CYTOSCAPE — SHORT TUTORIAL

THE NETWORK FILES

- Intro to Cytoscape (https://cytoscape.org/)
- Files on https://github.com/krabberod/BIO9905MERG1_V21/tree/main/Networks
- The commands for a typical run
  - *eLSA_starting_script.sh*

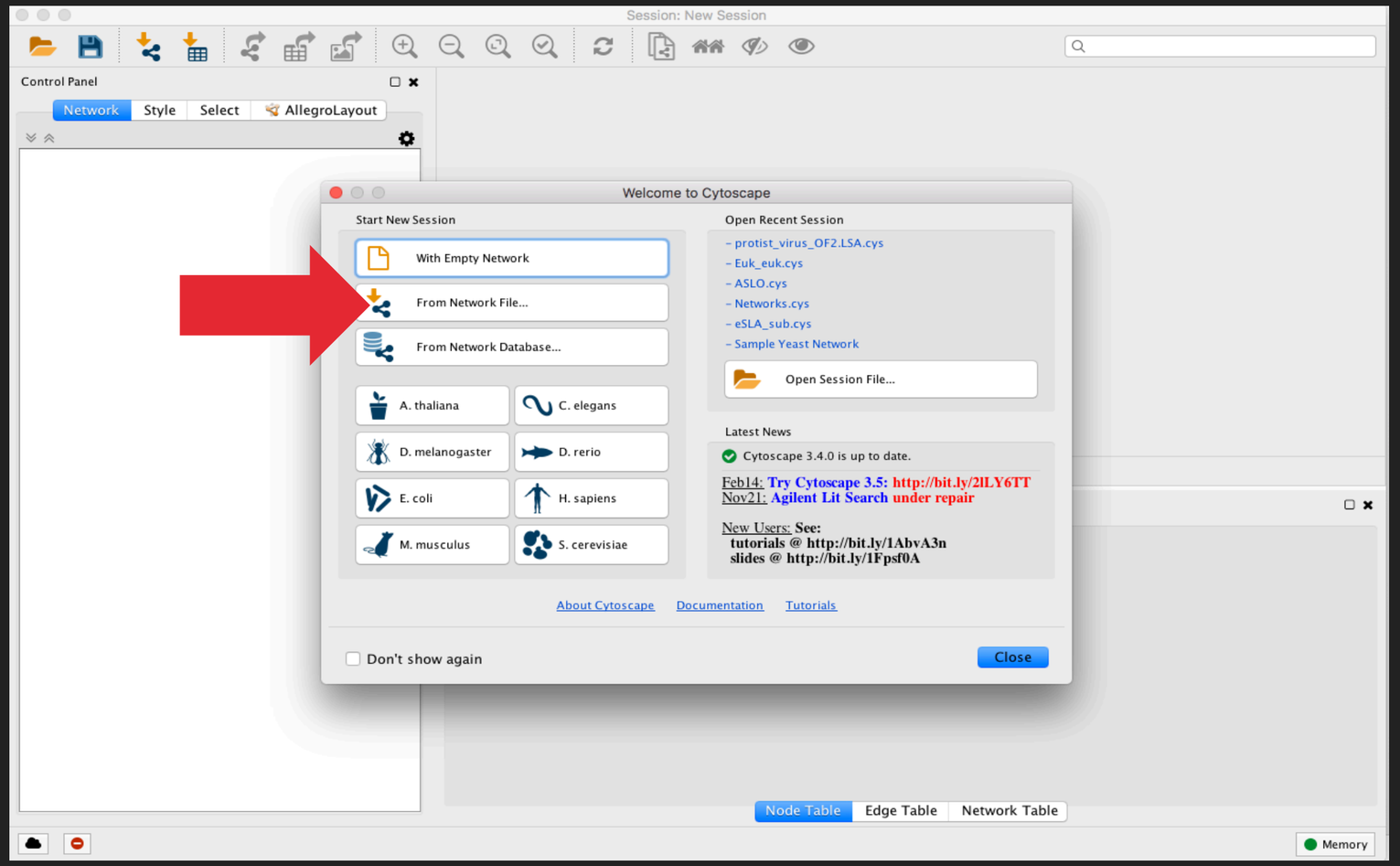
- *Input data*
  - *eLSA_otu_table.tsv*
  - *eLSA_top100_otus.tsv*

THE NETWORK FILES

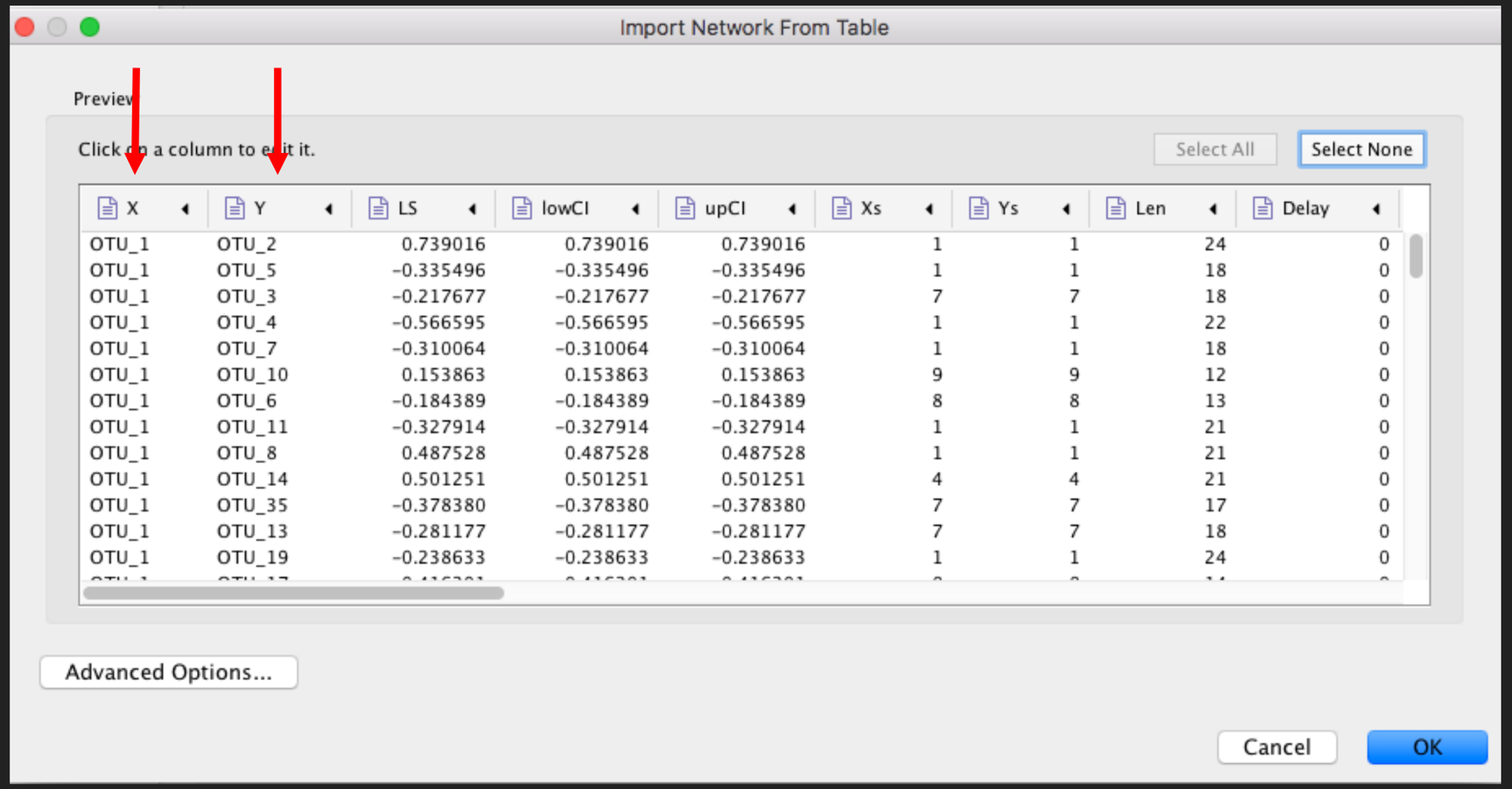
- *Output from eLSA*
  - ***eLSA_network_top100.perm.d0.tsv***
    eLSA_network_top100.perm.d1.tsv
    eLSA_network.d0.tsv
    eLSA_network.d1.tsv
- *eLSA_node_annotation_relabund.tsv*
- *eLSA_node_annotation_tax.tsv*
- *eLSA_for_cytoscape.cys (can be opened directly in cytoscape)*

USING CYTOSCAPE

- open Cytsocape, import *eLSA_network_top100.perm.d0.tsv*

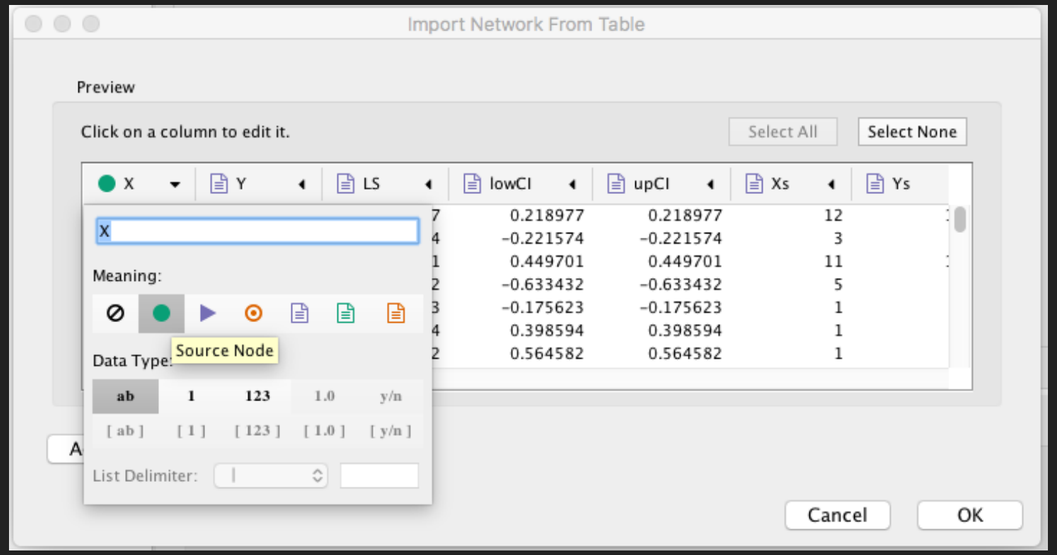


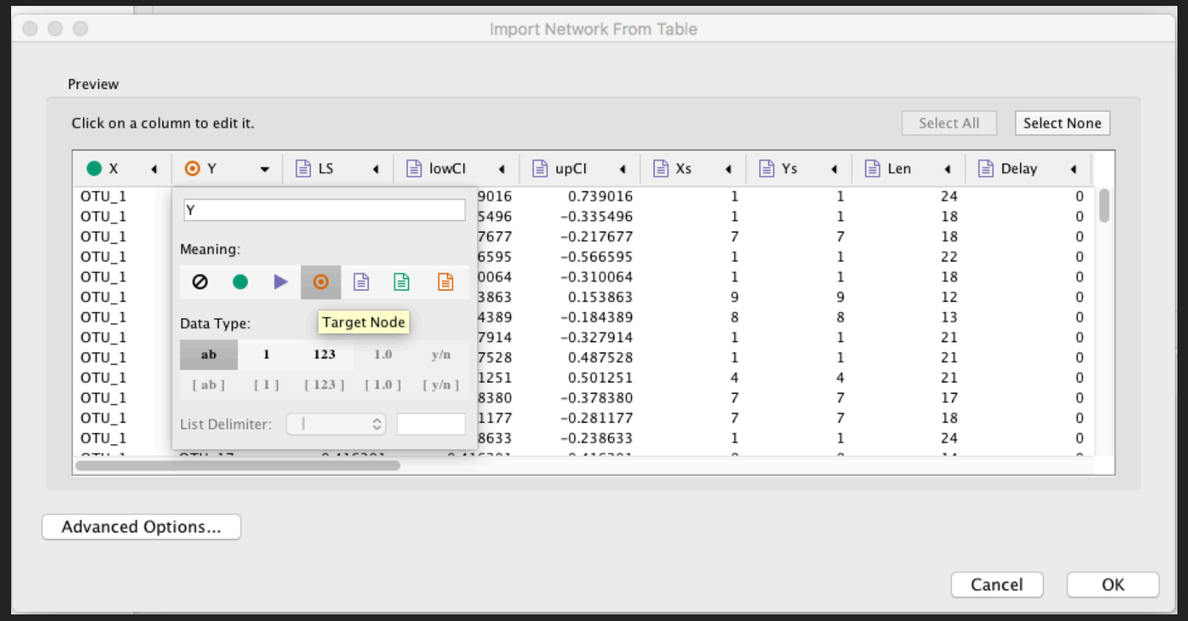
- Define target and source node (this is an undirected networks so the order of the nodes doesn't matter)

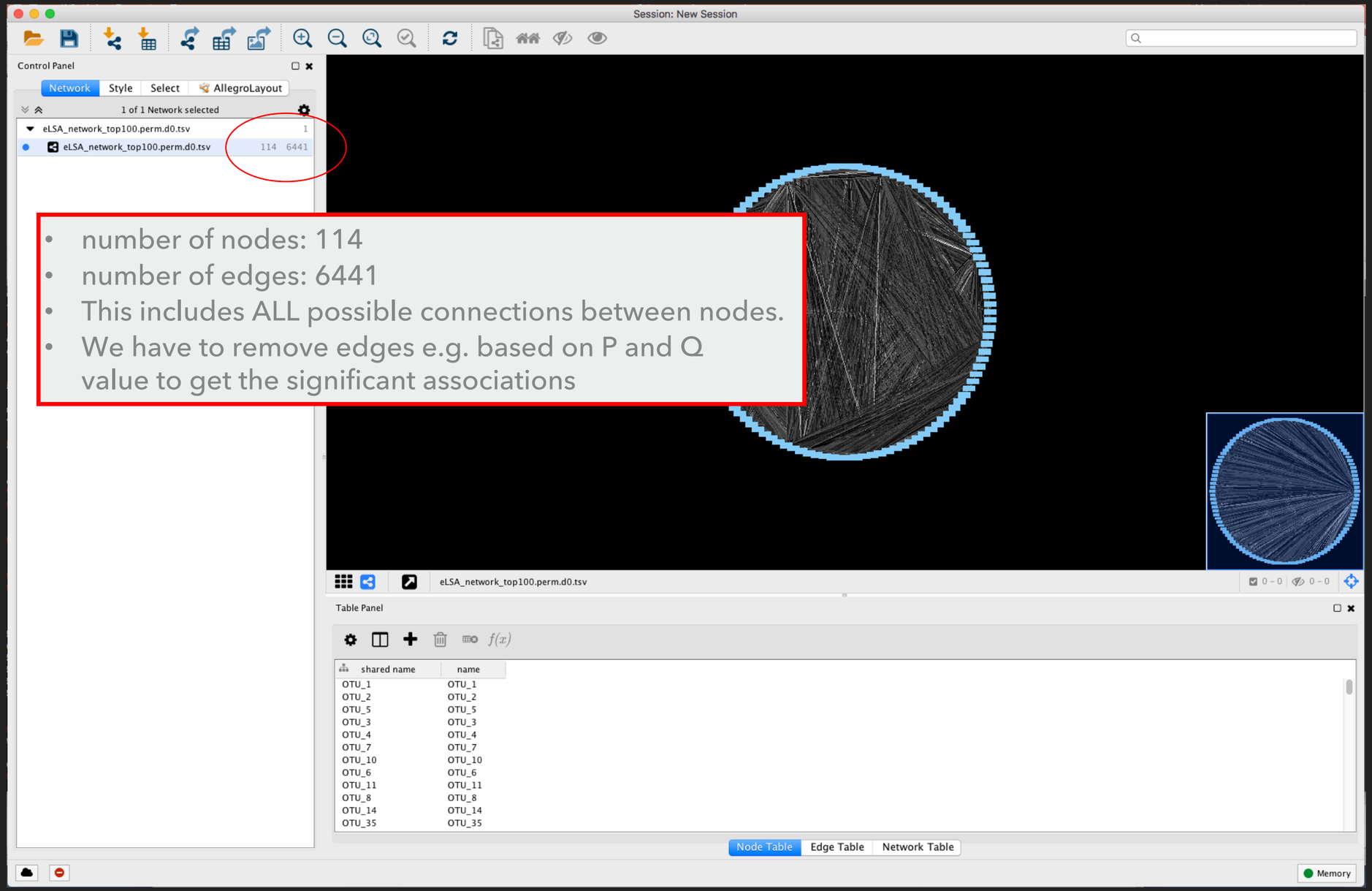


X	Y	LS	lowCI	upCI	Xs	Ys	Len	Delay
OTU_1	OTU_2	0.739016	0.739016	0.739016	1	1	24	0
OTU_1	OTU_5	-0.335496	-0.335496	-0.335496	1	1	18	0
OTU_1	OTU_3	-0.217677	-0.217677	-0.217677	7	7	18	0
OTU_1	OTU_4	-0.566595	-0.566595	-0.566595	1	1	22	0
OTU_1	OTU_7	-0.310064	-0.310064	-0.310064	1	1	18	0
OTU_1	OTU_10	0.153863	0.153863	0.153863	9	9	12	0
OTU_1	OTU_6	-0.184389	-0.184389	-0.184389	8	8	13	0
OTU_1	OTU_11	-0.327914	-0.327914	-0.327914	1	1	21	0
OTU_1	OTU_8	0.487528	0.487528	0.487528	1	1	21	0
OTU_1	OTU_14	0.501251	0.501251	0.501251	4	4	21	0
OTU_1	OTU_35	-0.378380	-0.378380	-0.378380	7	7	17	0
OTU_1	OTU_13	-0.281177	-0.281177	-0.281177	7	7	18	0
OTU_1	OTU_19	-0.238633	-0.238633	-0.238633	1	1	24	0

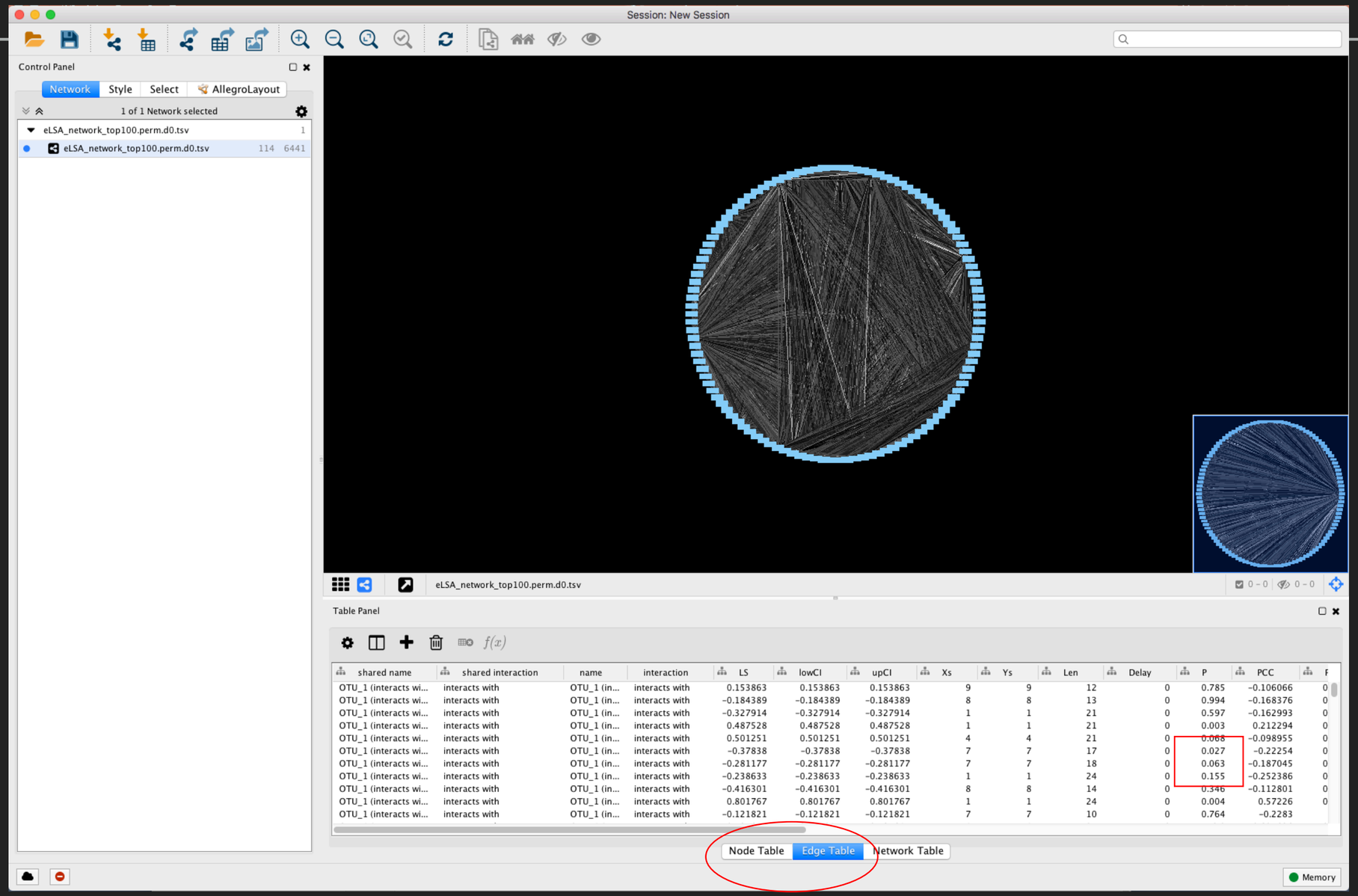
USING CYTOSCAPE

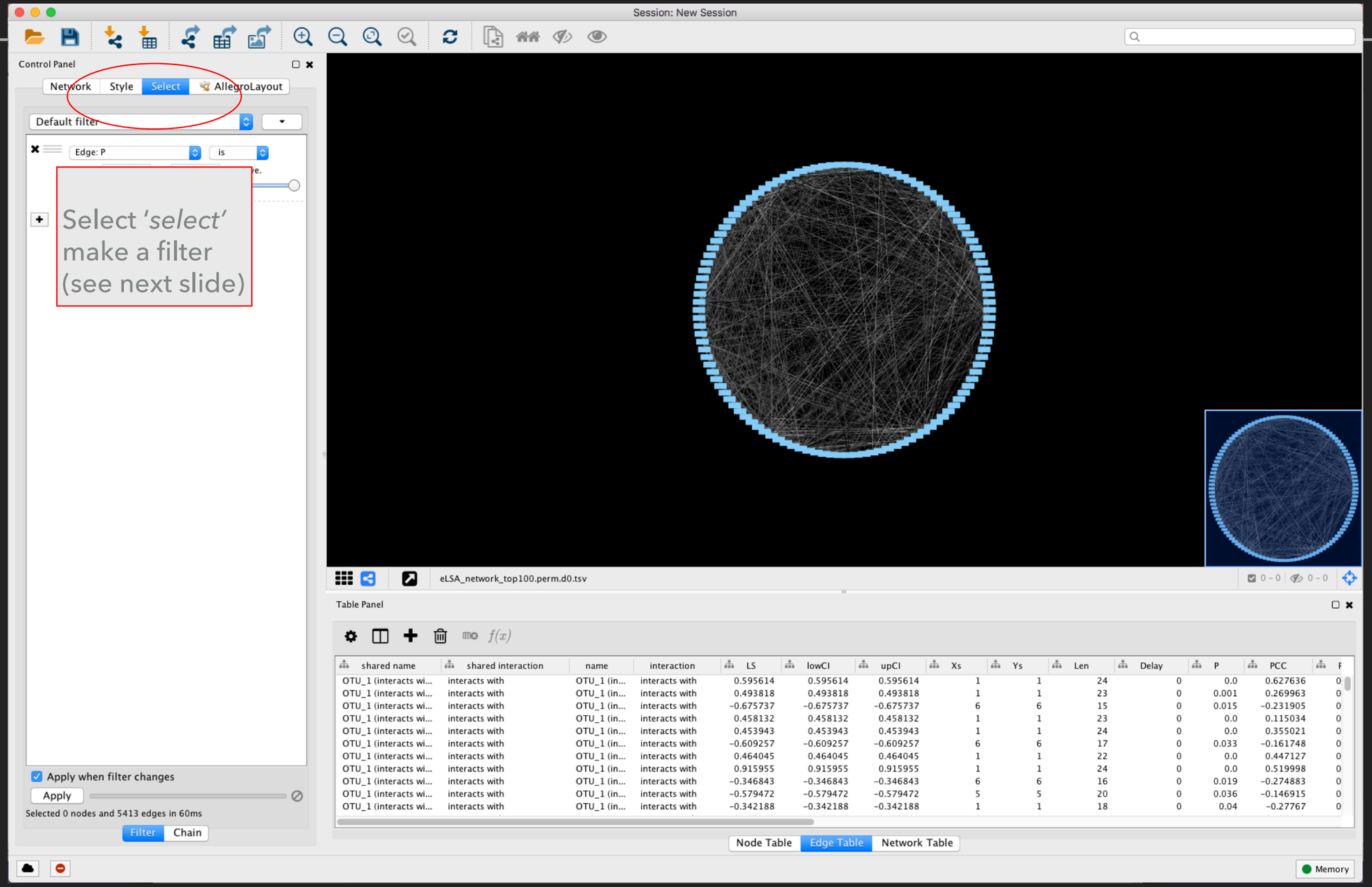




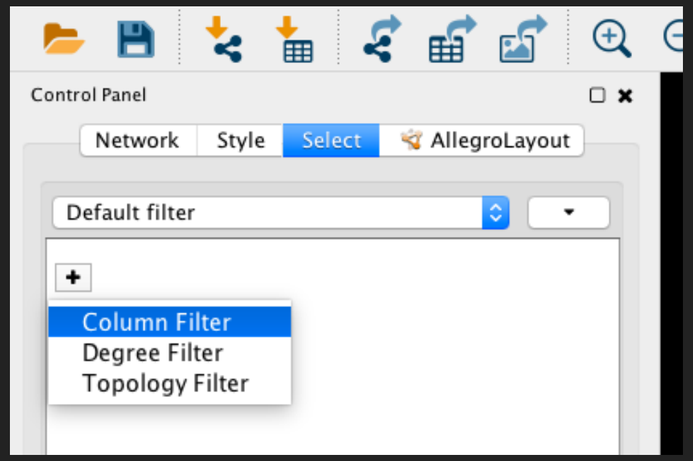


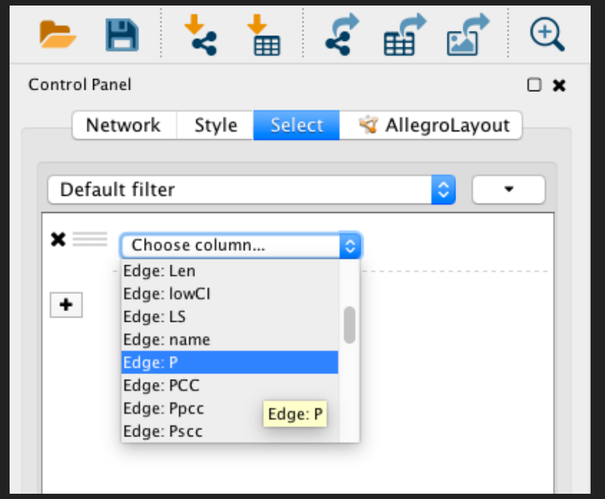
- number of nodes: 114
- number of edges: 6441
- This includes ALL possible connections between nodes.
- We have to remove edges e.g. based on P and Q value to get the significant associations

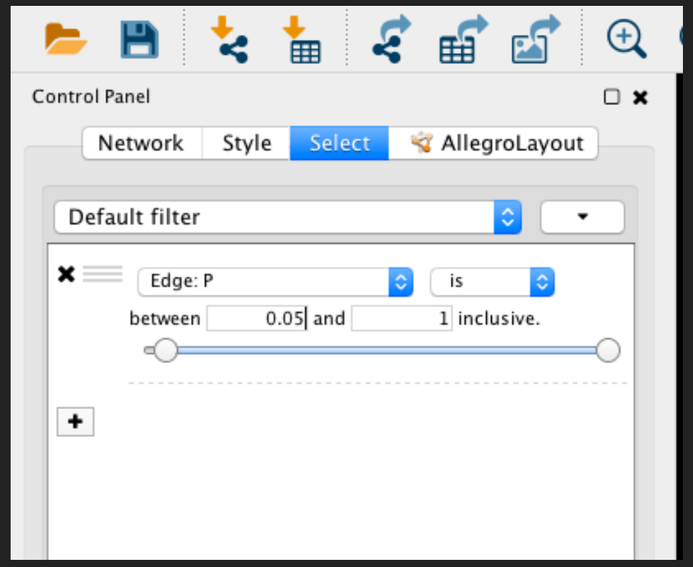

Session: New Session
Control Panel
Network
Style
Select
AllegroLayout
1 of 1 Network selected
eLSA_network_top100.perm.d0.tsv
1
eLSA_network_top100.perm.d0.tsv
114
6441
eLSA_network_top100.perm.d0.tsv
Table Panel
shared name
shared interaction
name
interaction
LS
lowCI
upCI
Xs
Ys
Len
Delay
P
PCC
OTU_1 (interacts wi...
interacts with
OTU_1 (in...
0.153863
-0.184389
-0.327914
0.487528
0.501251
-0.37838
-0.281177
-0.238633
-0.416301
0.801767
-0.121821
9
8
1
1
4
7
7
1
8
1
7
12
13
21
21
21
17
18
24
14
24
10
0
0.785
0.994
0.597
0.003
0.068
0.027
0.063
0.155
0.346
0.004
0.764
-0.106066
-0.168376
-0.162993
0.212294
-0.098955
-0.22254
-0.187045
-0.252386
-0.112801
0.57226
-0.2283
Node Table
Edge Table
Network Table
Memory

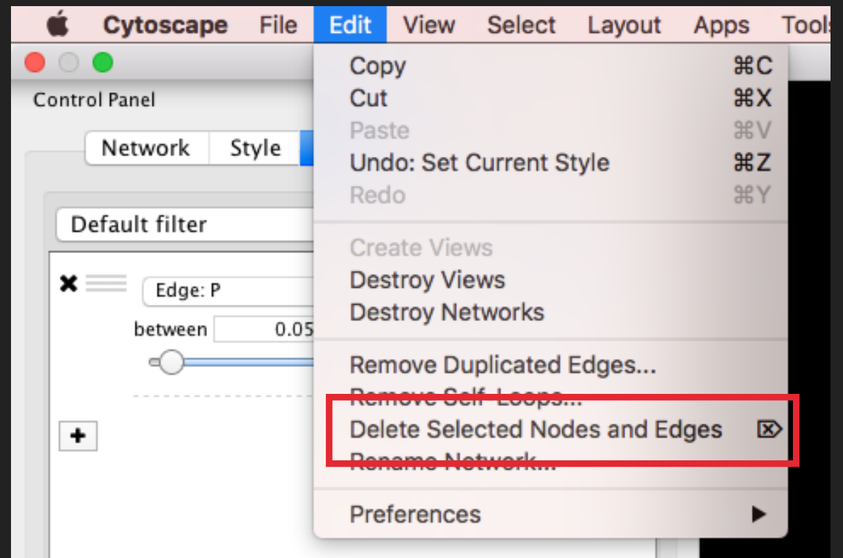

Session: New Session
Control Panel
Network
Style
Select
AllegroLayout
Default filter
Edge: P
is
Select 'select'
make a filter
(see next slide)
Apply when filter changes
Apply
Selected 0 nodes and 5413 edges in 60ms
Filter
Chain
eLSA_network_top100.perm.d0.tsv
Table Panel
shared name
shared interaction
name
interaction
LS
lowCI
upCI
Xs
Ys
Len
Delay
P
PCC
OTU_1 (interacts wi... interacts with OTU_1 (in... interacts with 0.595614 0.595614 0.595614 1 1 24 0 0.0 0.627636
OTU_1 (interacts wi... interacts with OTU_1 (in... interacts with 0.493818 0.493818 0.493818 1 1 23 0 0.001 0.269963
OTU_1 (interacts wi... interacts with OTU_1 (in... interacts with -0.675737 -0.675737 -0.675737 6 6 15 0 0.015 -0.231905
OTU_1 (interacts wi... interacts with OTU_1 (in... interacts with 0.458132 0.458132 0.458132 1 1 23 0 0.0 0.115034
OTU_1 (interacts wi... interacts with OTU_1 (in... interacts with 0.453943 0.453943 0.453943 1 1 24 0 0.0 0.355021
OTU_1 (interacts wi... interacts with OTU_1 (in... interacts with -0.609257 -0.609257 -0.609257 6 6 17 0 0.033 -0.161748
OTU_1 (interacts wi... interacts with OTU_1 (in... interacts with 0.464045 0.464045 0.464045 1 1 22 0 0.0 0.447127
OTU_1 (interacts wi... interacts with OTU_1 (in... interacts with 0.915955 0.915955 0.915955 1 1 24 0 0.0 0.519998
OTU_1 (interacts wi... interacts with OTU_1 (in... interacts with -0.346843 -0.346843 -0.346843 6 6 16 0 0.019 -0.274883
OTU_1 (interacts wi... interacts with OTU_1 (in... interacts with -0.579472 -0.579472 -0.579472 5 5 20 0 0.036 -0.146915
OTU_1 (interacts wi... interacts with OTU_1 (in... interacts with -0.342188 -0.342188 -0.342188 1 1 18 0 0.04 -0.27767
Node Table
Edge Table
Network Table
Memory

- Setting up a filter for P value (repeat for Q value)
  How many edges are left?

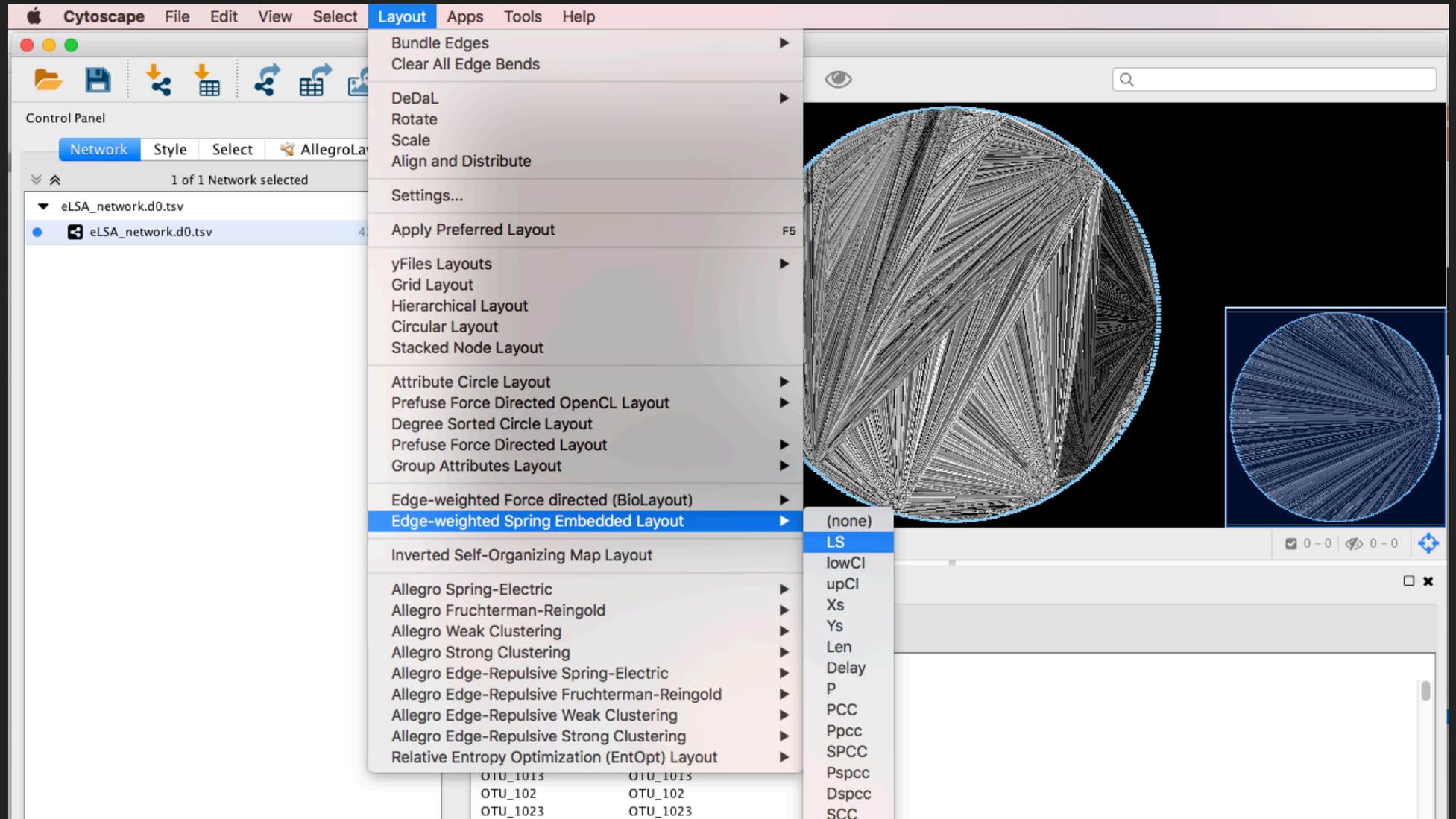




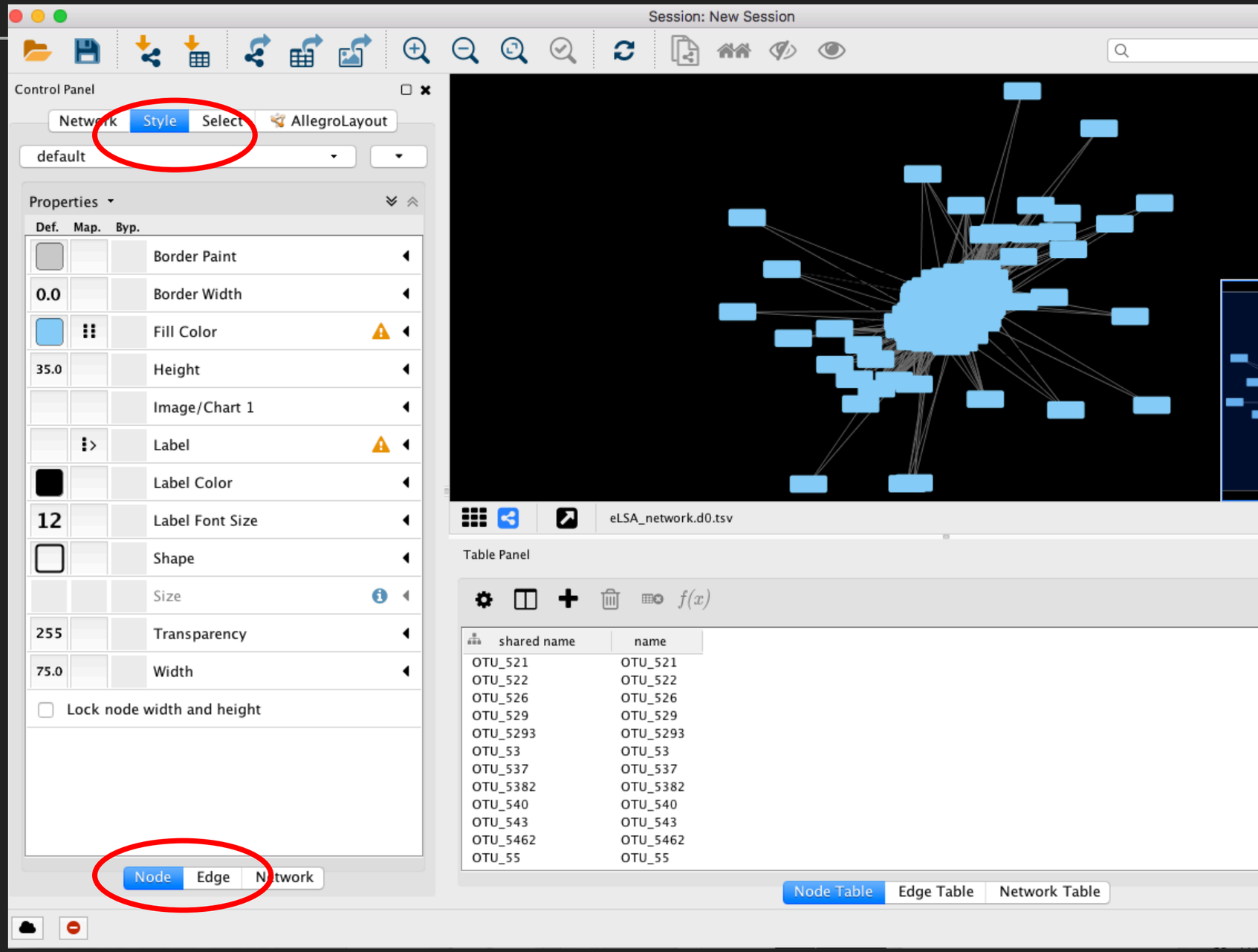




Choose a layout – Circular is fastest
Edge-weighted Spring Embedded Layout (LS) looks better☺



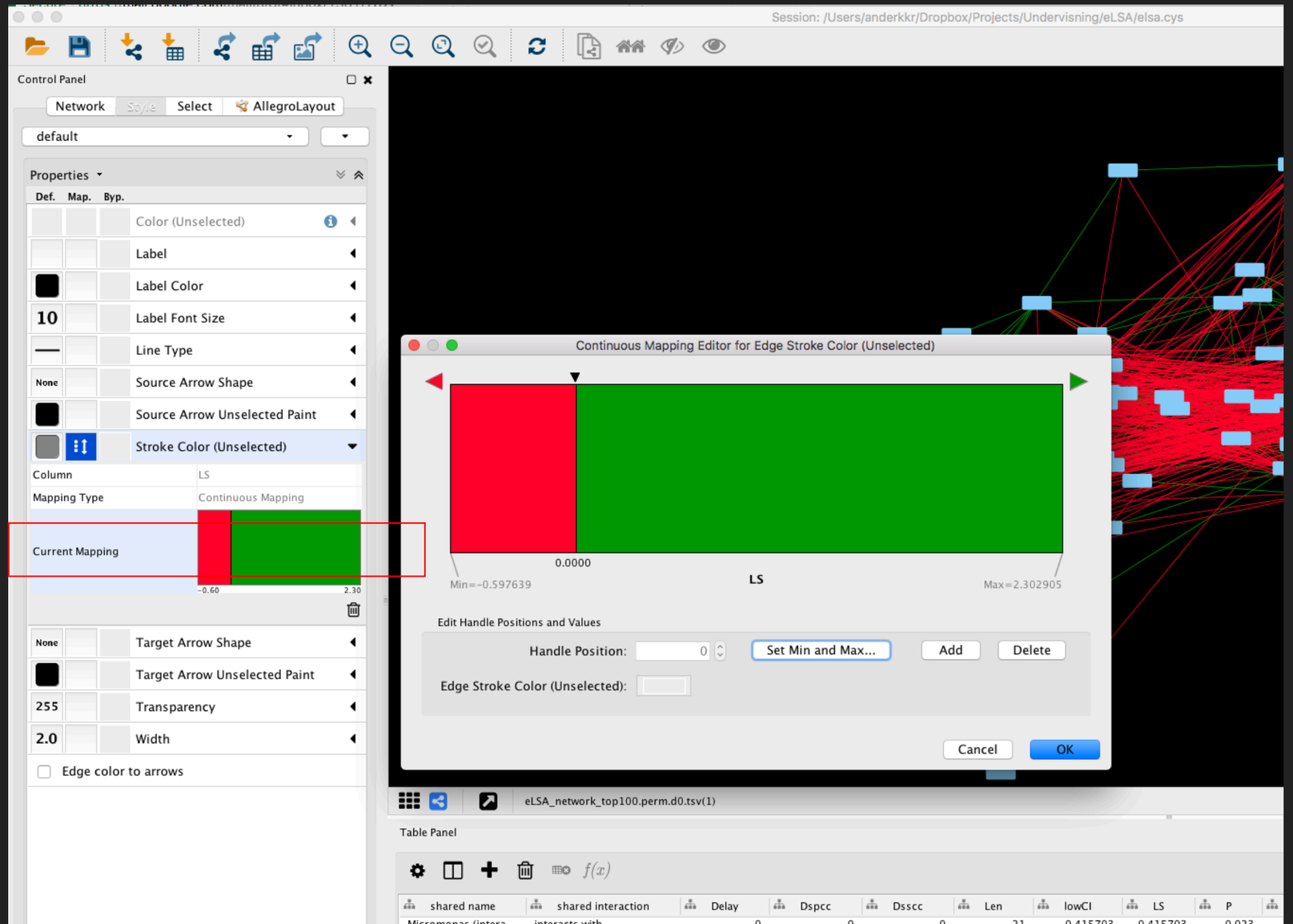
Now choose '*Style*' and then '*Edge*' to change the color of the edges



Use *Stroke Color* to make the positive edges green and the negative edges red

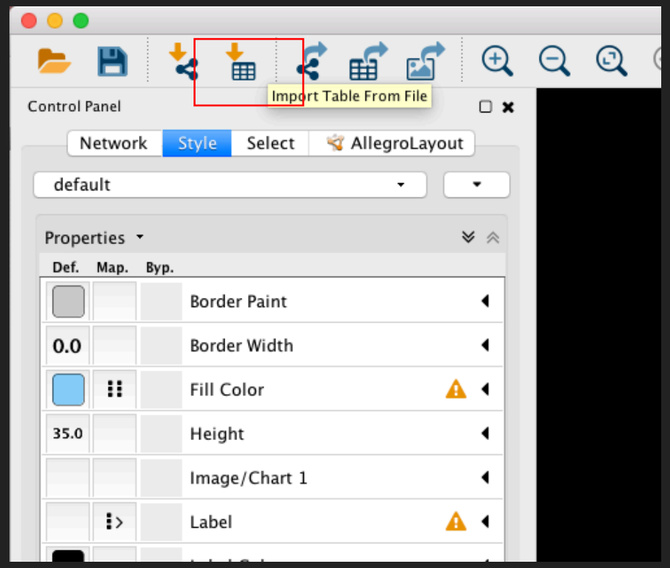
Column: LS

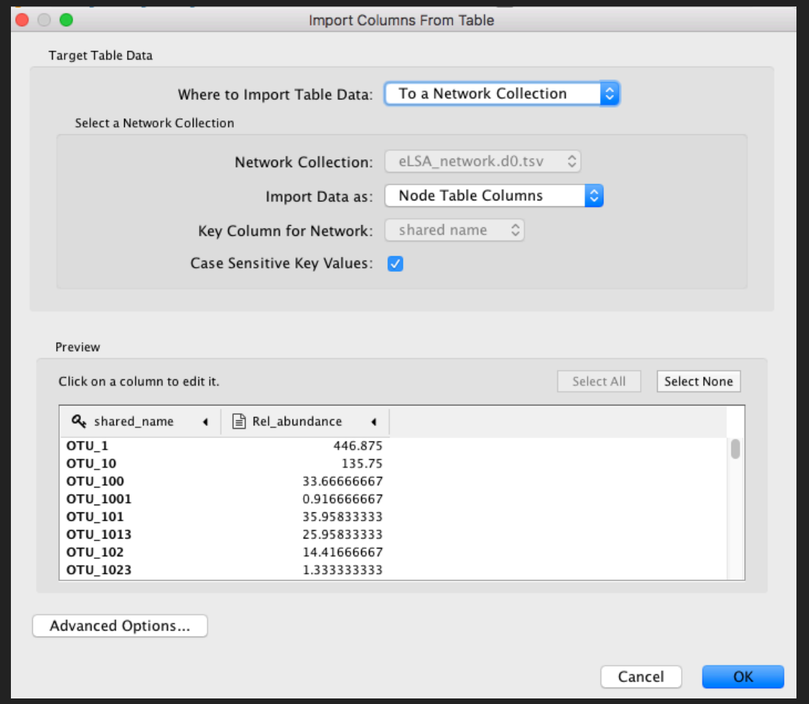
Mapping type: Continuous



ADD ANNOTATIONS TO THE NODES– IMPORT TABLE

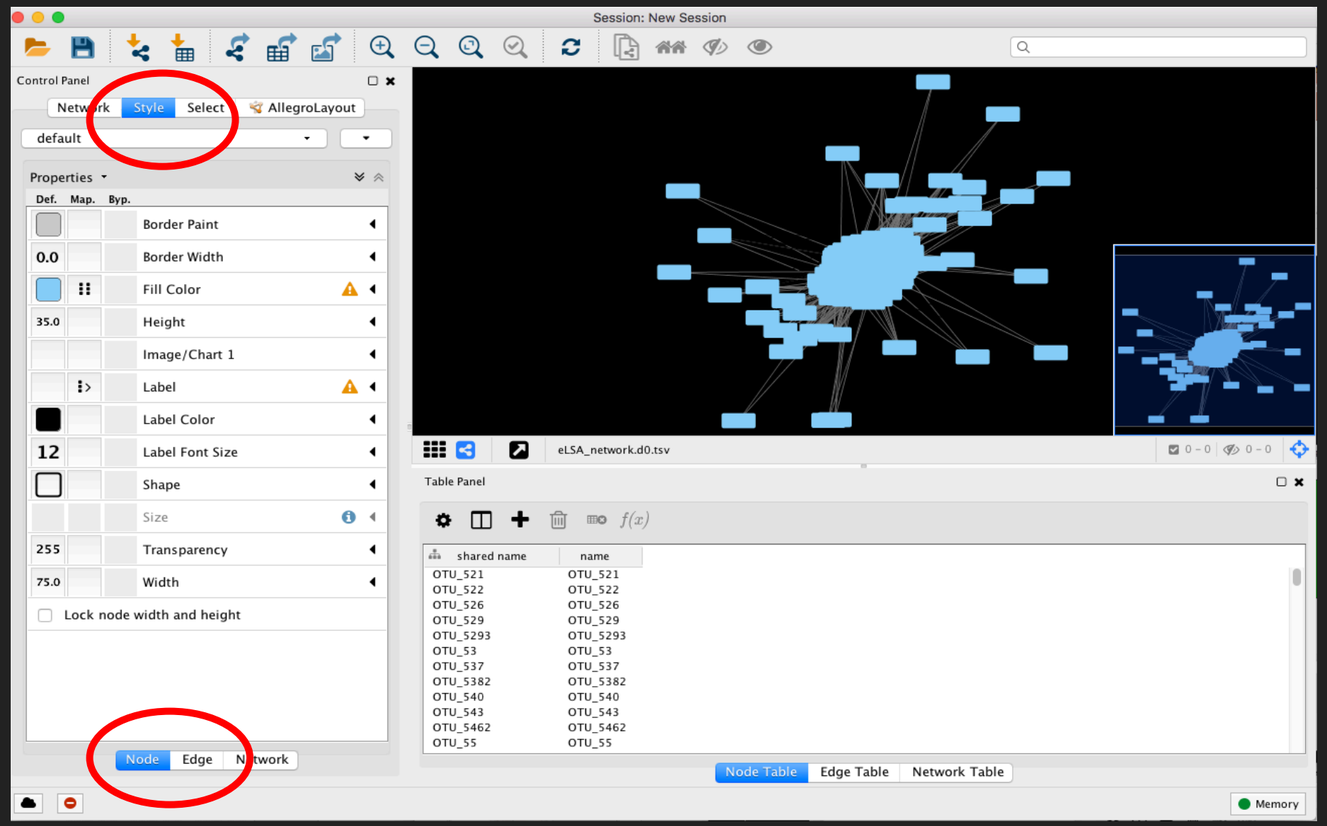
- Two annotation files:
  1) Relative abundance (eLSA_annotation_relabund.tsv)
  2) Taxonomic assignment (blastn vs MAS from UParse pipeline)



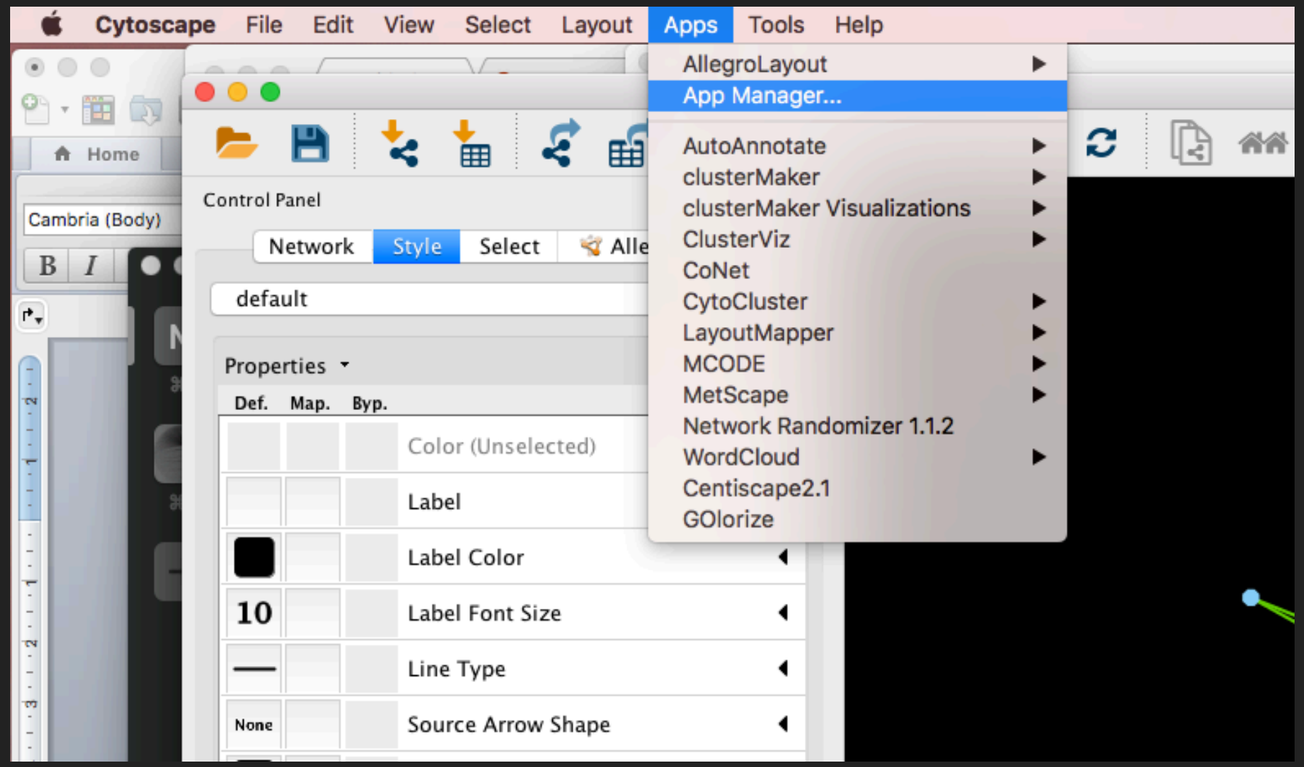


- Change the name, shape, color and/or size of the nodes based on the relative abundance and the taxonomic assignment of the OTUs

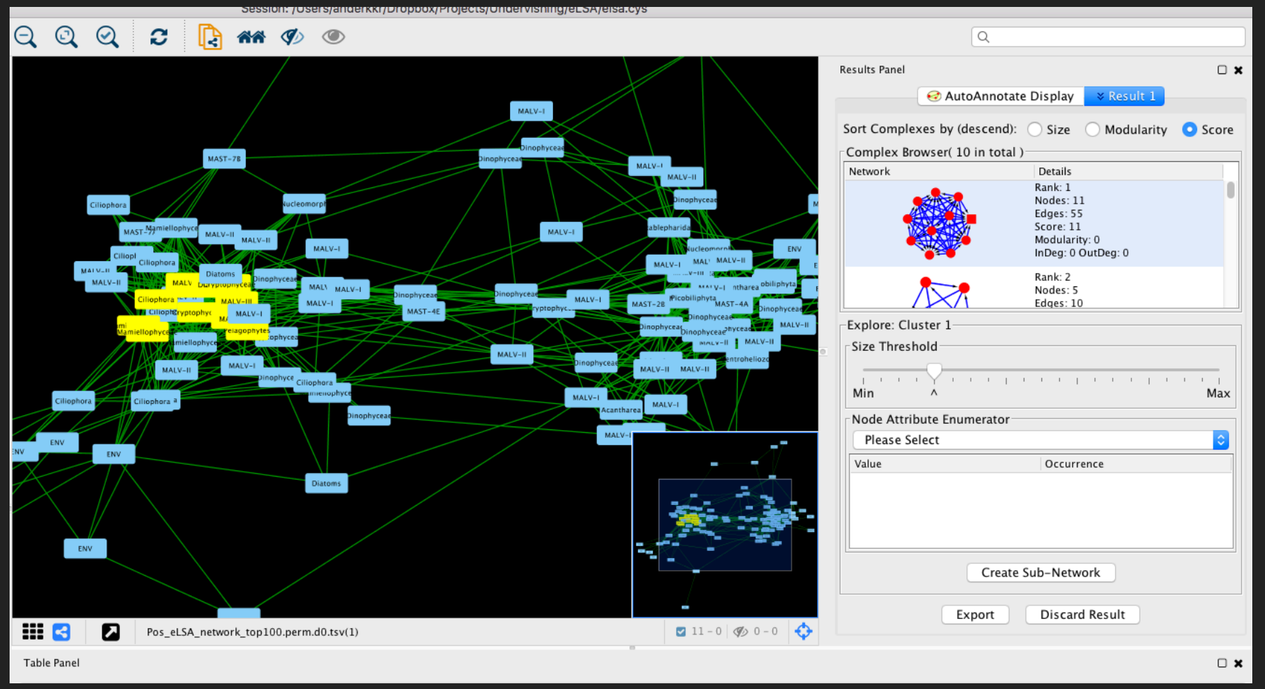
Choose '*select*'
and then '*node*' to change
the color, shape etc of the nodes



- Searching for **Modules**:
- Install **ClusterViz** from the App Manager



- Searching for **Modules**:
- (Save your project before moving on, just in case)
- Remove the negative edges, then search for Modules using **MCODE** in the **ClusterViz** App.



- Searching for Hubs (species that are highly connected, or have a high Degree). MCODE added the Degree for each node to the Node table.