

CSI 445/660 – Part 5
(Introduction to CINET)

References and URLs for CINET

References:

- 1 S. Abdelhamid et al., "CINET 2.0: A Cyberinfrastructure for Network Science", *Proc. 10th IEEE International Conference on eScience* (eScience 2014), Sao Paulo, Brazil, Oct. 2014.
- 2 S. Abdelhamid et al., "CINET: A Cyberinfrastructure for Network Science", *Proc. 8th IEEE International Conference on eScience* (eScience 2012), Chicago, IL. Oct. 2012.

Useful URLs:

- 1 For additional information regarding CINET:

<http://cinet.vbi.vt.edu>

- 2 To use CINET (through the Granite interface):

<http://cinet.vbi.vt.edu/granite/granite.html>

A Brief Overview of CINET

- CINET: CyberInfrastructure for NETwork science.
- Developed by a group of research laboratories and universities.
- **Lead Organization:** Network Dynamics and Simulation Sciences Laboratory (NDSSL), a unit of Virginia Bioinformatics Institute (VBI) at Virginia Tech (VT).
- Supported by several funding agencies (including NSF).

Goals of the project:

- A broadly accessible cyberinfrastructure.
 - A web portal that hides the details of computation and data management, thereby minimizing the required learning effort.

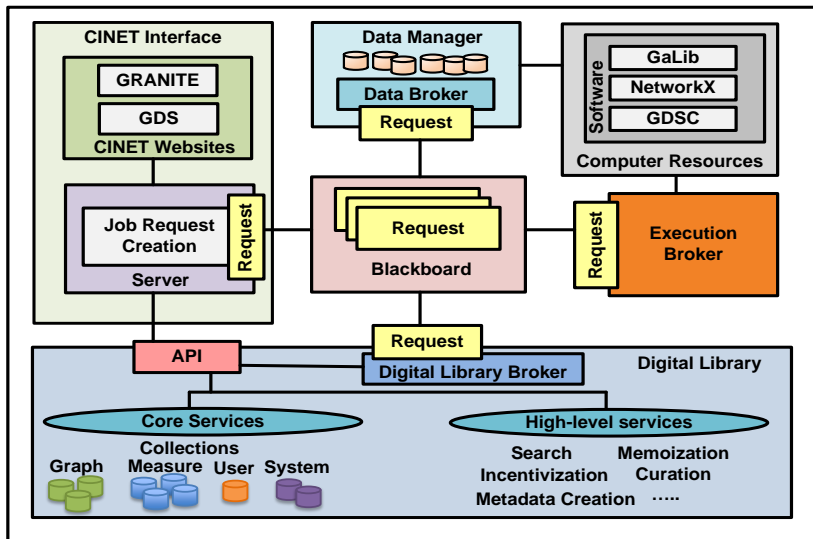
Goals of the project (continued)

- A flexible framework.
 - Allows addition of new algorithms and tools.
- A common repository.
 - Managing data, models and results through a digital library that maintains all the metadata.
- Fostering research, teaching and collaboration.
 - Allow a broad user base, from multiple disciplines.
 - Provide access to material from courses on Network Science taught at different educational institutions.

Facilities Provided by CINET

- A collection of about 200 networks of various sizes and from various domains.
- Many graph generators (that produce **synthetic** networks).
- Several software tools (e.g. GaLib, NetworkX) for computing measures of networks. (About 80 measures are supported.)
- Two tools (EDISON and GDS Calculator) for studying network dynamics.
- A convenient user interface for accessing the available services.
- Addition of new networks.
- Visualization of networks.

CINET: System Components and Interactions



Using CINET – Getting an Account and Logging in

- Go to

<http://cinet.vbi.vt.edu/granite/granite.html>

- or go to

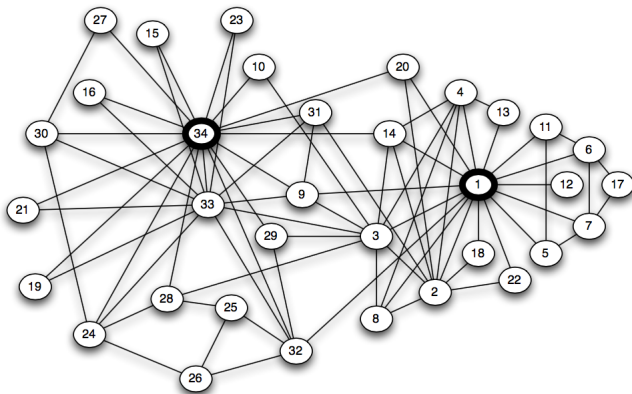
<http://cinet.vbi.vt.edu>

and then click on [Granite](#).

- To get a new account, click [Register](#). (If you already have an account, you can login.)

Using CINET – Network Example

Note: The following network (called “Karate Club Network”) is from Chapter 1 of the [EK] text.



Using CINET – Network Analysis

- In the menu bar, choose **Network Analysis**. (When you login, this is the default.)
- You will see the list of analyses done earlier.
- To perform a new analysis, click on **+New Analysis**.
- Type a name for the analysis task. (**Users often forget this step.**)
- Select one or more networks.
 - You can browse or use the search box.
- Click **Continue**.

Using CINET – Network Analysis (continued)

- Select one or more measures
 - You can browse or use the search box.
 - You can see some details about the measure.
 - Some measures need parameter values.
- Click **Analyze**.
- The new analysis now appears in the list of analyses. Observe the **Status**.
- When **Status** appears as **COMPLETED**, click **View Report**.
- You can see the results in the **Report** section.
- You can also download the results by clicking **Download**.

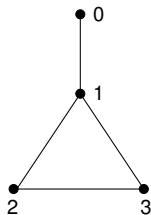
Graph Formats Used in CINET

Supported Formats: NetworkX and GaLib.

Description of NetworkX Format:

- Suggested file extension: `.nx`
- Nodes are numbered starting from zero.
- Each line of the file contains **4** integers that describe **one edge**.
 - The first two integers represent the end points of the edge.
 - The third integer represents the **weight** of the edge. For unweighted graphs, this integer should be given as **1**.
 - The last integer represents the **class label** of the edge. This value should be **zero** for the measures supported by CINET.
- For each edge $\{x, y\}$, the description appears **twice** in the input file.

Example for NetworkX Format:



0	1	1	0
1	0	1	0
1	2	1	0
1	3	1	0
2	1	1	0
2	3	1	0
3	1	1	0
3	2	1	0

Description of GaLib Format:

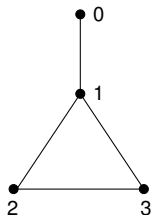
- Suggested file extension: `.gph`
- Nodes are numbered starting from zero.
- The first line of the file is an integer specifying the **number of nodes** in the graph.
- Groups of subsequent lines describe each node and the edges incident on that node.
 - For each node, the first line contains two integers that specify the **node number** and the **degree of the node**.
 - Each subsequent line for the node contains **three** integers that specify one edge incident on the node. The three integers represent the **the other end point** of the edge, the **weight** of the edge and its **class label**, respectively.

Description of GaLib Format (continued)

- The weight should be given as **1** for unweighted graphs.
- This value of class label should be **zero** for the measures supported by CINET.
- For each edge $\{x, y\}$, the description appears **twice** in the input file.

Graph Formats Used in CINET (continued)

Example for GaLib Format:



```
4
0 1
  1 1 0
1 3
  0 1 0
  2 1 0
  3 1 0
2 2
  1 1 0
  3 1 0
3 2
  1 1 0
  2 1 0
```

- In the menu bar, choose **Network Generators**.
- You will see the list of networks generated earlier.
- To create a new network, click on **+New Network Generator**.
- Type a name for the network generation task.
(**Users often forget this step.**)
- Select one of the generators.
 - You can browse or use the search box.
- Click **Continue**.

Using CINET – Network Generation (continued)

- If parameters are required, enter them and then click **Submit**.
- Click **Generate**.
- The new graph generation task now appears in the list of all such tasks. Observe the **Status**.
- Wait until **Status** appears as **COMPLETED**.
- You can see the results in the **Report** section.
- You can also download the results by clicking **Download**.

Using CINET – Uploading a New Network

- In the menu bar, select **Networks**.
- Click **+Network**.
- In the resulting window, select **Directly upload a file** and click **Done**.
- In the resulting window, click **Choose File** and select the file to be uploaded.
- When the file transfer is complete, the system shows you a window where you enter the name of the graph and other information.

Using CINET – Uploading a New Network (continued)

■ Important things to remember:

- You may leave the **Network Format** as “Auto detect”.
 - When you are not sure, you can choose the **Network Type** as “Others”.
 - There are **four** questions about the network (e.g. is it connected?) and you can choose the answer “No” to any question when you don’t know the answer.
 - Under **Visible**, please choose “Only me”.
-
- Click **Save** to complete the uploading step.
 - When you click on **Networks**, you can see the network that you just added.

Closing Remarks on CINET

- The graph generation facility will be discussed further later in the course.
- A tool (EDISON) that allows one to study dynamics on graphs will also be covered later.
- Remember that CINET is a prototype research tool; it is **not** production quality software.
- If you notice any problems with CINET, please inform Ravi and he will forward it to the CINET team.