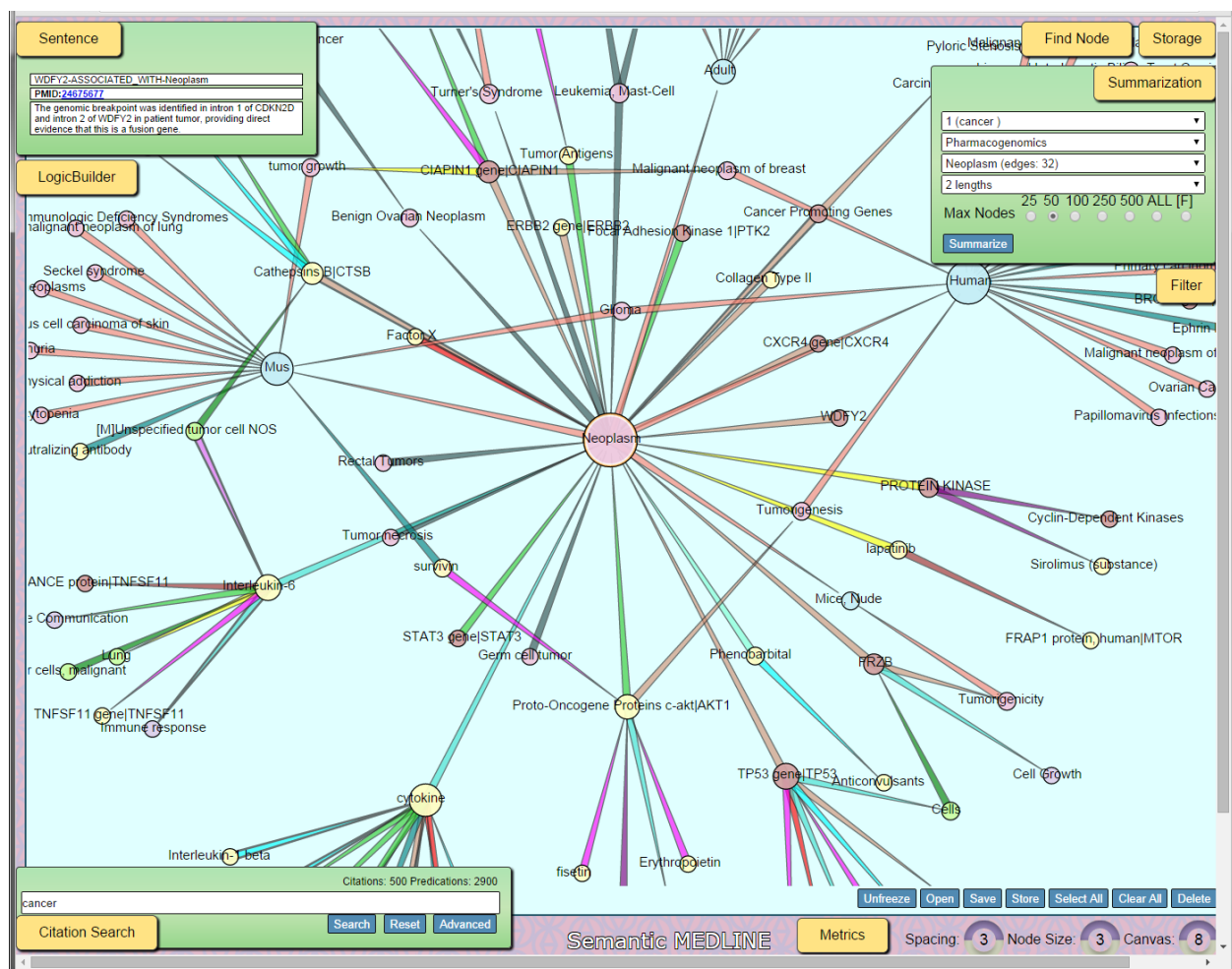


SEMANTIC MEDLINE 2.0 QUICK START GUIDE



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SEMANTIC MEDLINE 2.0 QUICK START GUIDE

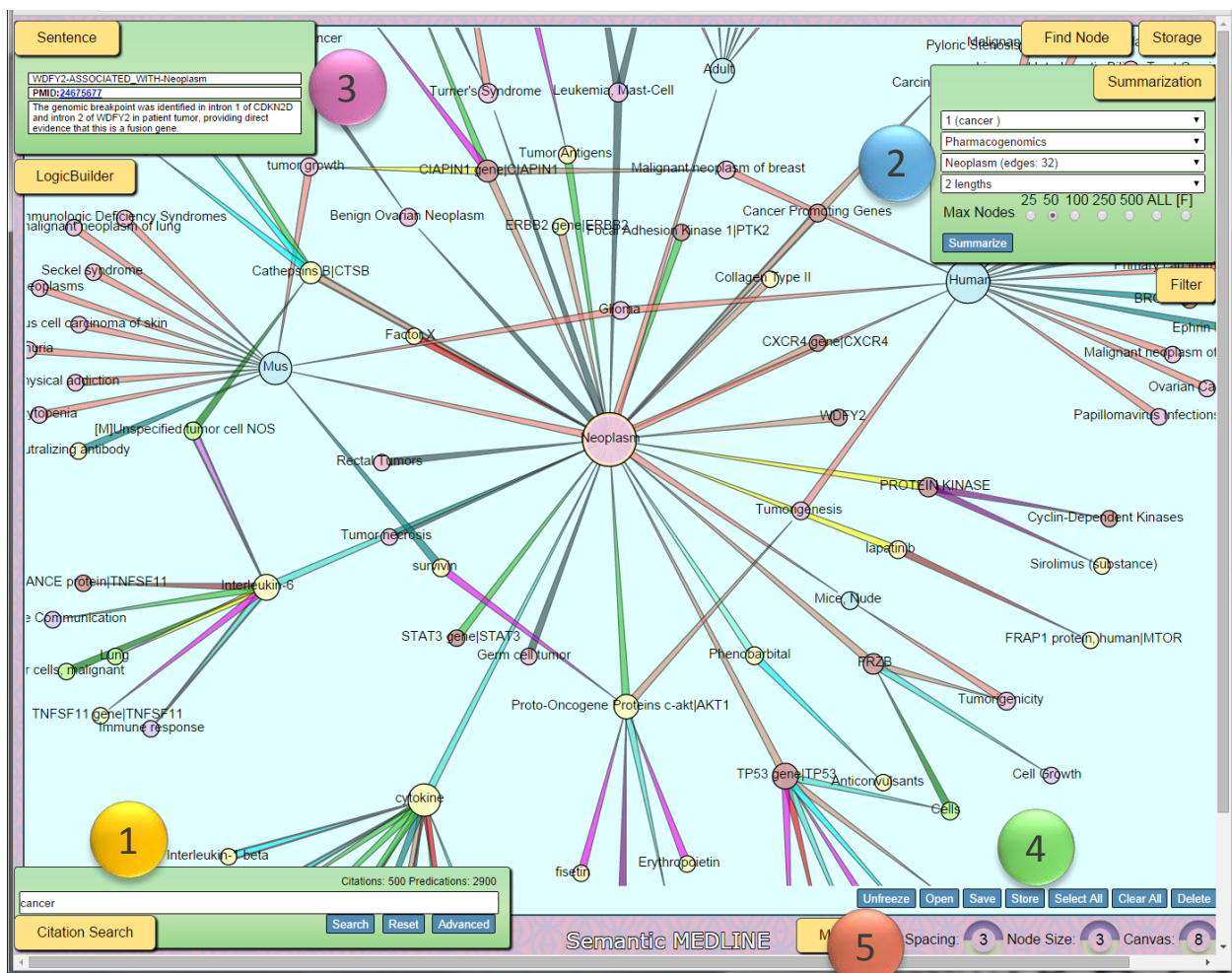


Figure 1. Basic features of SemMed2: 1) Search Panel, 2) Summarization Panel, 3) Sentence Panel, 4) Network Controls, 5) Network Appearance Knobs.

1.0 OVERVIEW

SemMed2 represents citations retrieved through a PubMed search as a visualized network of assertions extracted from the citations. The assertions take the form subject concept – relation – object concept. The concepts are represented in the network as nodes (color-coded circles) and the relations are represented as edges (color-coded triangles). The base of the relation triangle identifies the subject and the point of the triangle identifies the object.

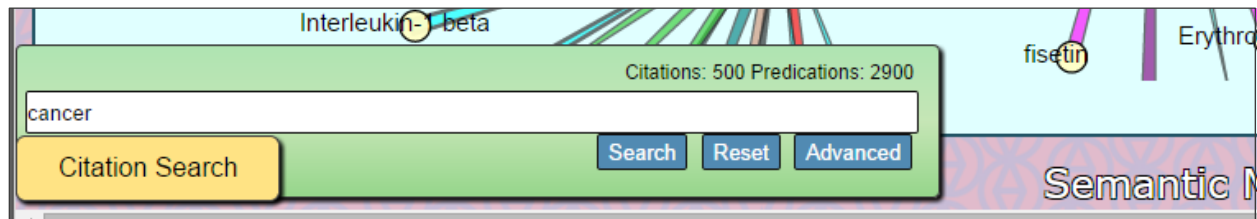
1.1 BEGIN SEARCHING

To begin, enter search terms into the Search Panel (Feature 1, in Figure 1). While the query is being processed, the SemMed2 logo will spin over the network visualization. After the logo stops spinning, the new network will be displayed. Allow the network to settle into position, and then left click on an edge to display the source sentence and citation (Feature 3). Click on the PMID to be taken to the PubMed entry for the source article for the SemMed2 assertion. To change the information displayed in the network from this search, change the summarization parameters in the Summarization Panel (Feature 2).

2.0 BASIC FEATURES

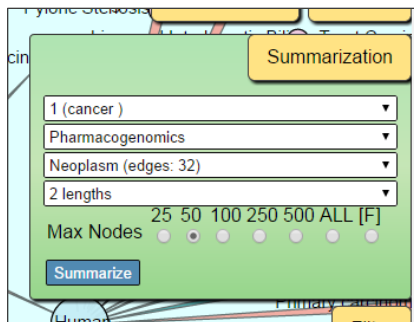
The layout of the application centers on the network visualization and arranges functions of manipulating and interacting with the network around the periphery. Figure 1 provides 5 basic features of SemMed2. Feature 1 identifies the Search Panel. The Search Panel allows the user to submit a PubMed search by typing in search terms and then typing enter or clicking the Search button. This is the starting point in using SemMed2 – submitting a search. Feature 2 shows the Summarization Panel. If the search issued by a user returns a network that would be too large for the visual display, SemMed2 automatically summarizes the network and the Summarization Panel opens. The user can decide how they would like the network to be summarized by setting summarization parameters and clicking the Summarize button. The Sentence Panel is identified as Feature 3. This panel displays the source sentences for the assertions in the network after the user clicks on the relation triangle. Network control buttons are shown as Feature 4. These buttons allow broad interaction with network visualizations such as saving and deleting. The Network Appearance Knobs are below the Network control buttons and listed as Feature 5. These knobs allow the adjustment of the appearance of the network. These features are further explored in Sections 2.1 – 2.5.

2.1 SEARCHING



A SemMed2 search begins at the Search Panel. The Search Panel allows the user to enter a PubMed Query and is initiated either by the Enter key on the keyboard or clicking the Search Button. In the upper right corner of the Search Panel, the number of citations and assertions (“predications”) are given once a search is returned. The Advanced button allows users to specify additional parameters for the search including the date range, maximum number of citations, and type of date to use.

2.2 SUMMARIZATION



The Summarization Panel allows the user to specify how the assertion network is displayed through a series of selections. The selectors function as follows:

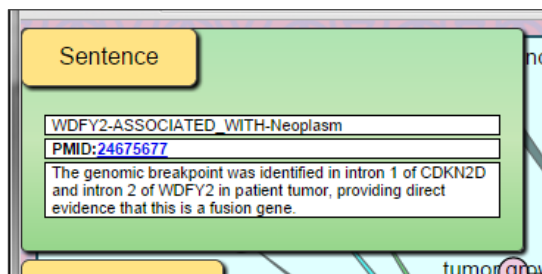
1. Network Selector: the first selector specifies which displayed network is to be summarized (only applicable when multiple networks are displayed).
2. Summarization Type Selector: the second selector specifies which type of summarization to perform (Pharmacogenomics, Treatment, Substance Interactions, Diagnosis, All Relations). These selections limit the assertions to specific types of assertions relevant to the summarization domain with the exception of All Relations, which does not limit the assertions.
3. Seed Concept Selector: the third selector is the seed concept selector, which allows the user to specify the central topic of a network. The number of edges in the

unsummarized network is displayed next to the concept name to provide an idea of how connected the concept is in the original unsummarized network.

4. Network Width Selector: the next selector controls the width (in nodes) of the network by specifying how many steps to include away from the seed node. Selecting “1 length” would only allow assertions that contain the seed node. The selection of “2 lengths” would build on the “1 length” network by extending out to assertions that contain any of the concepts in the “1-length” graph, “3 lengths” goes out an additional level, and so on.
5. Max Nodes Selector: the Max Nodes selector defines how many nodes the user would like to see in the final graph. The user can select a number from 25 to 500, “ALL”, or “[F]”. Selecting a number will return a network with approximately that number. Selecting “ALL” will not restrict the network to any size. Selecting [F] will limit the returned assertions to those with the most salient concepts and assertions and is based on the work of Udo Hahn.

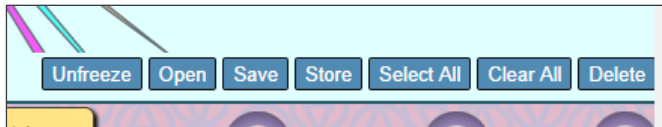
Once the Summarize button is clicked, the selected network (see 1 above) will be summarized according to the selections in the main screen. After summarization completes the selectors in the Summarization Panel will display the selections from the previous summarization.

2.3 SENTENCES



The Sentence Panel displays the assertion, the PubMed identification number (PMID) of the source citation, and the source sentence. Clicking on a relation triangle populates the Sentence Panel with the assertions source information. Clicking on the PMID of the source citation will open the PubMed entry for the citation in a new window.

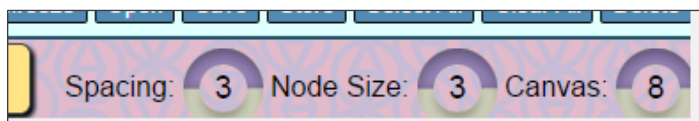
2.4 NETWORK CONTROL BUTTONS



The Network Control Buttons allow the user to manipulate the network as a whole. There are seven buttons which function as follows:

1. Freeze/Unfreeze: clicking this button will stop or start the network from moving automatically, depending on its current state. Freezing the network allows easier interaction with the network components and allows the user to move nodes to a new position.
2. Open: this opens the browse file dialog, allowing the user to open a saved network (compatible with current or previous versions of Semantic MEDLINE).
3. Save: click to save a network as a xgmml file, which can be reloaded or ported to another application.
4. Store: moves the highlighted network(s) to the storage panel for short term storage during the current session only.
5. Select All: highlights the nodes of all networks.
6. Clear All: clears the highlights from all nodes of all networks.
7. Delete: permanently removes any networks with at least one highlighted node.

2.5 NETWORK APPEARANCE KNOBS



The Network Appearance Knobs allow the user to alter the appearance of the network. There are three knobs which function as follows:

1. Spacing: controls the distance between nodes/length of edges.
2. Node Size: controls the size of nodes, node labels, and width of edges. Note that on size 1, node labels are removed from the visualization.
3. Canvas: changes the background color behind the network. Smaller numbers provide a lighter colored background and higher numbers provide a background with more intense color.

3.0 ADVANCED FEATURES

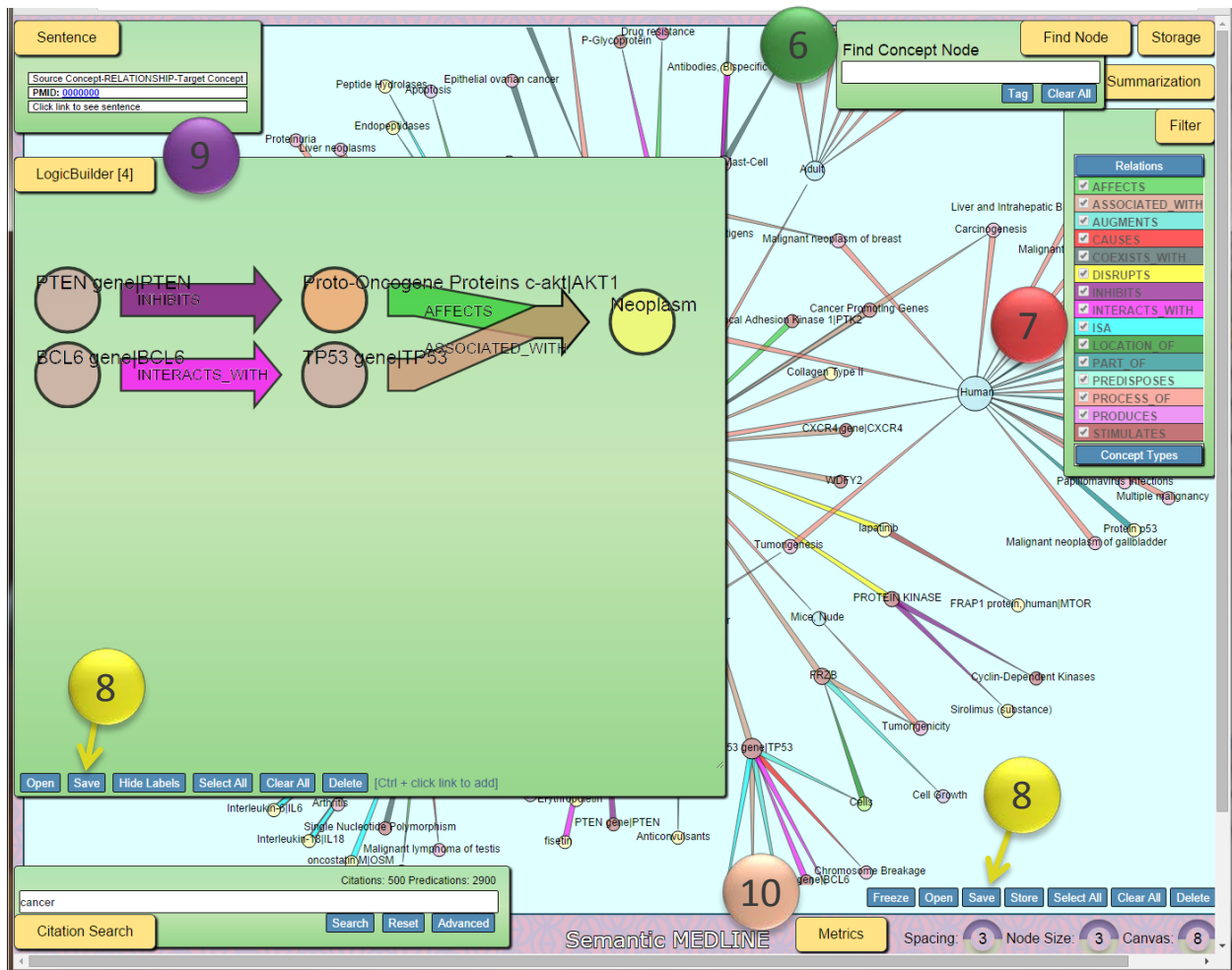
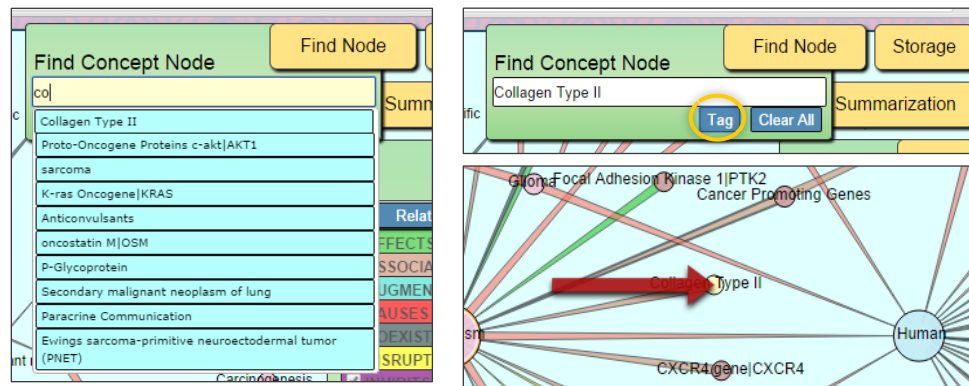


Figure 2. Advanced features of SemMed2: 6) Find Node Panel, 7) Network Filter Panel, 8) Save Button, 9) LogicBuilder Panel, 10) Network Metrics.

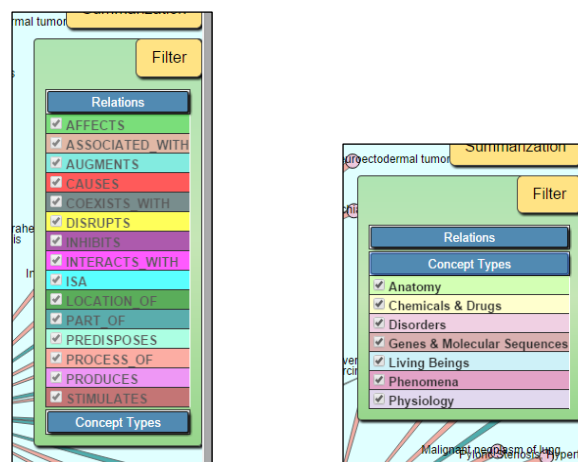
The advanced features of SemMed2 are shown in Figure 2. Feature 6, the Find Node Panel, allows the user to identify a specific node. Feature 7 is the Filter Panel which allows nodes and edges to be removed from the network by type of concept or specific relation. Feature 8 is the Save Button, which allows the user to save the current network, both in the main window and also in the LogicBuilder Panel. The LogicBuilder Panel is marked as Feature 9. This panel allows a user to save assertions from multiple searches in a single workspace. Feature 10 is the button for the Metrics Panel, which provides information on the network's features.

3.1 FINDING A NODE



To find a specific node, click the yellow Find Node Button to open the Find Node Panel. Begin typing the name of the concept in the text field. As you type, concepts containing the letters you typed will appear in the drop down list. Click on the concept desired, then click the Tag button to add an arrow. The Clear All button will remove all arrows, but individual arrows can be removed by left clicking on them directly or right clicking on the node and selecting the Clear Tag option from the menu. Arrows can also be added by right clicking on a node and selecting Tag Node from the menu.

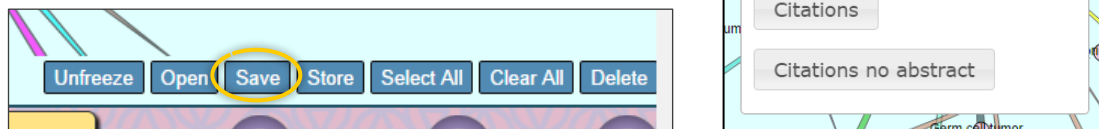
3.2 FILTERING NETWORKS



To filter nodes and edges, open the Filter Panel by clicking on the yellow Filter Button. Clicking on the Relations button will open a list of relations in the current network. Uncheck any relations in order to remove them from the graph. If a node has no other relations that those removed, it will also be removed from the graph. To remove nodes, click the Concept Types Button. This will display the concept types (technically, UMLS Semantic Groups). Unchecking a

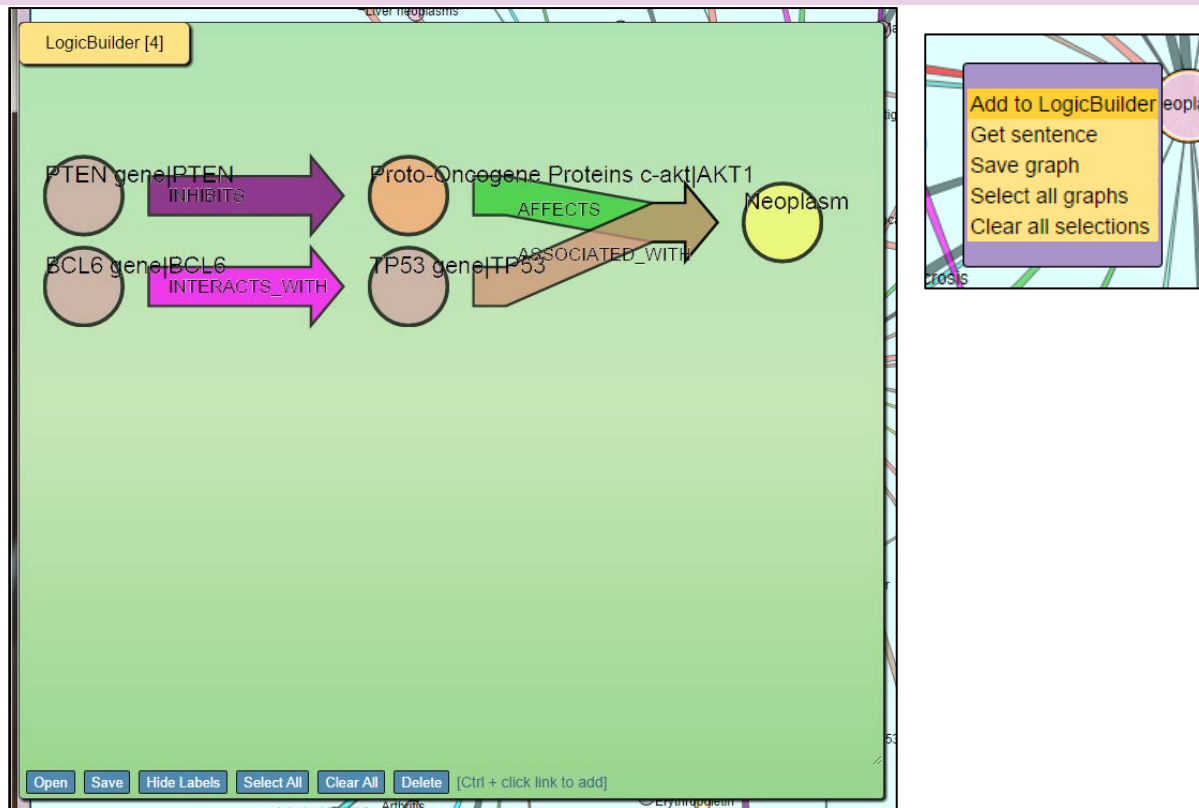
concept type will remove all nodes of those groups and their edges. To reintroduce the removed nodes and edges, simply recheck the selection. Currently, only one type of filtering may be performed at a time, i.e., either Relations or Concept Types.

3.3 SAVING NETWORKS



SemMed2 allows the user to save information in several formats. To save the displayed network to a file to be able to reopen it at a later time, select XML. The SVG option saves the visualization of the network exactly as it appears (including background color) as a scalable vector graphic, for the highest level of image integrity, although support for this format is in its early stages. The visualization can also be saved as a PNG file, which is more commonly supported but has less fidelity. The Citations option provides a rich text document with assertions and their source titles, PMIDs, and abstracts with source sentences highlighted. The “Citations no abstract” option is the same as Citations, but does not include the abstracts to reduce space requirements.

3.4 LOGICBUILDER



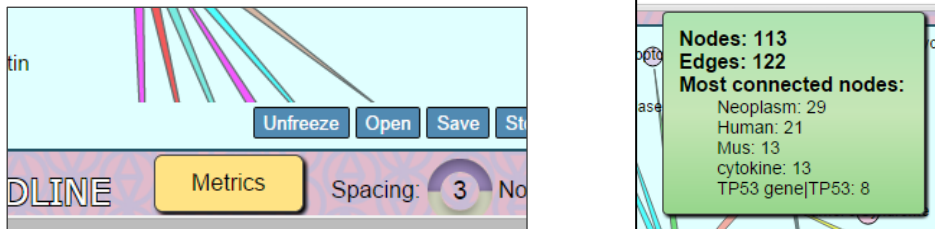
The LogicBuilder Panel allows the user to build a network of assertions from any amount of searches. The network can be saved and reopened to accommodate long-term projects. Assertions are added from the main network by left clicking while holding down the control button or by right clicking and selecting “Add to LogicBuilder”. The LogicBuilder Panel contains several buttons for network manipulation which are described below:

1. Open: opens a previously saved LogicBuilder network.
2. Save: saves the current LogicBuilder network.
3. Hide Labels: hides the edge labels.
4. Select All: highlights all assertions.
5. Clear All: removes the highlights from all assertions.
6. Delete: deletes any assertions with highlighted edges.

Some additional functions are available directly on the network. Left clicking on the assertion’s arrow-shaped edge will highlight the assertion as well as show the source sentence in the Sentence Panel. Left clicking on a node will highlight the node in red. Note that highlighting a node does not affect whether the assertion is deleted when clicking the Delete button. Only

assertions with highlighted edges can be deleted. Right clicking on either a node or an edge will provide a menu of options.

3.5 NETWORK METRICS



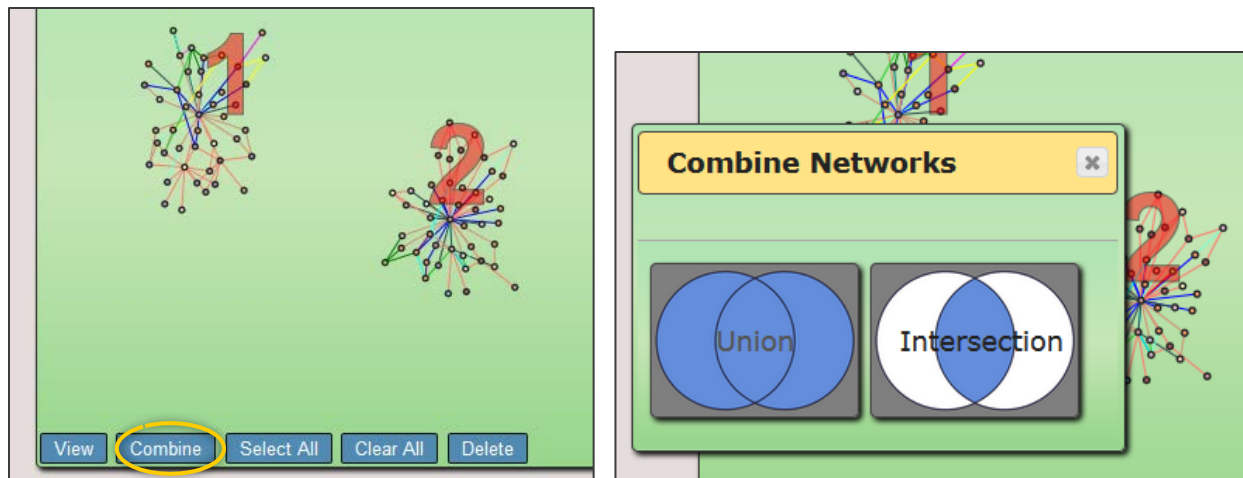
The Network Metrics Panel displays the number of nodes and edges in the network, as well as the number of connections for the most highly connected nodes. The panel is displayed or hidden by clicking the Metrics Button.

3.6 STORAGE PANEL – NETWORK ARITHMETIC

The Storage Panel allows multiple networks to be combined into a new network. The resulting network can either be the union or the intersection of the original networks.



To combine two or more networks, they must first be available in the Storage Panel. To move a network to the Storage Panel from the main screen, right click on one of the nodes so that the border of the node switches from black to red, highlighting the node. Alternatively, clicking the Select All button from the Network Control Buttons (see 2.4) will highlight all nodes of all networks. Once at least one node is highlighted, clicking on the Store button from the Network Control Buttons will move the network to the Storage Panel.



Once the source networks are available in the Storage Panel, select the networks to be combined (or click the Select All button) and click the Combine button. A dialog window will appear allowing you to choose the Union or Intersection of the selected networks. Click the appropriate button and the resulting network will be added to the main screen.