. Gautham, "Bioinformatics - Databases and Algorithms", Narosa publishing house, 2006.
5. Daniel Ashlock, "Evolutionary Computation for Modeling and Optimization", Springer, 2005.
6. Gusz Eiben and Jim Smith, "Introduction to Evolutionary Computing", Springer, 2005.
7. Andries Engelbrecht, "Computational Intelligence: An Introduction", Wiley, 2007.
8. Kenneth DeJong, "Evolutionary Computation a Unified Approach", MIT press, 2000.

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