Assignment 3: Prolog

Practical Computing for Bioinformatics

December 19, 2022

For this assignment form pairs, work out the questions, note the names of <u>both</u> members in your answer document, and upload all your answer files as a single compressed archive on Toledo for <u>both</u> participants. When answering the questions, make sure <u>you explain your logic and the steps you took</u> as well as the actual answer (code and prolog queries). If your answer includes an output file, include it in your archive. Make sure your solutions are your own work, so no copying solutions from other groups.

Assignment

1. Write a prolog script to translate a DNA sequence to protein. Find the codon table as prolog facts on Toledo. To simplify, you can assume that sequence is provided as a list of codons (e.g. [atg,caa,taa,aga].Your code should not continue to translate beyond a stop codon. Demonstrate your program works.

2. We try to model how a terminator sequence affects the efficiency of transcription and translation. We can score terminators based on its size and the presence of particular protein binding sequences, which are the Efficiency element (E) of 12 bp, the Positioning element (P) of 6 bp and the Poly(A) signal (PA) of 7 bp. We can think of terminators as lists e.g. with starting after a stop codon, first a linker of a given size, an element/signal, another linker of given size, element, linker with define lenght to end (see Figure 1 for an example).

   We have the following rules: 1. A terminator with length smaller than 50 bp or without any element has a score of 0. 2. The presence of the elements E, P and PA increase the score by 1 each. However, having more than one of each, induces no further score increase. 3. If the linkers between elements are more than 10bp they do not interfere and strengthen each other, adding 0.5. 4. If the final element is PA, and the linker to the end is between 10 and 20 bp, you further increase the score by 1. Write a prolog script to score terminator sequences. Demonstrate that your code works. One way a terminator can be described is: [link(10),element(efficiency),link(20),element(positioning),link(15),element(polya),link(12)].

Figure 1: Example of a terminator sequence