

CSI 445/660 – Network Science – Fall 2015

CINET Assignment I

Date given: Oct. 6, 2015

Due date: Oct. 16, 2015

The purpose of this assignment is to familiarize students with the use of CINET. The assignment has two parts.

Part I: The purpose of this part is to become familiar with the network analysis feature of CINET.

You are required to do the following.

1. Find *two* networks available in CINET so that each network satisfies *both* of the following conditions.
 - (a) The network has at least 500 nodes.
 - (b) It is *not* connected.
2. For each of the two networks chosen in Step 1, use CINET to compute the following.
 - (a) The degree distribution. (Use the “Normalized” option in CINET for this measure.)
 - (b) The distribution of clustering coefficients of nodes. (Use the “Clustering Coef. (Cc) Distribution” measure in CINET and the default parameters provided by CINET.)
 - (c) The distribution of the sizes of the connected components.

For each network, your report for Part I must include the following:

- (1) The name of the network, the number of nodes and edges in the network.
 - (2) The three plots corresponding to Items 2(a), 2(b) and 2(c) described above. (For Item 2(c), you may show a table instead of a plot.)
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Part II: The purpose of this part is to ensure that students become familiar with the following:

(i) the NetworkX format for graphs and (ii) the procedure to upload a network to CINET.

You are required to do the following. (Note that Steps 1 and 2 below *don't* involve CINET.)

1. Construct a network that satisfies *all* of the following six properties.
 - (a) The number of nodes in the network is exactly 12.
 - (b) It is connected.
 - (c) The clustering coefficient of every node is *strictly greater than* 0.

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- (d) It has at least two bridges.
- (e) It has at least three articulation points.
- (f) The number of triangles is as large as possible.

Note: Ravi has an example of a network that satisfies Properties 1(a) through 1(e) above and has 22 triangles. Try to come up with a network with a larger number of triangles.

2. Prepare a file that represents your network in NetworkX format.
3. Upload the network (i.e., the file that you created in Step 2) to CINET.
4. For your network, find the following using CINET.
 - (a) The degree distribution. (As mentioned earlier, use the “Normalized” option in CINET for this measure.)
 - (b) The clustering coefficient distribution. (As before, use the “Clustering Coef. (Cc) Distribution” measure in CINET and the default parameters provided by CINET.)
 - (c) The diameter.
 - (d) The set of bridges.
 - (e) The articulation points.
 - (f) The number of triangles.

Your report for Part II must include the following.

- (1) A figure showing your network. (Hand-drawn figures are acceptable. However, please draw the figure clearly.)
- (2) A NetworkX description of your network.
- (3) The plots or answers for the six items mentioned in Step 4 above.