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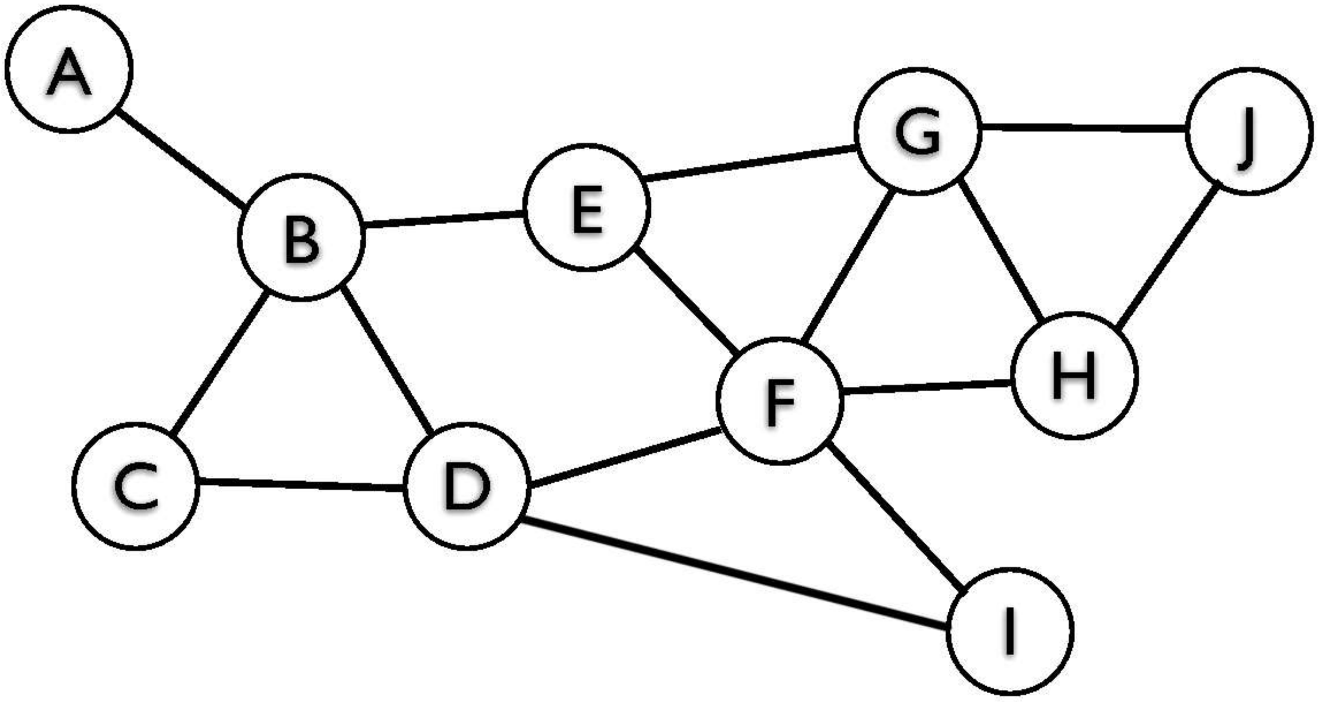
hw2_csps_q4_tree_structured_csps

Question 4: Tree-Structured CSPs

0.0/6.0 points (graded)

There exist efficient solvers for tree-structured CSPs. We can use such solvers in the inner loop of a CSP solver for near-tree-structured CSPs as follows: First find a cutset (i.e. a set of variables such that if removed, the remaining constraint graph forms a tree), then loop over all instantiations of the cutset variables, and for each instantiation call the tree-structured CSP solver to verify if for that instantiation a solution exists; the algorithm terminates when a solution is found or when it has looped over all possible instantiations and no solution was found (and hence the CSP has no solution).



Consider the graph above. Select the variables that are in the smallest cutset of this graph. Note: in general, this is a computationally difficult problem. We have not seen an algorithm to compute the minimum cutset in lecture, but for a small graph you should be able to do it

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☐ A

☐ B

☐ C

☑ D ✓

☐ E

☐ F

☑ G ✓

☐ H

☐ I

☐ J

By removing G and D, the remaining vertices form a tree, which is a graph with exactly one path from any one vertex to any other vertex, which for an undirected graph is equivalent to containing no cycles. In general, this problem is NP-hard. Having lots of connections and being part of a large number of cycles is often a good indication that a vertex is part of the minimal cutset.

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ℹ Answers are displayed within the problem

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