1 Sequence Alignment Algorithms

1.1 Foundations

*Computer Science Foundations*

- Algorithm for creating the Edit Graph/Dynamic Programming Matrix for aligning two sequences
- Dynamic programming and backtracking
- Dijkstra’s Shortest Path algorithm
- The Dot Plot Algorithm
- Graph Theory: directed weighted graphs (longest paths, shortest paths)
- Stringology: prefixes, suffixes, and substrings of strings

*Statistical Foundations*

- Heuristic interpretation of the alignment score as a likelihood score
- Algorithm for the construction of the Blosum substitution matrix

*Biology Applications*

- PAM matrices (Margaret Dayhoff)
- Homology and similarity
- Three reasons why it is easier to detect homology when comparing protein sequences than DNA sequences

1.2 Global Alignment: the Needleman-Wunsch Algorithm


1.3 Local Alignment: the Smith-Waterman Algorithm

1.4 Global Alignment with Affine Gap Function


1.5 A Good Survey


2 Combinatorial Pattern Matching Algorithms

2.1 Finite Automata and Regular Expressions

M. Fiore, Lecture Notes on Regular Languages and Finite Automata, 2010

2.2 Finding a Pattern in a Text: the Knuth-Morris-Pratt Algorithm


2.3 A Good Survey

M. Crochemore and T. Lecroq, “Pattern matching and text compression algorithms”