# Third mini-project: Edge-connectivity in graphs

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## I. MEASURES OF CONNECTIVITY

A measure of the robustness of a network is the number of edges whose failure prevents network-wide communications. A network is modeled as a graph. The *edge-connectivity* of a network is the minimum size of a set of edges the removal of which prevents the network from being connected.

The edge-connectivity of a network is a global parameter. In order to compute the edge-connectivity of a network, we may start by analyzing the edge-connectivity between pairs of nodes. Oftentimes, the edge-connectivity between pairs of nodes is interesting in its own right. A set of edges *separates* a source node from a destination node if every path from the source to the destination contains at least one edge belonging the set. It is well-known that the minimum number of edges that separates a source node from a destination node equals the maximum number of edge-disjoint paths from the source to the destination. A set of paths is *edge-disjoint* if the paths do not share an edge.

## II. YOUR ASSIGNMENT

**What you have to do.**

- Design and implement an algorithm to compute the minimum number of edges that separates a source node from a destination node. The network is given in a file where each line identifies an edge. The source and destination nodes are given online. You may assume that there are no more than 100 nodes with identifiers between 0 and 99. (50% of the grade.)
- Given a network in the format above, produce the complementary cumulative distribution of the minimum number of edges that separates one node from another. That is, for every natural number $k$, compute the fraction of pairs of nodes such that more than $k$ edges separates the first node from the second. (25% of the grade.)
- Given a network in the format above, compute the edge-connectivity of the network. In order to convince a user of your program that the value presented is the correct one, you should exhibit a set of edges that prevents the network from being connected. (25% of the grade.)

**What do you have to deliver, how, and when.**

- You have to deliver your code and a report with a cover page and no more than three other pages containing a text explanation of your algorithms, their pseudo-codes, their asymptotic complexities, the statistics required, and a short discussion.
- The code and the report should be sent in a .zip file to my email address with subject p3.<group number>.zip where <group number> is your group number.

- The deadline is December 2, 2016, 23:59.

**How I will evaluate your assignment.**

- Write your report and your pseudo-code clearly, and present a commented code.

- Be sure to test your code for correctness. I will take into consideration the efficiency of your algorithms.

- I will have a discussion with you about your report and will test your code at the end of the semestre, jointly with the other assignments.