Master Module Proteinbiochemistry and Bioinformatics December 2024

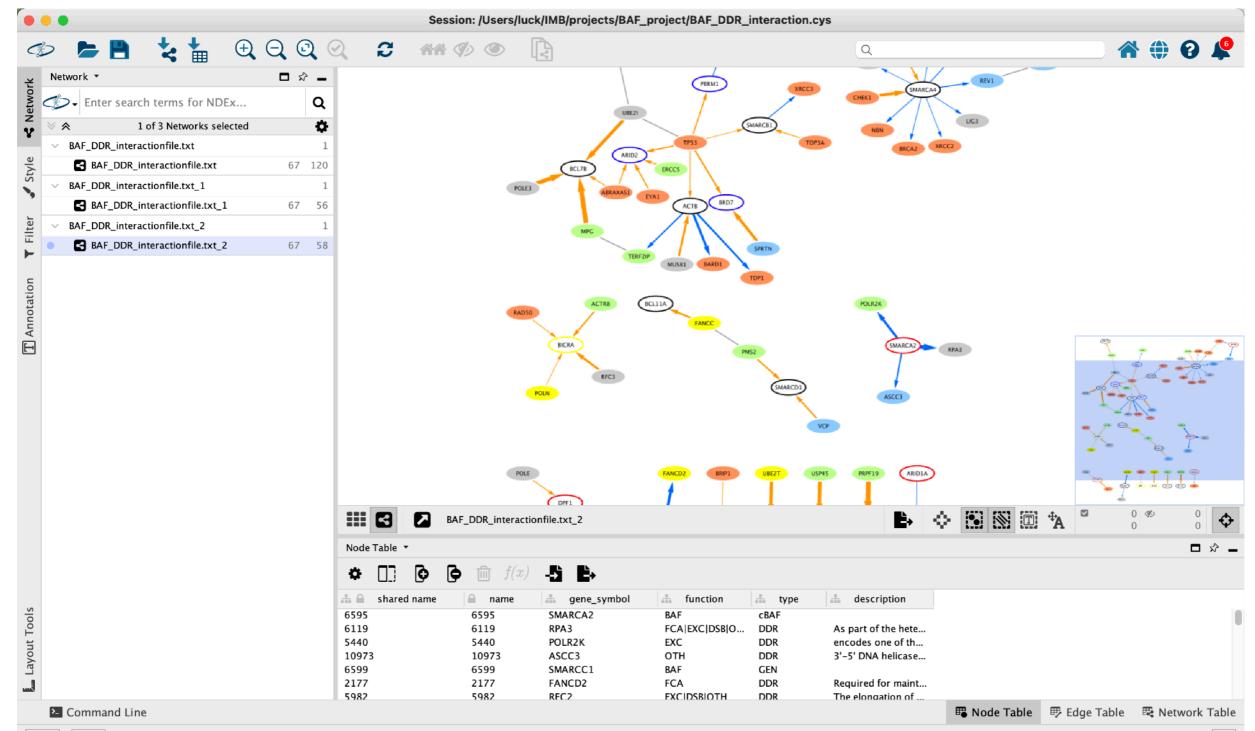
Session: Protein interaction networks

5. Visualizing and analyzing networks using Cytoscape

Introduction into Cytoscape

Software to:

- explore a set of genes with protein interaction data
- analyze and visualize network data



Introduction into Cytoscape

Example data:

Evidence for 28 genetic disorders discovered by combining healthcare and research data

Denovo mutations in protein-coding genes are a well-established cause of developmental disorders¹. However, genes known to be associated with developmental disorders account for only a minority of the observed excess of such de novo mutations^{1,2}. Here, to identify previously undescribed genes associated with developmental disorders, we integrate healthcare and research exome-sequence data from 31,058 parentoffspring trios of individuals with developmental disorders, and develop a simulationbased statistical test to identify gene-specific enrichment of de novo mutations. We identified 285 genes that were significantly associated with developmental disorders, including 28 that had not previously been robustly associated with developmental disorders. Although we detected more genes associated with developmental disorders, much of the excess of de novo mutations in protein-coding genes remains unaccounted for. Modelling suggests that more than 1,000 genes associated with developmental disorders have not yet been described, many of which are likely to be less penetrant than the currently known genes. Research access to clinical diagnostic datasets will be critical for completing the map of genes associated with developmental disorders.

What is the relationship between these genes?

In which processes are they involved?

Which genes to focus on for downstream studies?

Kaplanis et al Nature 2020

Introduction into Cytoscape

What you need on your computer:

- Cytoscape
- Cytoscape_tasks.txt
- STRING_interactions_Kaplanis_285.tsv
- Kaplanis_28_genes_annotated.txt
- GTEx_tissue_expression_Kaplanis_genes_285.tsv

What's the plan?

- Quick Cytoscape tour by lecturer (~10 minutes)
- Network visualization and exploration on your own following some guidance provided in file Cytoscape_tasks.txt (60 minutes)