**Cytoscape Guide – Version 3.2.0**

* Downloading Cytoscape
  1. Go to www.cytoscape.org.
  2. Click on the “Download 3.2.0” button. When prompted, select “run” and follow the download instructions for your operating system.
* Creating a compatible data file

1. After you research your network, you should have data that gives information on how the nodes and edges of your network are connected. (This is the equivalent of who calls whom in your cell phone network). This is called a SIF (Simple Interaction Format) file. Create an Excel (or other comparable) file that includes all of this interaction data. In the first row, enter categories of your data in separate columns.
   * + i.e. “prey”, “interaction”, “predator”
2. In the next row, enter one set of targets and interactions in their own cells. Repeat for subsequent target/interaction sets in separate rows.

* i.e. “Salmon” “is eaten by” “Bear” in three separate cells in the same row.

1. To simplify Cytoscape use for students, use only one type of interaction per data sheet.

* i.e. Do not enter both “eats” and “is eaten by” relationships in the same sheet.

1. Save spreadsheet as an Excel Workbook.

* Importing a data file to Cytoscape
  1. In the Cytoscape welcome screen, select “With Empty Network” and “okay” in the pop-up.
  2. Click “File” -> “Import” -> “Network” -> “File.” A new window will open.
  3. Select your Excel Workbook and click “Open.” You should see your data in the Preview section of the window.
  4. Use the colorful menus at the top of the page to select categories for your data.
     + i.e. Source Interaction = Column 3, Interaction Type = Column 2, Target Interaction = Column 1. (This selection is specifically for directional energy transfers such as “Salmon is eaten by bear” in which ‘salmon’ is the target node and ‘bear’ is the source node. The target node “receives” the interaction from the source node.)
  5. Select “OK” at the bottom of the page. This will direct you back to the main Cytoscape window and should display your visualized data web.
  6. Drag nodes away from each other to ensure that edges connect the intended nodes. You can also click on the “Apply Preferred Layout” icon in the main toolbar next to the zoom icons to automatically arrange the network or select any of the options in the main “Layout” menu.
* Editing Nodes and Edges
  1. To choose default display options for all network elements, select the Style tab under the Control Panel on the left. Select “default” from the pull-down menu beneath the tabs. To add directional arrows to all edges, select the Edge tab at the bottom of the Control Panel, click on the left box in the “Source Arrow Shape” panel, select an arrow shape, and click “Apply.” Any other default property can be edited in this way.
  2. To modify the visual properties of a single node, click on the node you’d like to change to highlight it, right-click, and hover over “Edit”->“Bypass Style”-> “Set Bypass to Selected Nodes”. Use the “Byp.” Column of the Control Panel’s Style tab to select non-default visual properties for the network element you have selected. You can edit the visual properties of a group of nodes by holding the Control key and clicking on multiple nodes. Any bypass changes you make will apply the changes to the group of nodes.
  3. To modify the visual properties of a single edge or multiple edge, click on a node connecting to the desired edge(s). From the Cytoscape Select menu, click ”Edges”->”Select Adjacent Edges” and add bypass settings for the selected edges in the Control Panel Style menu. You can deselect all nodes and edges in the Cytoscape Select menu.
  4. To move a node, either drag it around or click on one and use the arrow keys to reposition it.
* Adding Nodes and other Elements
  1. Right click on the network window.
  2. Hover over “Add” to display options.
  3. To change the node label, right-click on the node and select “Edit”->”Rename node”.
* Adding Edges
  1. Right click on a source node you want to modify.
  2. Select “Edit” -> “Add Edge.”
  3. Click on the target node. The arrow will point from the target to the source.
* Navigating a Network

Multiple options for visually navigating through a network are available in Cytoscape. To zoom in and out, either scroll manually or click on the magnifying icons in the toolbar. Clicking the “1:1” icon allows you to view the entire network at once, while clicking the dotted-edged box zooms in on a selected portion of the network. To select a portion of the network, simply click and drag your mouse over a section of the network. The selected network elements will be highlighted. You can also center-click and drag the network around (“panning”) to move around the network window.

* Running a Pathway Simulation

The PathExplorer app allows Cytoscape users to identify patterns and relationships between networks by locating directional paths between nodes. To download this app, click on “Apps” in the main menu and select “App Manager.” In the “Install Apps” tab is a list of applications and their descriptions. Select the “PathExplorer” app and click “Install” at the bottom of the window. All downloaded applications will be listed under the “Currently Installed” tab. Once PathExplorer is downloaded, a PathExplorer option will be available in the right-click menu of every node. Selecting “PathExplorer” -> “Find paths to here” highlights every source node connected to the chosen node. Alternately, “PathExplorer” -> “Find paths from here” highlights all incoming target nodes. Highlighted paths can be cleared by selecting “PathExplorer” -> “Clear path.” A node can be silenced by selecting “PathExplorer” -> “Exclude node.”

* Adding Node Attributes

Node attributes represent additional data about network members. This could include expression levels in gene networks or food chain roles in ecosystem relationships.

To add attributes to a pre-existing network from a data file, complete the following steps:

1. Enter attribute data into a MS Excel file. Put node names in one column *as entered in your original network table* (Cytoscape is case-sensitive, so make sure your node names are identical in both files). Enter attribute values in another column. Each attribute can only be one type of data. For example, a “WebRole” attribute of a food web network could not contain both words and numbers. However, you can create multiple attributes in one file of different data types by entering them in separate columns. Label every column in the first row.
2. In Cytoscape, select “File” -> “Import” -> “Table” -> “File.” This will open a new window. Click on your Excel attribute file and select “Open.”
3. At the top of the window, make sure the “Import Data as:” field is set to “Node Table Columns.” Select the name of your network in the dropdown menu next to “Network Collection.” The name of your network can be found in the Network Control Panel on the left side of the main Cytoscape interface. The “Key Column for Network” field should be set to “shared name.”
4. Click “Okay.” The attributes will appear in a separate column in the Table Panel below the main display window.

To add attributes to a pre-existing network within Cytoscape, complete the following steps:

1. Locate the Table Panel beneath the main network display area and select the Node Table tab. Click on the blank page icon from the Table Panel toolbar. Selecting “New Single Column” adds an attribute with one data value to every node. Selecting “New List Column” allows you to input a series of data for every node.
2. Hover over the type of column you want to add. Click on the type of data you intend to input. ‘Integers’ are non-decimal values, ‘long integers’ are larger integer values, ‘strings’ are words, ‘floating points’ are decimal values, and ‘booleans’ are conditional values (true, false).
3. Double click any column cell you want to modify or add data to in the Table Panel list of attributes.

The Table Panel contains all attributes and their controls. Click the double checkmark icon to display all attributes (referred to in Cytoscape as ‘columns’). To rename an attribute, right click on the column header and select “Rename column.”

To change the visual properties of nodes or edges based on their attributes, click on the arrow next to a property in the Control Panel Style menu to expand the property menu. Double-click on the column next to “Column” and select the desired attribute. Double-click on “Mapping Type” and select “Discreet Mapping.” The values in your attribute should appear below the Mapping Type label. Use the options next to each attribute value to change the visual property for that specific attribute.