Network analysis and visualization with Cytoscape and STRING

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Overview

Introduction
- Network analysis in biology
- Types of biological networks
- Protein-protein interaction networks
- Building and analysing PPINs

Practice
- Getting familiar with the STRING database

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Network analysis in biology

- Biological systems are often represented as networks which are complex sets of binary interactions or relations between different entities;
- **Systems biology** aims to understand biological entities at the systemic level, analysing them not only as individual components, but also as **interacting systems** and their emergent properties;
- **Network biology** which allows the representation and analysis of biological systems using tools derived from graph theory.

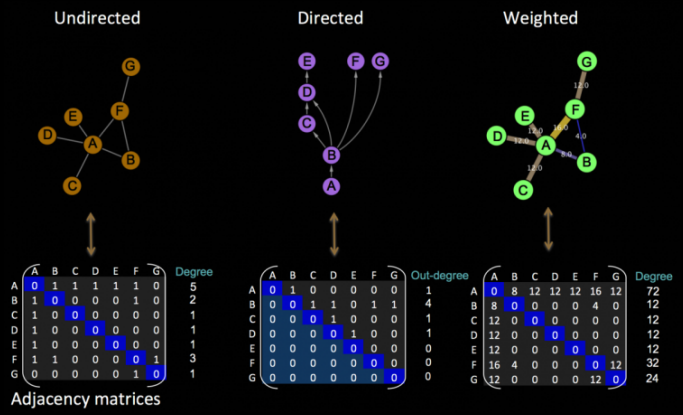


Figure: Example of molecular network types and its respective matrices.

Adapted from [Millan, 2011]

Types of biological networks

- Protein-protein interaction networks
- Metabolic networks
- Genetic interaction networks
- Gene / transcriptional regulatory networks
- Cell signalling networks

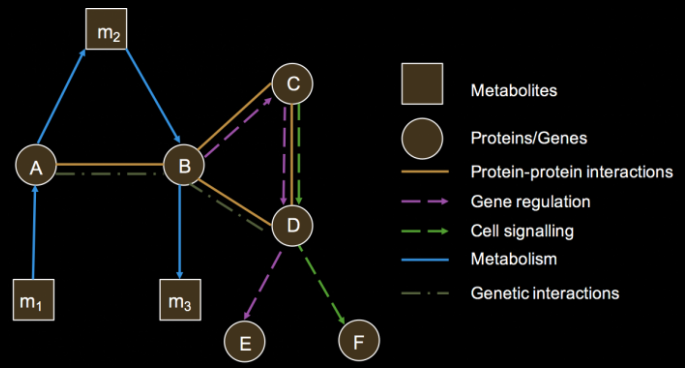


Figure: Example of molecular network[Dr. Natasa Przulj].

Adapted from [Millan, 2011]

Protein-protein interaction networks

Protein-protein interactions (PPIs) are essential to almost every process in a cell, so understanding PPIs is crucial for understanding cell physiology in normal and disease states. It is also essential in drug development, since drugs can affect PPIs.
Protein-protein interaction networks (PPIN) are mathematical representations of the physical contacts between proteins in the cell. These contacts:

- are specific;
- occur between defined binding regions in the proteins;
- and have a particular biological meaning.

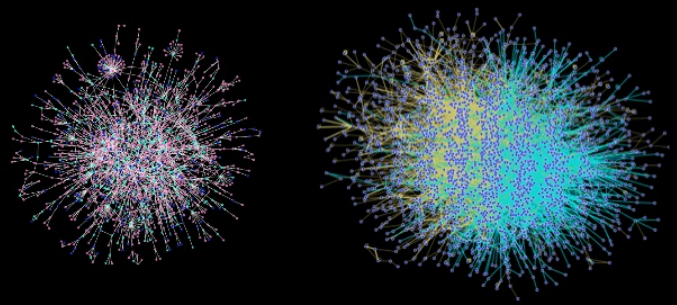


Figure: Yeast and human interactomes[Jeong et al., 2001][Rual et al., 2005].

Adapted from [Millan, 2011]

Building and analysing PPINs

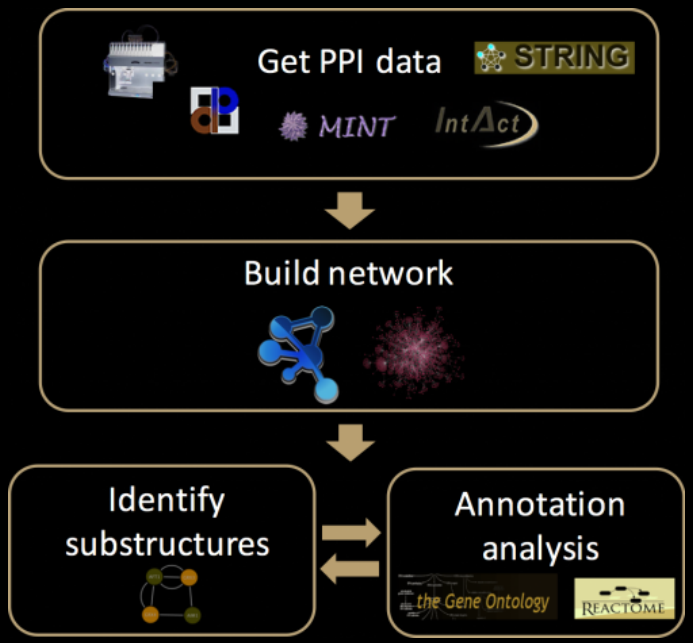


Figure: A potential workflow for building and analysing protein-protein interaction networks.

Adapted from [Millan, 2011]

Getting familiar with the STRING database

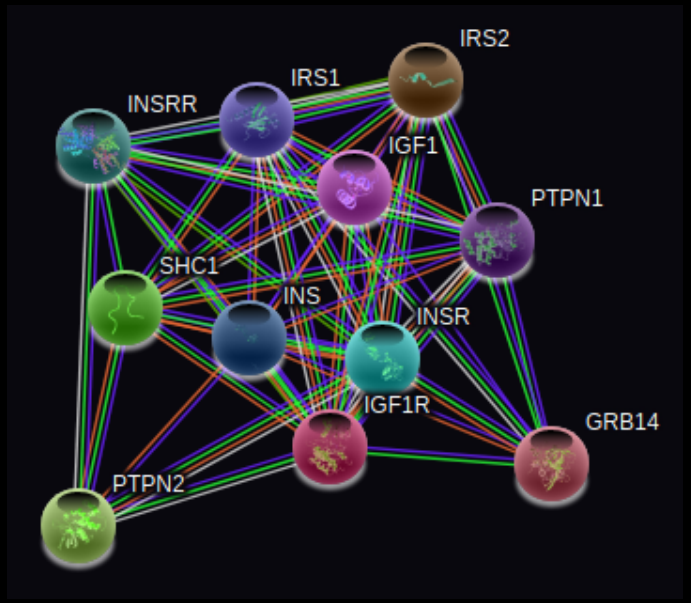
Basic Exercises – STRING database

- ex 1 – 4

Advanced Exercises – STRINGapp for Cytoscape

- ex 5 – 8

STRING [Doncheva et al., 2018]



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Tecnologia e ciência se encontram aqui

Oferecemos uma vasta gama de serviços especializados em consultoria e análise de dados biológicos. Auxiliamos na extração e interpretação de resultados obtidos a partir de dados biológicos gerados por tecnologias de Nova Geração.

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Dr. Natasa Przulj

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