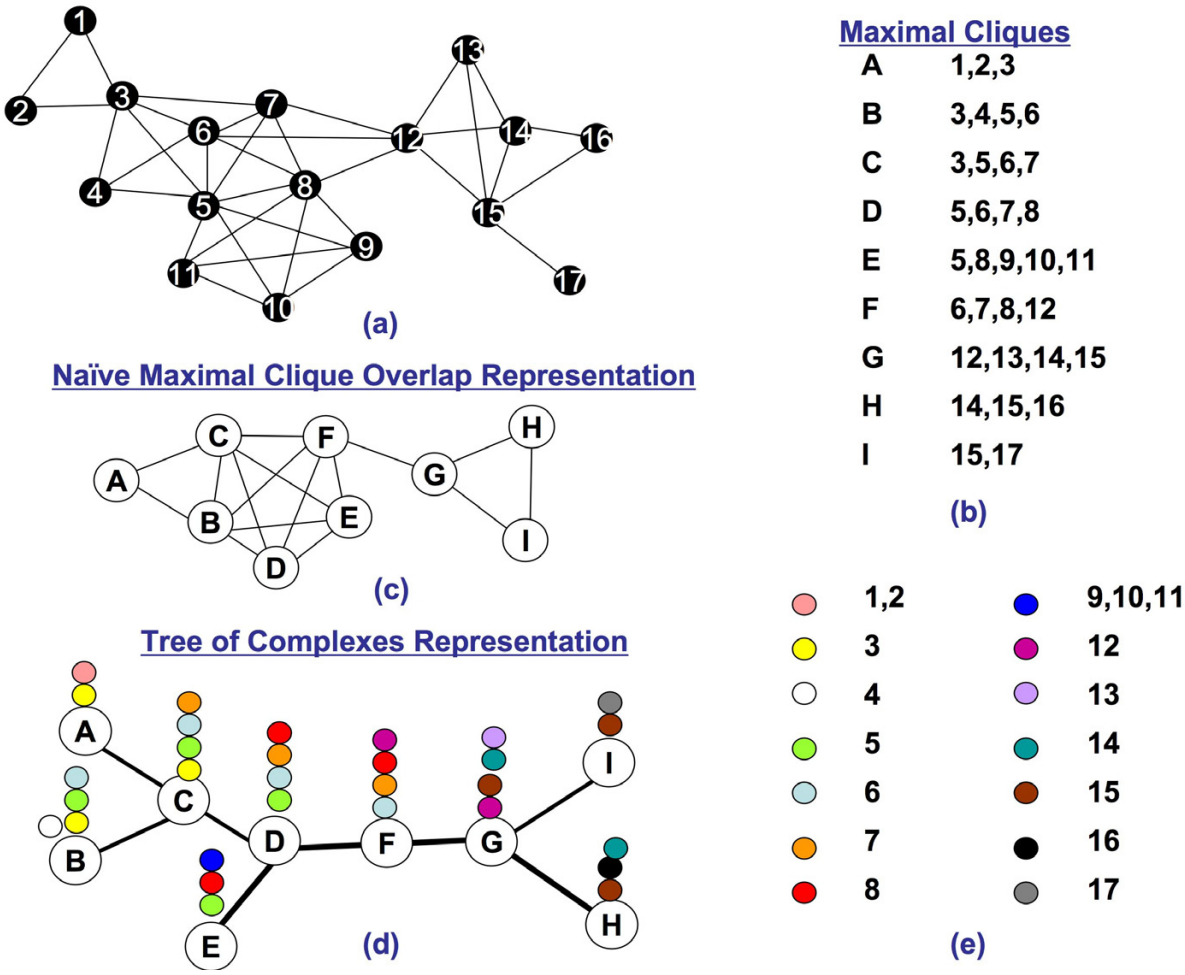

Figure 2
A Hypothetical Protein Interaction Network. (a) A hypothetical protein interaction network. (b) A list of all maximal cliques in the network. (c) A naive representation of overlaps between maximal cliques. Each maximal clique is a node and there is an edge between two maximal cliques if and only if they share a protein. (d) The clique tree representation. Once again, every maximal clique is a node, but the cliques are connected in such a way that the resulting graph is a tree. Moreover, cliques that contain a given protein form a connected subgraph. (e) This color scheme is used to show the subtree of every protein. For example, protein 3 is contained in maximal cliques *A*, *B*, and *C*, which is shown by placing yellow dots above the maximal cliques.

The main idea behind COD method is to provide a representation of a functional module, which is analogous to the clique tree, in which nodes are cographs (representing variants of protein complex within a functional group) rather than maximal cliques. If we knew in advance all the functional groups in the module, we could simply connect the proteins within each functional group turning it into a clique and, under the assumption that the resulting graph is chordal, apply clique tree construction algorithm to the graph. Since we do not have predefined functional groups, our algorithm identifies them by adding edges to the graph in such a way that each added edge connects a pair of nodes that putatively belong to the same functional group.

The COD method's edge addition strategy and its biological motivation builds on a concept of *weak siblings*. We call a pair of nodes weak siblings if and only if they are connected to the exactly the same set of neighbors, but are not connected to each other. In terms of protein interaction networks, weak siblings are proteins which interact with the same set of proteins but do not interact with each other. In particular, proteins that can substitute each other in a protein interaction network may have this property.