
AutoAnnotate Documentation

Release 1.2

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AutoAnnotate is a Cytoscape App that identifies clusters of nodes and automatically draws shape and label annotations for each cluster. The generated labels provide a concise semantic summary of the data attached to the nodes in each cluster.

AutoAnnotate maintains a relationship between the annotations and the nodes in a cluster, when the layout of the network changes then the annotations are automatically repositioned.

AutoAnnotate maintains multiple sets of annotations for a single network, which allows you to experiment with different clustering algorithms and label generation strategies. Additionally, AutoAnnotate allows clusters to be collapsed, which can simplify large networks by reducing potentially large sections of the network into single nodes.

Session: /Users/mkucera/baderlab/autoannotate/docs-session.cys

Control Panel

Network Select Style AutoAnnotate

MCL Cluster Annotation ...

Cluster	Nodes	Collapsed
vesicle-associated membrane prot...	139	
proton-transporting activity mitoc...	55	
spliceosomal tri-snrnp complex	47	
regulation dna development	39	
eukaryotic preinitiation initiation	38	
regulation signaling transcription	24	
protein ubiquitin transcription	23	
procollagen-lysine 5-dioxygenase...	21	
class synthetase aminoacyl-trna	18	
coating methylpurine-dna glycosy...	17	
l7ae leucine-rich I11	12	
fumarate acyl-coa succinate	9	
hematopoietic splicing spliceosome	9	
renal sodium antiporter	4	

14 clusters, 0 selected

Results Panel

AutoAnnotate Display

Shape

Border Width: 3

Opacity: 20%

Shape: ☐ ☐

Fill Color:

Border Color:

☐ Hide Shapes

Label

Font Scale: 50%

☒ Scale font by cluster si...

Font Color:

☐ Hide Labels

Table Panel

HIV-human PPI default node Table

name	Xref	GeneID
P6		
NC		
NEF		
28872818...		
28872818		
GP160		
28876544		
19172954		
GP120		

Node Table Edge Table Network Table Unassigned Tables

Memory

1.1 Requirements

Minimum versions (latest versions are recommended):

Package	Minimum Version
Cytoscape	3.4.0
WordCloud	3.1.0
clusterMaker2	0.9.5

1.2 Installation

Install Cytoscape

- If you don't have Cytoscape please download and install the latest release from <http://www.cytoscape.org/download.php>.

Install AutoAnnotate 1.2

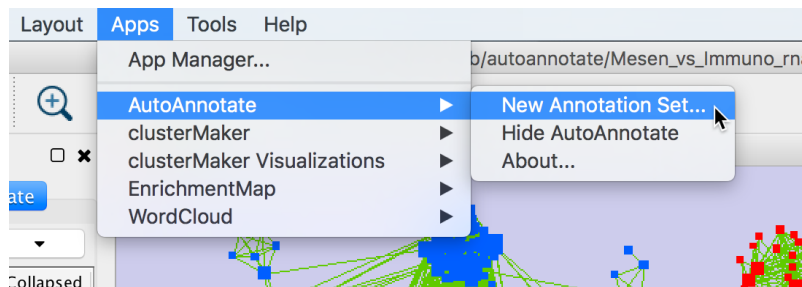
- Open Cytoscape
- In the main menu select **Apps > App Manager**
- In the App Manager select AutoAnnotate in the list of All Apps and click the Install button.
- WordCloud and clusterMaker2 will also be installed automatically along with AutoAnnotate

Alternatively the apps can be installed from the App Store.

- AutoAnnotate: <http://apps.cytoscape.org/apps/autoannotate>
- WordCloud: <http://apps.cytoscape.org/apps/wordcloud>
- clusterMaker2: <http://apps.cytoscape.org/apps/clustermaker2>

Creating an Annotation Set

- Start by selecting a network view.
- In the main menu select **Apps > AutoAnnotate > New Annotation Set...**
- The Create Annotation Set dialog will open.



2.1 Create Annotation Set Dialog

This dialog is used to select the options for creating an Annotation Set.

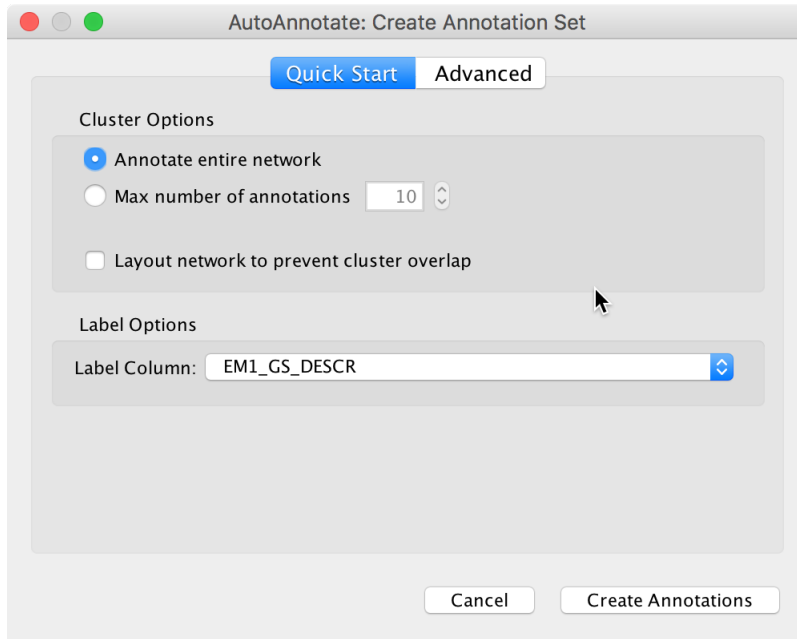
Note: AutoAnnotate can detect if the network was created by EnrichmentMap, and if so sensible defaults for EnrichmentMap networks will be pre-selected.

Note: You may manually edit the contents and labels of the clusters after the Annotation Set is created, and you may create as many Annotation Sets as you like, so its not critical to get everything perfect at this step.

The dialog has two tabs, **Quick Start** and **Advanced**.

2.1.1 Quick Start

The quick start tab has a minimal set of basic options.



Annotate the entire network Every node in the graph will be part of a cluster.

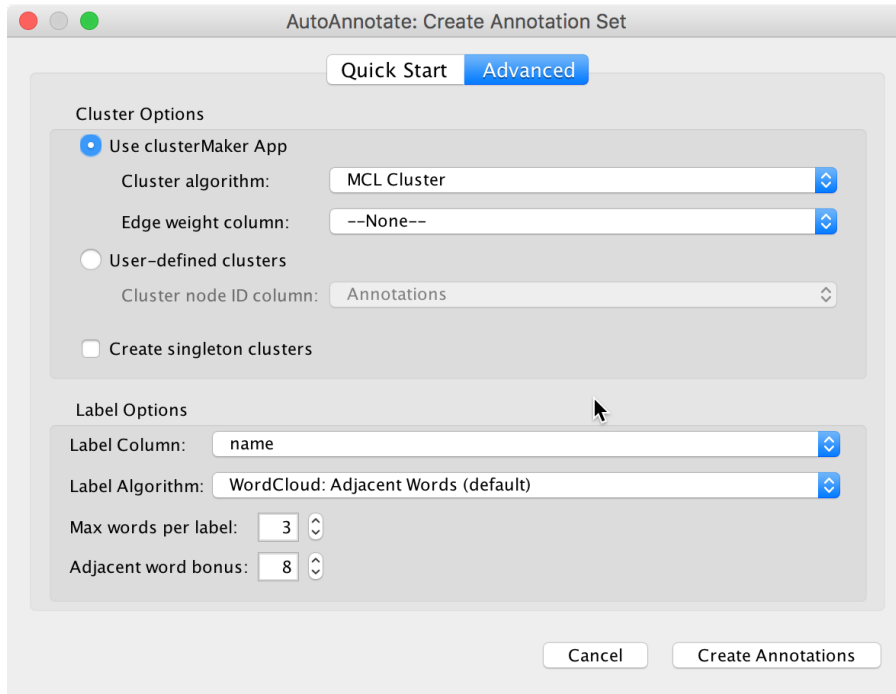
Maximum number of annotations If this is selected then only the X largest clusters in the network will be given annotations.

Layout network to prevent cluster overlap Runs a layout algorithm that separates the clusters so that they do not overlap.

Label Column Column used to generate the labels.

2.1.2 Advanced

The Advanced tab provides full control over clustering and label options.



Cluster Options

Use clusterMaker App If this is selected then clusterMaker will be used to calculate the clusters.

Cluster algorithm Used to select the clustering algorithm provided by clusterMaker that will be used to calculate the clusters. See the table below for a list of clusterMaker algorithms currently available for use in AutoAnnotate.

Edge weight column Some clusterMaker algorithms use edge weights. This box is used to select the Edge Column to use for the edge weights. If the selected algorithm does not use edge weights then this box will be disabled (greyed out).

User-defined clusters You may provide your own clusters or use another clustering app to calculate the clusters. In this case the clusters must already be calculated and cluster identifiers must be stored in a Node Column. Any Node Column of may be used to identify the clusters. If you select a column of List type then the clusters may overlap.

Label Options

Label Column Select a Node Column that will be used to calculate the cluster labels.

Label Algorithm Select an algorithm that is used to calculate the label for each cluster. Two label algorithms are currently available:

1. WordCloud: Adjacent Words

Uses the WordCloud app to calculate the labels.

Based on the algorithm that is used by the “Cloud Style: Clustered Standard” option in WordCloud. Words in the label are chosen from the most frequent words in the cluster, and words that are adjacent to the most frequent words. The higher the “*adjacent word bonus*” is, the more likely adjacent words will be in the label.

2. WordCloud: Largest Words

Uses the WordCloud app to calculate the labels.

Basically the same algorithm that is used by the “Cloud Style: No Clustering” option in Word-Cloud. Words in the label are chosen from the most frequent words in the cluster.

Click **Create Annotations** to create the new Annotation Set.

Warning: AutoAnnotate will manage all groups (compound nodes) for the current network view. It is not recommended to manually create groups on a network view that has Annotation Sets. If you would like to manually create groups at any time please duplicate the network view.

2.2 ClusterMaker2 Algorithms

The following clusterMaker2 algorithms are made available in AutoAnnotate:

Algorithm	Weighted?
Affinity Propagation Cluster	Yes
Cluster Fuzzifier	Yes
Community cluster (GLay)	No
ConnectedComponents Cluster	Yes
Fuzzy C-Means Cluster	Yes
MCL Cluster	Yes
SCPS Cluster	Yes

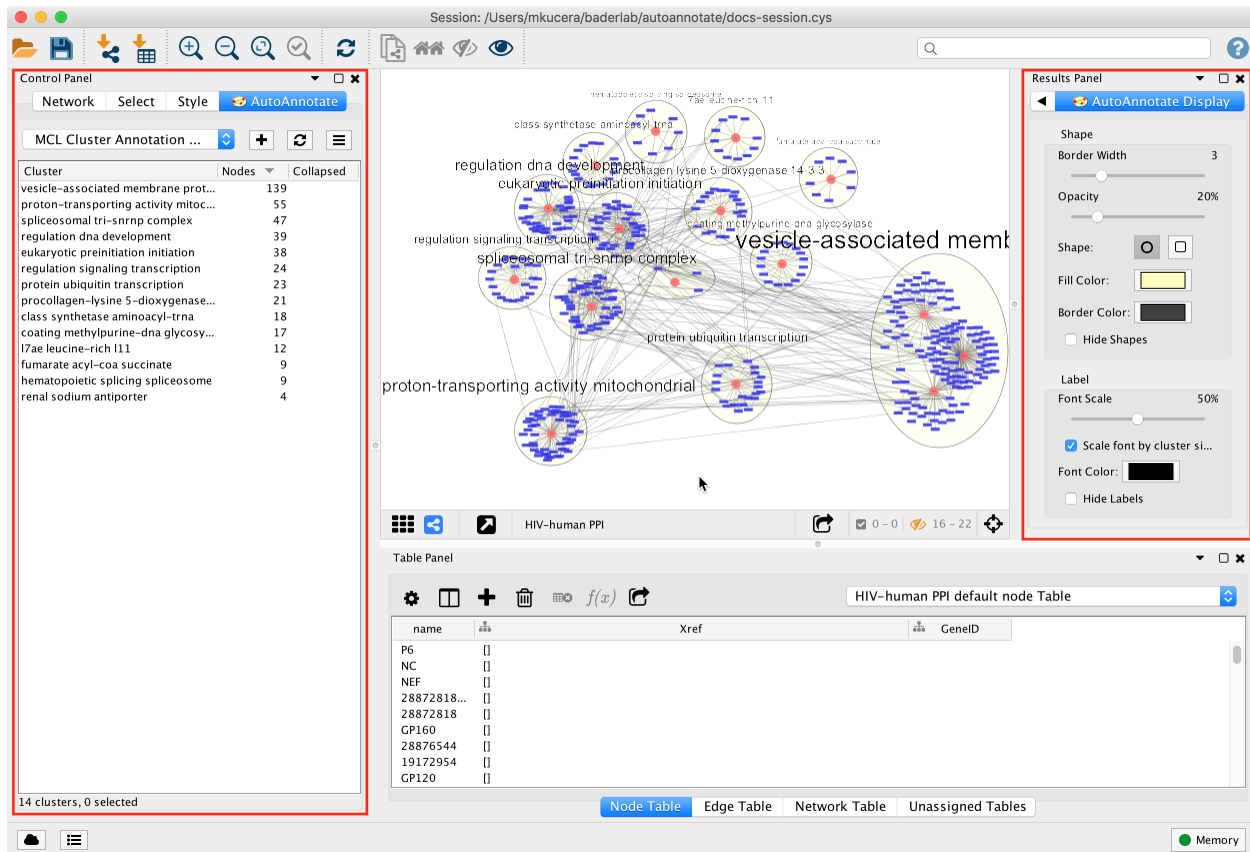
Weighted algorithms require an edge attribute to be used as the edge weight.

Working With AutoAnnotate

3.1 Panels

When an Annotation Set is created the AutoAnnotate panels will be shown.

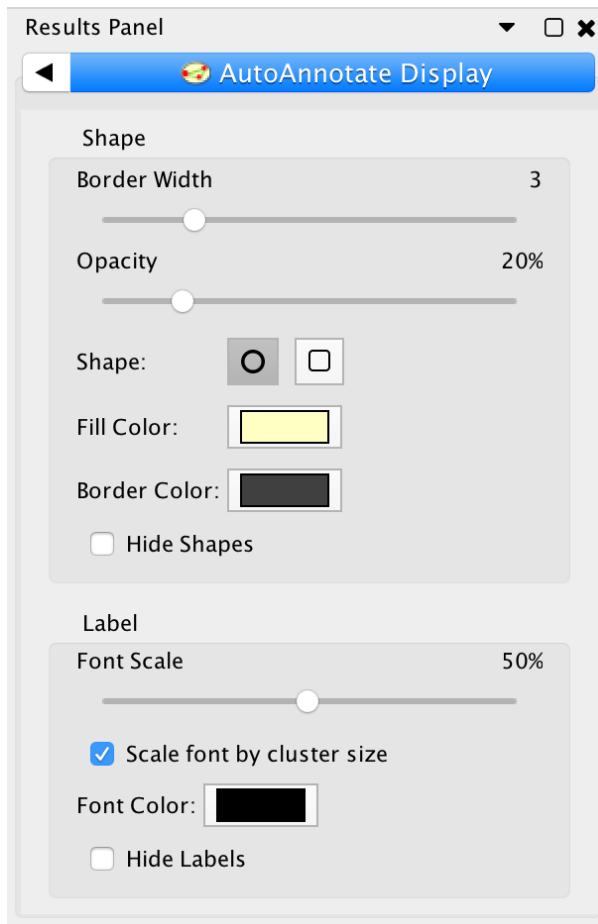
Note: To show or hide the AutoAnnotate panels go to the main menu and select **Apps > AutoAnnotate > (Show/Hide) AutoAnnotate**.



- In the **Control Panel** on the left side is the **Main AutoAnnotate Panel**.
 - This panel is used to manage Annotation Sets and Clusters.
- In the **Results Panel** on the right side is the **Display Options Panel**.
 - This panel is used to modify the look of the annotations.

3.2 Changing Display Options

This AutoAnnotate Display panel shows display options for the currently selected Annotation Set.



Shape Options

Border width Slider that adjusts the width of the cluster annotation borders.

Opacity Slider that adjusts the opacity of the cluster annotation fill color. Slide to the left for completely transparent. Slide to the right for completely opaque.

Shape There are two available shapes: Ellipse or Rectangle

Hide Shapes Select to hide all cluster shape annotations.

Fill Color Opens a color picker for choosing the fill color.

Border Color Opens a color picker for choosing the border color.

Label Options

Font Size Slider that adjusts the font size.

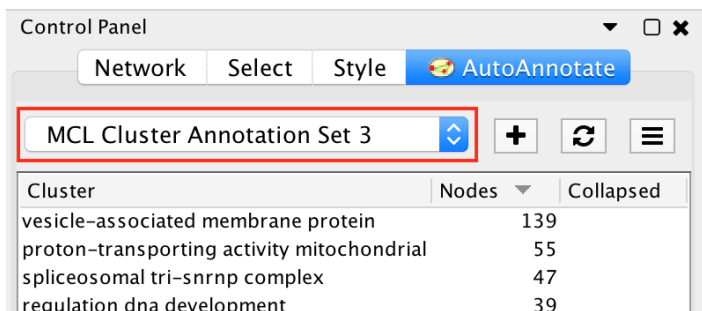
Scale font by cluster size When selected the size of the label will be relative to the number of nodes in the cluster. Larger clusters will have larger labels. When deselected all the clusters will have the same size labels. Slider is used to adjust the font size or font scale.

Font Color Opens a color picker for choosing the font color.

Hide Labels Select to hide all cluster labels.

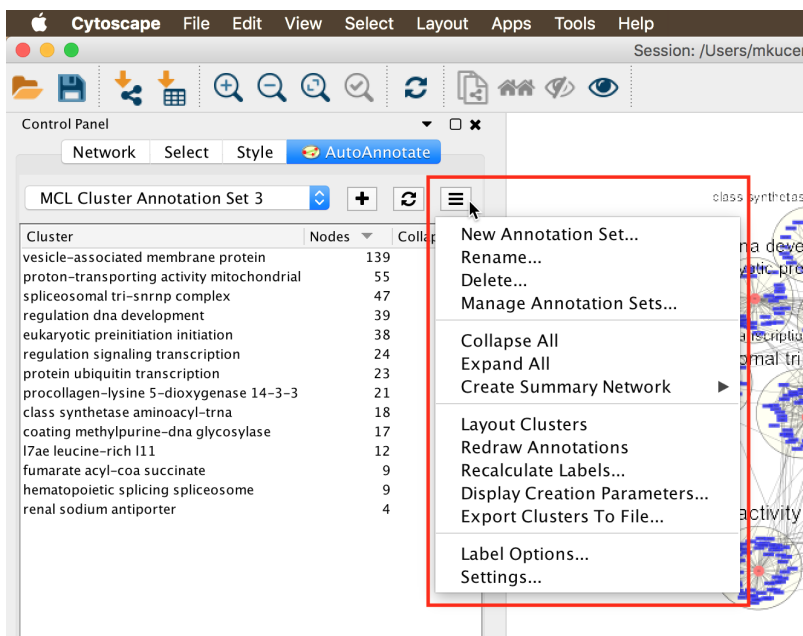
3.3 Managing Annotation Sets

The main AutoAnnotate panel is used to manage Annotation Sets.



At the top of the panel is a dropdown box that allows you to switch between all of the Annotation Sets that have been created for the current network view.

- Select the (none) option to clear all annotations from the view.
- Select an Annotation Set to show all the annotations and labels in that set.
- When switching between Annotation Sets all the annotations in the view will be erased and redrawn.
 - Similarly when switching Annotation Sets any collapsed groups will be expanded.



Click the button to show the Annotation Set Menu.

New Annotation Set... Opens the Create Annotation Set dialog. The dialog can also be opened by clicking the button.

Rename Renames the current annotation set.

Delete... Deletes the current annotation set.


Manage Annotation Sets... Opens a Dialog where you can change the order that Annotation Sets appear in the dropdown and delete multiple Annotation Sets at a time.

Collapse All Collapses all the clusters. **Warning:** Collapsing all clusters in a large network can be very slow. Consider using the **Create Summary Network** option instead.

Expand all Expands all the clusters.

Create Summary Network Generates a new network where each node represents a collapsed cluster in the original network. Very similar in functionality to “Collapse All”, but runs significantly faster.

Layout Clusters Runs a layout algorithm that will layout each cluster separately using the perfuse layout (evenly spaced in a grid). Note: this operation cannot be undone.

Redraw annotations Older versions of Cytoscape have a bug that cause annotations to occasionally be drawn in the wrong location. Redrawing the annotations can fix this problem. Annotations can also be redrawn by clicking the  button.

Recalculate Labels Recalculates the labels for all of the clusters in the annotation set. Typically used when the WordCloud options or label algorithm changes. More on this later in this guide. (Note: to recalculate labels for a subset of clusters please select the clusters in the table and right-click to show the cluster context menu.)

Display Creation Parameters... Opens a dialog that shows the parameters that were chosen in the Create Annotation Set Dialog for the current Annotation Set.

Export Clusters to File... Creates a TXT file containing the labels of all the clusters.

Label Options Opens a dialog where you can select the label algorithm that is used when recalculating labels.

Settings... Opens the AutoAnnotate settings dialog.

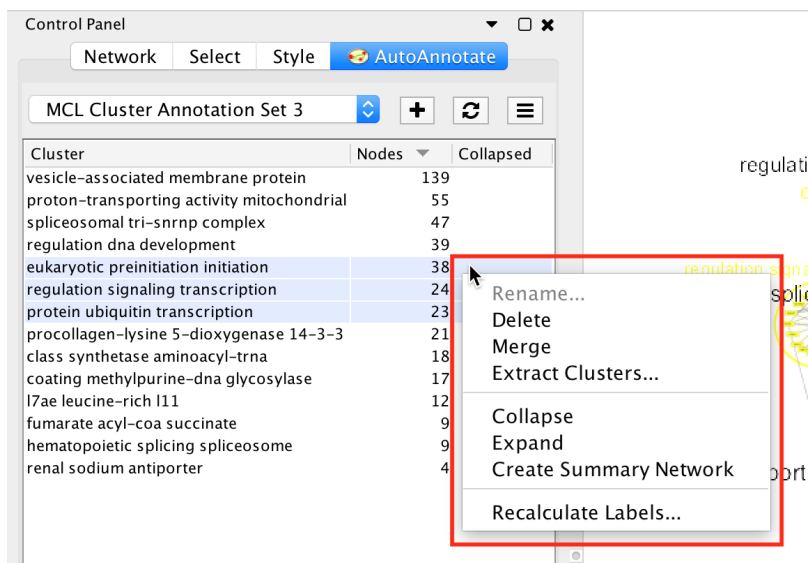
3.4 Managing Clusters

On the main AutoAnnotate panel you will find the Cluster Table.

- This table shows each cluster, along with its label, the number of nodes in the cluster and a checkbox icon that indicates if the cluster has been collapsed.
- Click on a table header to sort the table by that column.

Most of the cluster options are available using the context menu of the cluster table.

- Start by selecting one or more clusters in the cluster table.
- To select multiple clusters hold the Shift key to select a range or hold the Ctrl/Command key to select individual clusters.



Right click with the mouse to show the cluster table context menu.

Rename... Enabled when 1 cluster is selected. Manually set the label for the cluster.

Delete Delete the cluster annotations. Note: This does not delete the nodes or edges in the cluster, just the annotations.

Merge Enabled when 2 or more clusters are selected. Merges the clusters into a single cluster. A new label for the merged cluster is automatically calculated.

Extract Clusters... Creates a new Annotation Set consisting of the selected clusters.

Collapse Collapses the selected clusters. Warning: can be very slow when many clusters are selected.

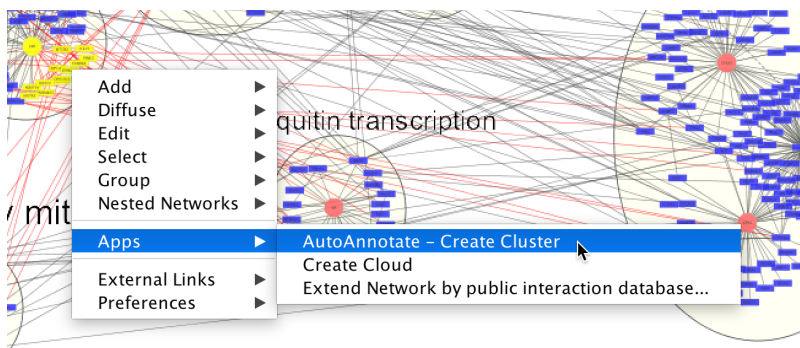
Expand Expands the selected clusters.

Generate Summary Network Generates a new network where each node represents a collapsed cluster that is selected in the original network. Very similar in functionality to “Collapse”, but runs significantly faster.

Recalculate Labels Recalculates the labels for the selected clusters.

3.5 Managing Clusters in the Network View

To manually create a cluster select some nodes in the network view, right click to show the context menu, and select **Apps > AutoAnnotate > Create Cluster**.



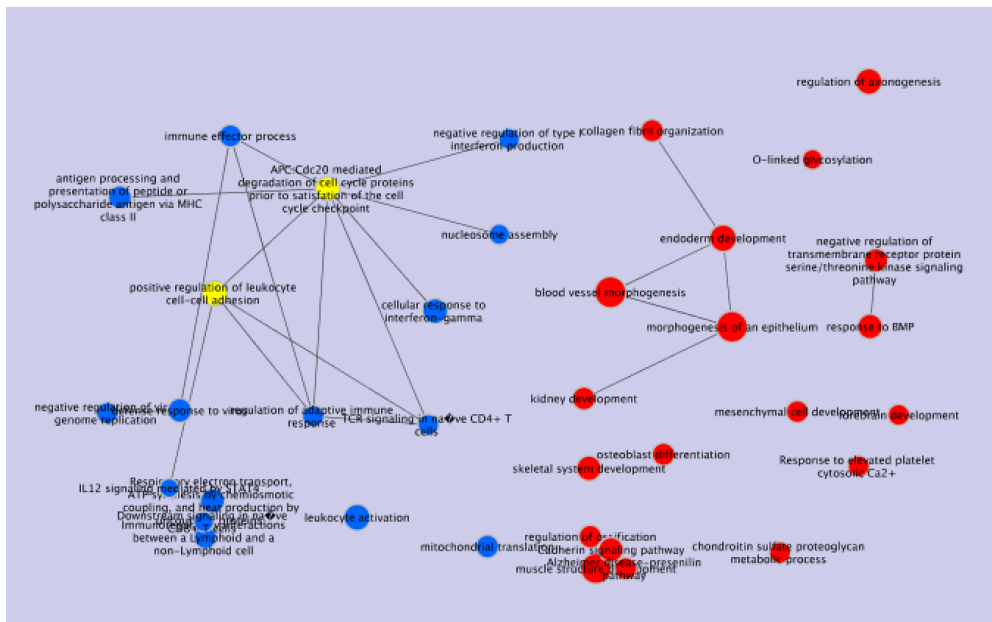
- A new cluster is created.
- A label for the cluster is automatically calculated.
- The cluster is selected in the cluster table.

Deleting a node in an existing cluster will remove the node from the cluster. A new label is calculated.

3.6 Collapsing and Expanding Clusters

AutoAnnotate can summarize a network by collapsing some or all of the clusters automatically.

Warning: Depending on the number of clusters this function can be very slow. Consider using the **Generate Summary Network** option instead because it runs significantly faster. See the section below for more details.



The Cytoscape “group nodes” feature is used to collapse and expand clusters. A group node is a compound node that contains other nodes.

When AutoAnnotate collapses a cluster it first creates a group node that contains all the nodes in the cluster and then the group node is collapsed. When the cluster is collapsed Cytoscape will create “meta-edges” between the group node and any other nodes it is connected to. The collapsed group nodes and the meta-edges provide a summary of the network.

When a cluster is expanded the group node is expanded and then deleted. The annotations are shown again.

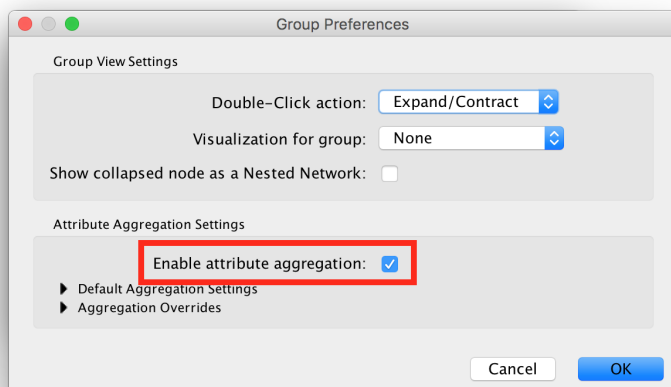
Note: The annotation for a cluster is not shown when the cluster is collapsed. The label shown for a collapsed cluster is generated by Cytoscape and depends on the Group Preferences (explained below).

Warning: It is not recommended to manually collapse or expand clusters using the Groups menu as this may confuse AutoAnnotate. When switching between Annotation Sets all collapsed clusters are automatically expanded.

Warning: There are currently some limitations in Cytoscape with regards to saving and restoring annotations and groups in a session file. For this reason when you save your session all the clusters must be expanded first.

Clusters can be collapsed or expanded from the Annotation Set Menu or the Cluster Table Context Menu. Before collapsing clusters make sure that node aggregation is enabled. This will tell Cytoscape to generate a label for the group node that aggregates the labels of the nodes in the cluster.

- In the main menu select **Edit > Preferences > Group Preferences**.
- In the Group Preferences dialog select the option for Enable Attribute Aggregation.



3.7 Summary Network

Using group nodes to collapse clusters can be very slow when there are many clusters. As an alternative a new option called **Generate Summary Network** has been added in AutoAnnotate 1.1. A new network is generated where each node represents a collapsed cluster in the original network, and each edge represents a meta-edge between clusters. The resulting network is very similar to the results you get from collapsing the clusters.

The main differences are:

- Nodes that are not contained in any cluster are ignored.
- There is no relationship maintained back to the original network. If the clusters in the original network change the summary network will not be updated. Create a new summary network at any time to reflect the current state of the clusters.
- A new visual style for the summary network is created based on the original visual style.

A summary network can be created from the Annotation Set Menu or the Cluster Table Context Menu.

Summary network uses the same attribute aggregation settings as collapsed group nodes. Available from **Edit > Preferences > Group Preferences** then expand the Default Aggregation Settings section.

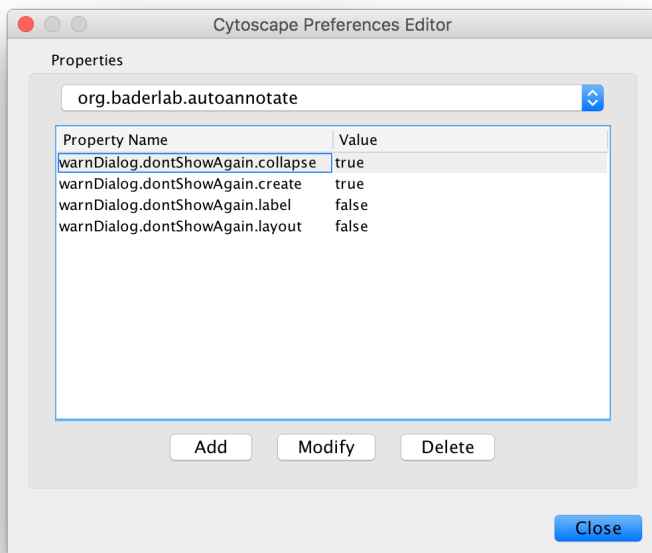
3.8 Working with WordCloud

Labels for clusters are generated by the WordCloud app.

- You may change the label generation options from the WordCloud panel.
- In the main menu select **Apps > WordCloud > Show WordCloud**.
- In the WordCloud panel you can change the label options, for example using the Normalize slider.
- Back in the AutoAnnotate panel select **Recalculate Labels** to regenerate labels using the updated WordCloud options.

3.9 Additional Options

AutoAnnotate has various warning dialogs that can be dismissed permanently by selecting “don’t show this again”. If you would like to see these warnings again they can be re-enabled. In the main menu select **Edit > Preferences > Properties**, then select **org.baderlab.autoannotate** in the Properties Dialog.



Bug Reports and Enhancement Requests

Thank you for using AutoAnnotate. Your feedback is important and helps us to improve the App for everyone. If you have any comments, requests for new features or enhancements, or bugs to report, please enter them on the AutoAnnotate github issue tracker.

<https://github.com/BaderLab/AutoAnnotateApp/issues>