COMMUNITY DETECTION IN NETWORKS

**Materials**:

# Read the introduction of the article “*Community detection in social networks*”:

<https://www.kernix.com/article/community-detection-in-social-networks/>

1. Watch the first 2 minutes of the video “*Community Detection in Graphs*”:

<https://www.youtube.com/watch?v=MiKecKWbJhM>

1. Read abstract of the article “*Community structure in social and biological networks*”: <https://www.pnas.org/content/99/12/7821>

**Concepts to learn from the materials:**

1. What is a community in a network?
2. What are examples of communities in networks?
3. What is the community detection problem?

**Quiz** Complete the blackboard quiz about these concepts before midnight on Tuesday April 14.

Software Design & Implementation Activity

Interpret the normalized linkage table as a representation of a network (in the same manner as in the previous activity). Design and develop software to *discover, visualize and characterize five (5) communities* of strongly interacting windows in the Hist1 region:

1. Find the five nodes with the largest degree centrality. Each of the five nodes is the ‘hub’ of one community in the network, which consists of the hub and its neighbors (i.e., the nodes directly connected to the hub).
2. For each community identified:
   1. report the following:
      * the size of the community (number of nodes)
      * the percentage of nodes in the community that contain a hist1 gene
      * the percentage of nodes in the community that contain a LAD
      * the list of nodes that are in the community
   2. visualize the community as a heatmap
      * the size of the heatmap should be 81 x 81 (#windows x #windows)
      * each cell in the heatmap represents one edge in the graph
      * the heatmap should show **only** the subgraph that corresponds to the community

**PART1**: due on Friday, April 17 before midnight (email to welch@ohio.edu)

Submit a design of the software: design diagram and explanation (1-2 paragraphs).

**PART2**: due on Friday, April 24 before midnight (email to welch@ohio.edu)

Submit a demo of the software:

* Page 1: Screenshot of the core code that discovers, visualizes and characterizes the five (5) communities.
* Pages 2-3: Screenshot of the output produced by your program

**NOTE**: I may respond to your email submissions with questions about your design, code, results, and/or interpretation. Please respond promptly to my questions.