COMP 182: Algorithmic Thinking
28 January 2014

Inside the cell of a living organism, proteins interact in a pairwise fashion, and a protein-protein interaction (PPI) network is the collection of all such pairwise interactions among all proteins in the cell. Some patterns of protein interactions (e.g., five proteins interacting pairwise with each other) are of special interest to biologists. Consequently, the problem of finding whether a PPI network contains a pattern of interest is an important problem in biology. Here, we assume that 'interact' is a binary relation (that is, two proteins either interact or do not interact).

1 Illustration

Give an example of a pattern of 5 proteins such that at least 6 pairs of them interact, and an example of:

1. a PPI network with at least 10 proteins that contains the pattern.
2. a PPI network with at least 10 proteins that does not contain the pattern.

2 Problem formulation

Formulate the above problem as a graph-theoretic problem.

3 Algorithm

Give the pseudo-code of an algorithm for solving the graph-theoretic problem you defined.

4 Efficiency

Using big-O notation, what is the worst-case running time of your algorithm. Clearly specify your assumptions.