

Lemma 2

If BFS has an intra-layer edge, then the graph has an odd-length cycle.

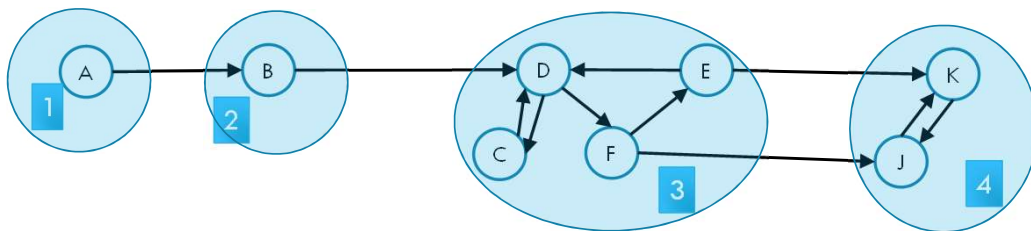
An "intra-layer" edge is an edge "within" a layer.

Problem 2

Given a graph, find its strongly connected components

Strongly Connected Component

A set of vertices C such that every pair of vertices in C is connected via some path **in both directions**, and there is no other vertex which is connected to every vertex of C in both directions.



Scenario #1

You've made a new social networking app, Convrs. Users on Convrs can have "asymmetric" following (I can follow you, without you following me). You decide to allow people to form multi-user direct messages, but only if people are probably in similar social circles (to avoid spamming).

You'll allow a messaging channel to form only if for every pair of users a, b in the channel: a must follow b or follow someone who follows b or follow someone who follows someone who follows b , or ...
And the same for b to a .

You'd like to be able to quickly check for any new proposed channel whether it meets this condition.

What are the vertices?

What are the edges?

What are we looking for?

What do we run?

Scenario #2

Sports fans often use the "transitive law" to predict sports outcomes -- In general, if you think A is better than B , and B is also better than C , then you expect that A is better than C .

Teams don't all play each other -- from data of games that have been played, determine if the "transitive law" is realistic, or misleading about at least one outcome.

What are the vertices?

What are the edges?

What are we looking for?

What do we run?