



# OmicNet Tutorial: Starting from three lists of molecules

# Computer Requirement

- Modern browser supporting **WebGL**
- Chrome 50+, Firefox 47+, Safari 10.1+ and Edge 12+
- Please make sure WebGL is enabled in your browser
  - Please consult this web page to verify: <https://get.webgl.org/>
- If not enabled, please consult our **FAQ** page for instructions
- For best performance and visualization, use:
  - Latest version of **Google Chrome**
- A modern computer with at least 4GB of physical RAM
- A 15-inch screen or bigger (larger is better)
- Retina Display is supported

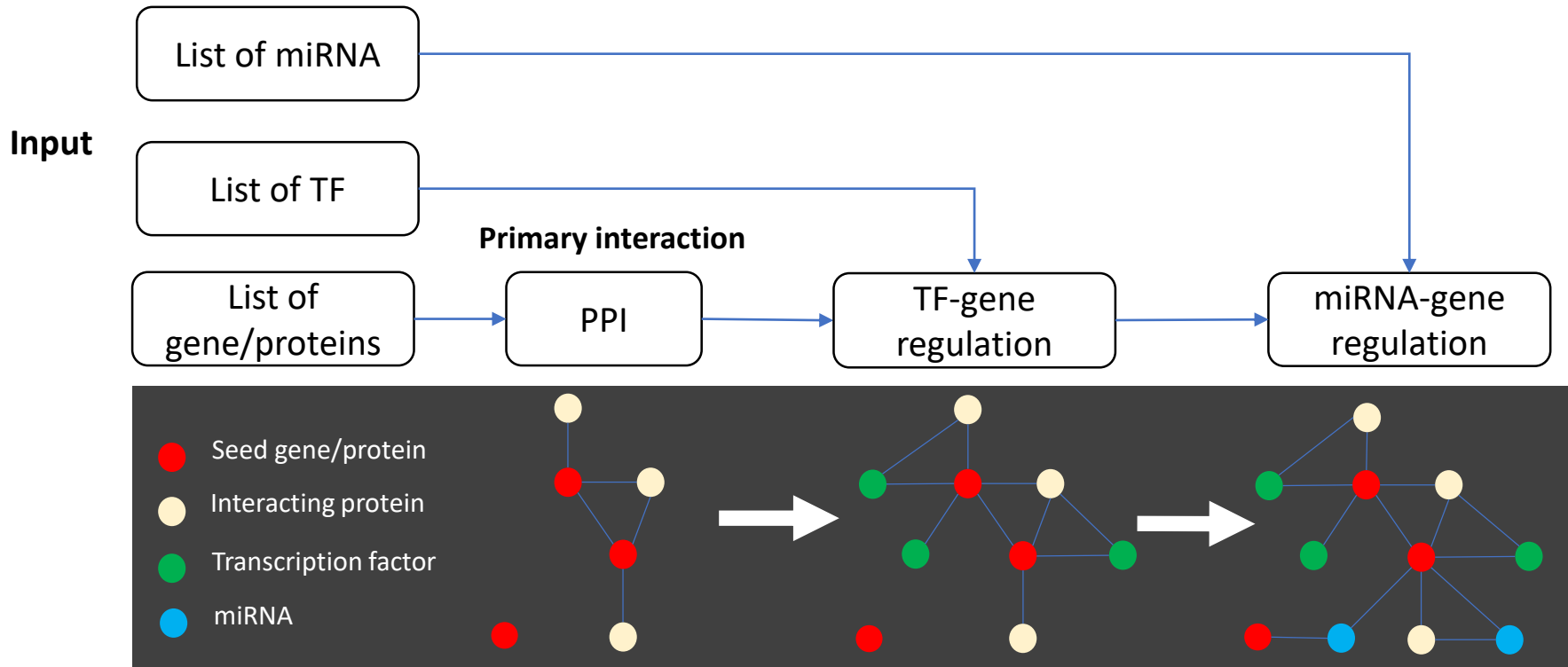
# Motivation

- Explore the interacting relationships between a list of gene/proteins with two other lists of molecules.
- Build composite network to visualize and analyze.
- Approach:
  - Build PPI interaction network from list of gene/proteins and expand it into a composite network.

# Network Building Rules

- Primary interaction network is composed of seeds and its immediate interacting partners.
- Secondary and tertiary interaction will query for interactions against gene/proteins contained in the primary network.
  - **Add edges** : PPI as secondary or tertiary interaction will add edges to existing gene/proteins in the network
  - **Add nodes and edges**: All other interaction types
- If more than one input list is uploaded, the input list of secondary and tertiary interaction will serve as a constraint to limit the search space.

# Case: Build TF and miRNA co-regulatory network



This procedure identifies which TFs and miRNAs from input lists interact with **BOTH** seed proteins and its direct interacting proteins.

- It could expand the primary network to include previously unconnected seed gene/protein

# Network Builder

**Omics Net**

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OK Welcome! Please use the central panel to create your network.

### Network Building

By default, PPI will be selected for gene input, MPI for metabolites, MGI for miRNAs, and TGI for TFs. To build composite network containing more than one type of interactions, use numbers (1, 2, 3) to indicate the orders.

- If PPI is not the primary interaction, only edges will be added
- Duplicate numbers are not permitted

Orders	Interaction Types	Databases
1	Protein-protein interactions (PPI)	<input checked="" type="radio"/> <b>InnateDB</b> Manually curated comprehensive PPI (human/mouse) <input type="radio"/> <b>IntAct</b> Manually curated experimentally validated PPI <input type="radio"/> <b>STRING</b> Comprehensive PPI containing both known and predicted PPI ( <a href="#">set parameters</a> )
3	miRNA-gene interactions (MGI)	<input checked="" type="radio"/> <b>miRNet</b> Experimentally-validated miRNA targets information based on TarBase and miRTarBase
--	Metabolite-protein interactions (MPI)	<input type="radio"/> <b>KEGG</b> Metabolite-protein interaction data based on KEGG reactions <input type="radio"/> <b>Recon2</b> High-quality genome-scale metabolic reconstruction (human)
2	TF-gene interactions (TGI)	<input checked="" type="radio"/> <b>TRRUST</b> TF-gene interactions constructed using text mining, followed by manual curation <input type="radio"/> <b>ENCODE</b> TF-gene interactions derived from ENCODE CHIP-seq data <input type="radio"/> <b>JASPAR</b> TF-gene interactions derived from transcription factor binding profiles

Submit

Network Tools

Network Result

Type	Size
Gene List	48
TF List	6
miRNA List	6
Metabolite List	0

Networks Nodes Edges Seeds

No records found.

Previous Proceed

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**Callouts:**

- Set PPI as primary interaction and select STRING database
- Set miRNA as secondary interaction
- Set TF as tertiary interaction and select ENCODE database
- Click on "Submit" to generate the network

# Network Building Options

The screenshot shows the Omics Net Network Builder interface. The main window is titled 'Network Building' and contains instructions and a table of interaction types. A dialog box titled 'Network Building Options' is open, prompting the user to select an approach to expand the primary PPI network. The dialog box contains a table with three options: 'Target primary seed nodes only', 'Target primary seed nodes and other nodes', and 'Target any nodes in primary network'. The 'Target any nodes in primary network' option is selected. A callout box points to this option with the text: 'Select "Consider all nodes" option to show all TFs/miRNAs having targets in our primary PPI network.'

**Omics Net**

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Network Builder

### Network Building

By default, PPI will be selected for gene input, MPI for metabolites, MGI for miRNAs, and TGI for TFs. To build composite network containing more than one type of interactions, use numbers (1, 2, 3) to indicate the orders.

- If PPI is not the primary interaction, only edges will be added
- Duplicate numbers are not permitted

Orders	Interaction Types	Source	Quality
1	Protein-protein interactions (PPI)	<input checked="" type="radio"/> InnateDB <input type="radio"/> IntAct <input type="radio"/> STRING	Manually curated Manually curated Comprehensive
3	miRNA-gene interactions (MGI)	<input checked="" type="radio"/> miRNet	Experimental
--	Metabolite-protein interactions (MPI)	<input type="radio"/> KEGG <input type="radio"/> Recon2	Metabolite High-quality
2	TF-gene interactions (TGI)	<input checked="" type="radio"/> TRRUST <input type="radio"/> ENCODE <input type="radio"/> JASPAR	TF-gene interaction TF-gene interaction TF-gene interaction

#### Network Building Options

Select an approach to expand the primary PPI network

Option	Details	Notes
<input type="radio"/> Target primary seed nodes only	Add interactors from your <b>uploaded list</b> that target seed nodes in primary network, do not consider non-seed nodes.	You can see your miRNAs/TFs/metabolites of interest that interact <u>only</u> with your genes of interest.
<input type="radio"/> Target primary seed nodes and other nodes	Add interactors from your <b>uploaded list</b> that target <u>both</u> seed nodes and other nodes in primary network (i.e. add edges targeting non-seeds).	You can view your miRNAs/TFs/metabolites of interest that interact with <u>both</u> your genes of interest and other genes in the network.
<input checked="" type="radio"/> Target any nodes in primary network	Add interactors from your <b>uploaded list</b> that target any nodes in the primary network.	You can view your miRNAs/TFs/metabolites of interest that interact with <u>any</u> genes in the primary network.

Proceed

#### Input Summary

Type	Size
Gene List	48
TF List	6
miRNA List	6
Metabolite List	0

Network Tools

Network Result

**Primary:** Protein-protein (InnateDB)  
**Secondary:** TF-gene (TRRUST)  
**Tertiary:** miRNA-gene (mirNet)

The current selection will be displayed by default.

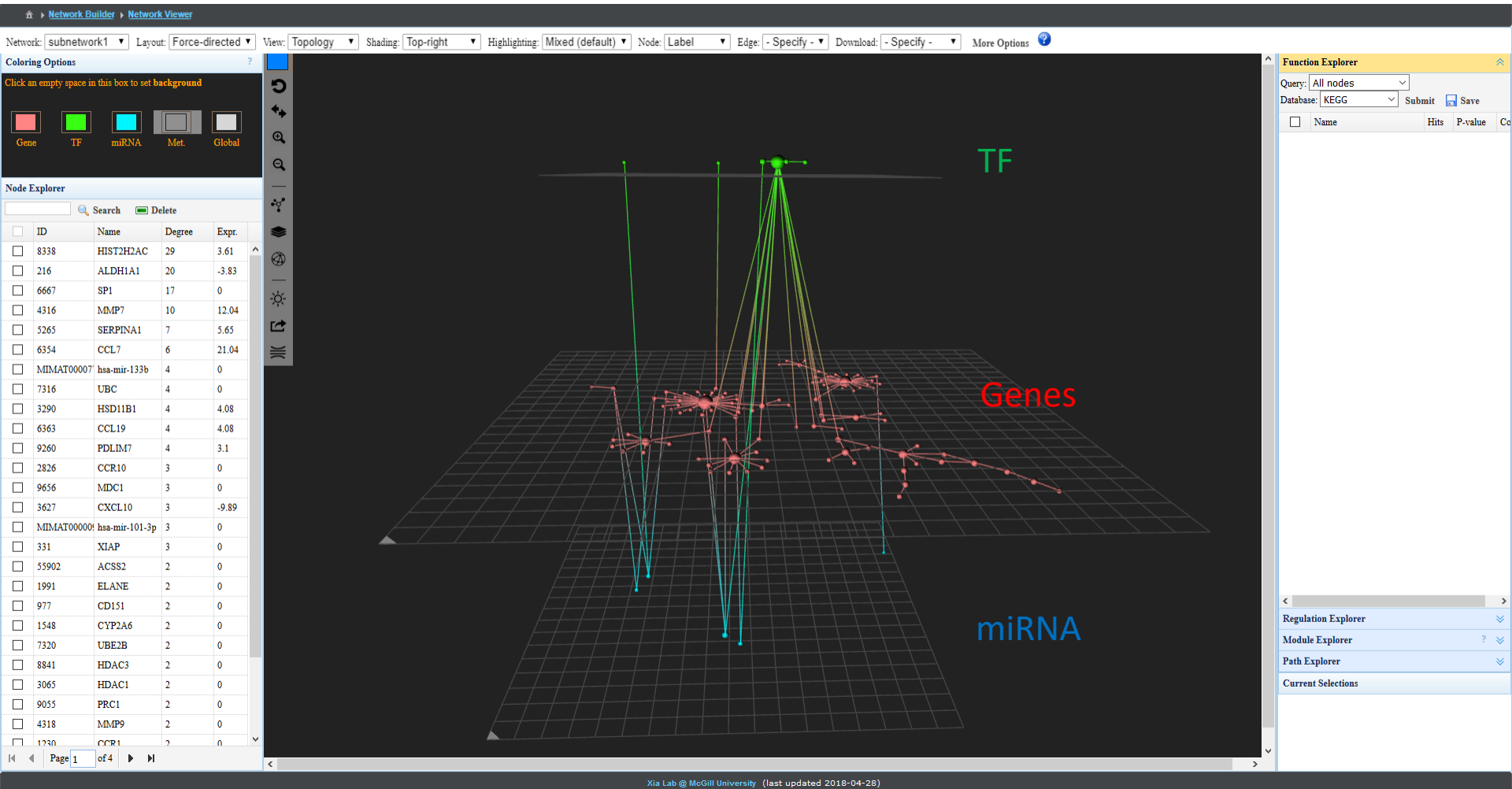
	Networks	Nodes	Edges	Seeds
<input checked="" type="radio"/>	subnetwork1	446	567	50
<input type="radio"/>	subnetwork2	3	2	1
<input type="radio"/>	subnetwork3	3	2	1

Proceed

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# Network Visualization



2D perspective layout



The End

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