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Sequence alignment from the perspective of stochastic optimization: a survey

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Abstract: DNA and protein are the fundamental biological sequences. DNA is a fundamental molecule that plays a vital role in the processes of life. Proteins synthesized by DNA in a cell are the building blocks of every living organism. There is a variety of reasons behind the alignment of biological sequences. Biological sequence alignment helps to discover functional and structural similarity of sequences. Biologists work with these aligned sequences to construct phylogenetic trees, characterize protein families, and predict protein structure. Sequence alignment is an extremely promising field of research that is characterized by very high computational complexity. Stochastic optimization is needed for sequence alignment, as it generates efficient solutions to the problem. The objective of this study is to survey recent trends in stochastic optimization for sequence alignment as means of a guide for researchers who are interested in the sequence alignment problem.

Key words: Sequence alignment, stochastic optimization, simulated annealing, genetic algorithms, particle swarm optimization, ant colonyoptimization