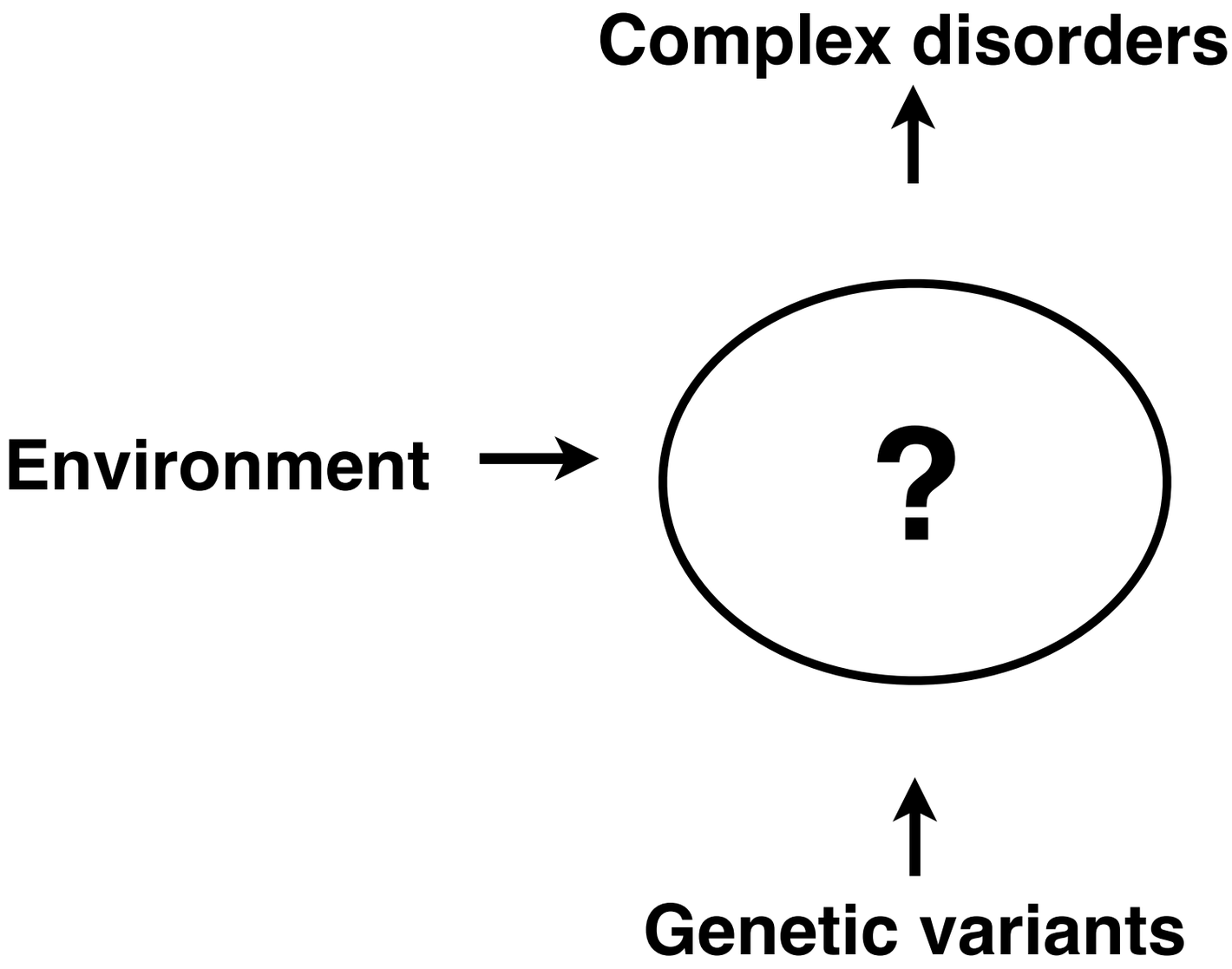
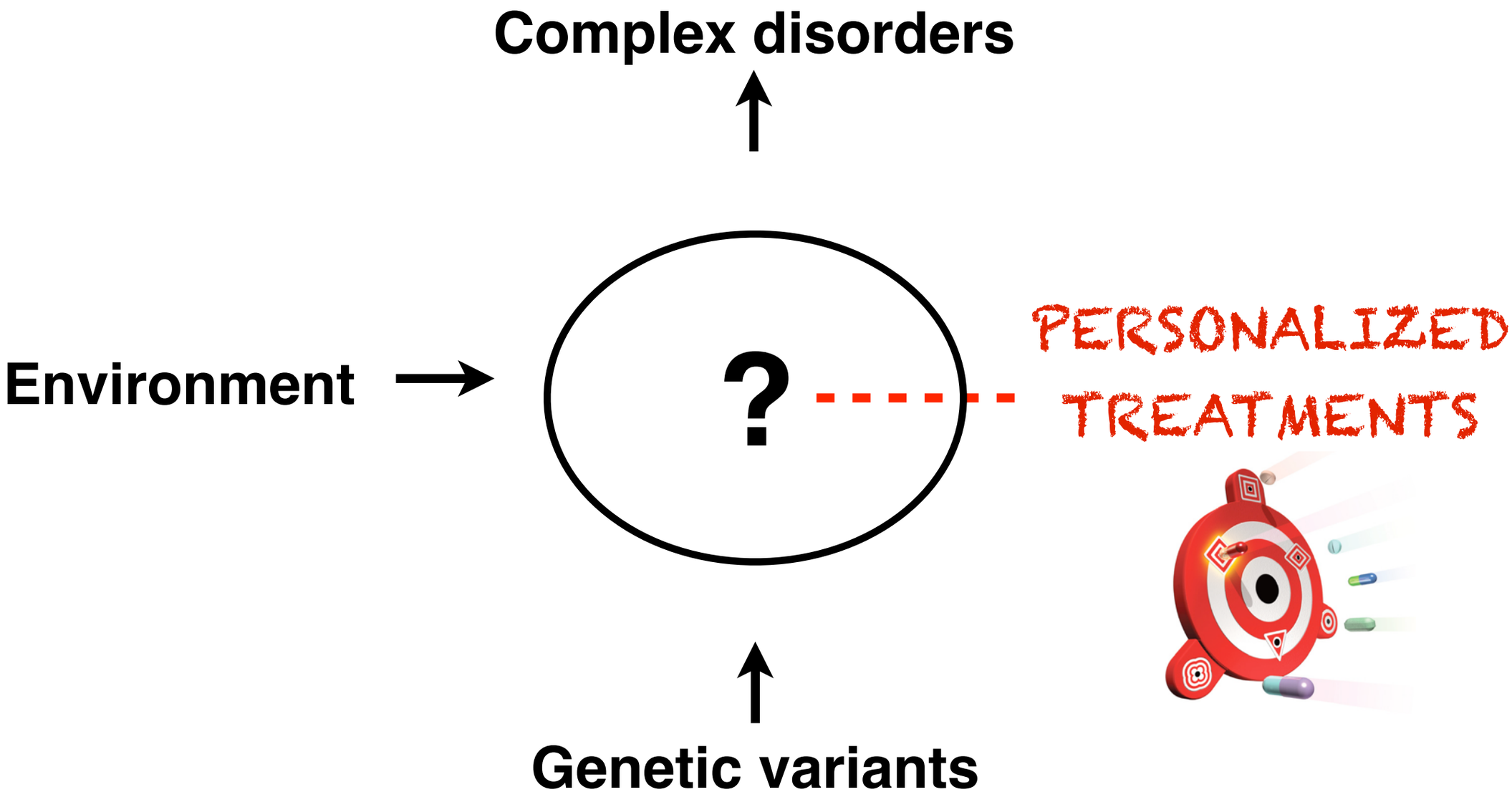
The Facebook of genes: community detection in biological networks

Daniel Marbach

Motivation



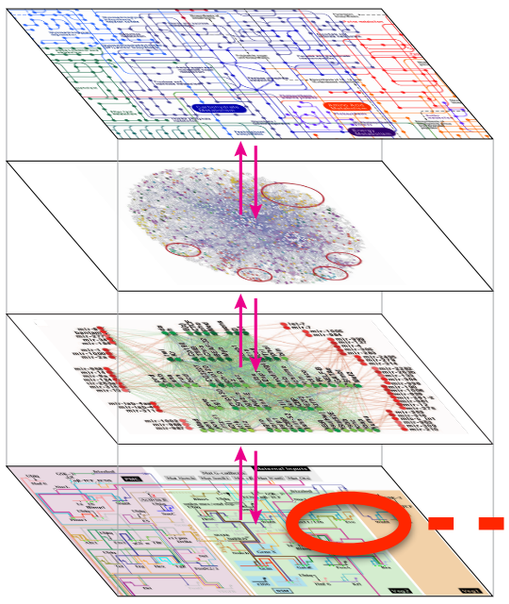
Motivation


Complex disorders
Environment
?
PERSONALIZED
TREATMENTS
Genetic variants

Motivation

Complex disorders

Environment →



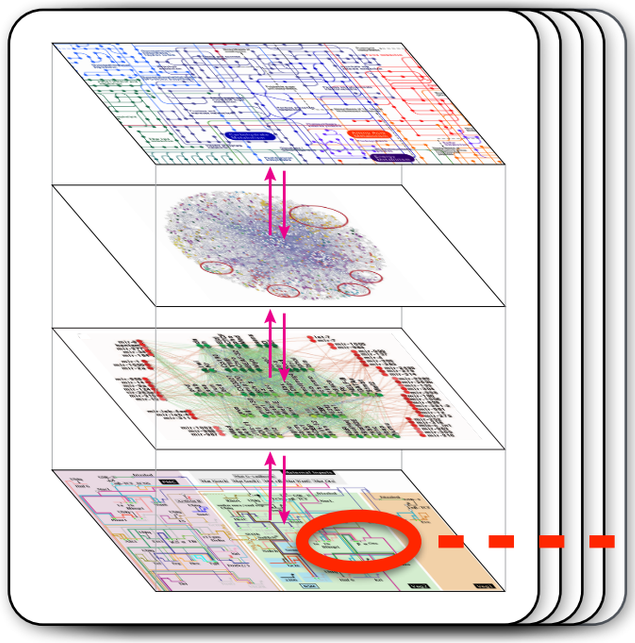
PERSONALIZED TREATMENTS

Genetic variants

Motivation

Complex disorders

Environment →

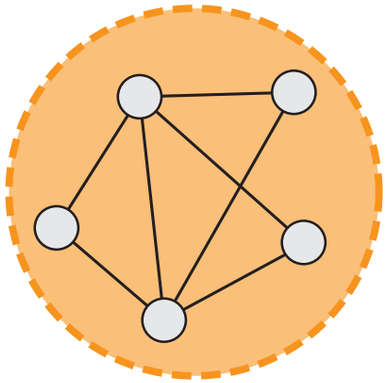


TISSUE-SPECIFIC NETWORKS

PERSONALIZED TREATMENTS

Genetic variants

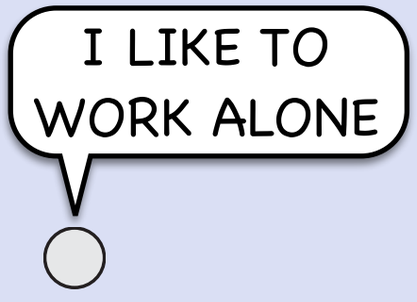
Biological pathways / modules



Group of functionally related molecules
(genes, proteins, metabolites, …)

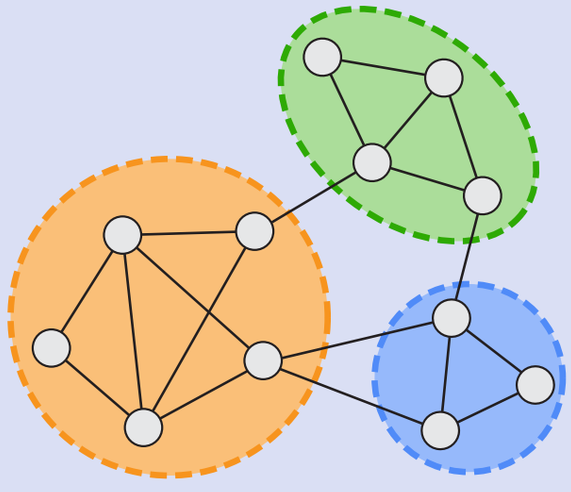
Mendelian traits

- Single gene
- Rare

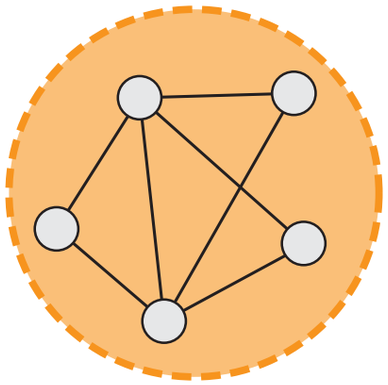


Complex traits

- Multiple genes
- Common



Biological pathways / modules



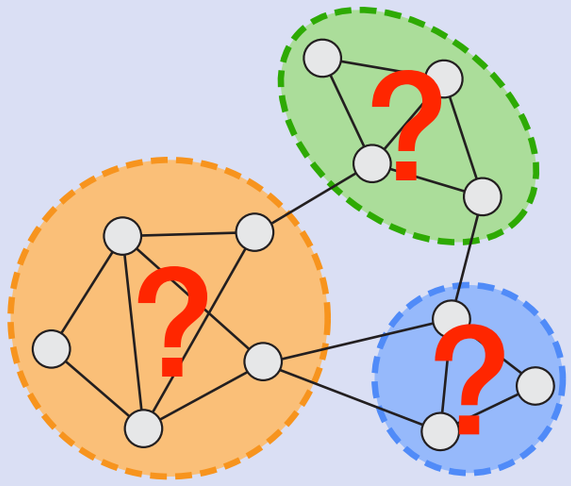
Group of functionally related molecules
(genes, proteins, metabolites, …)

Omics data

Pathway analysis

Complex traits

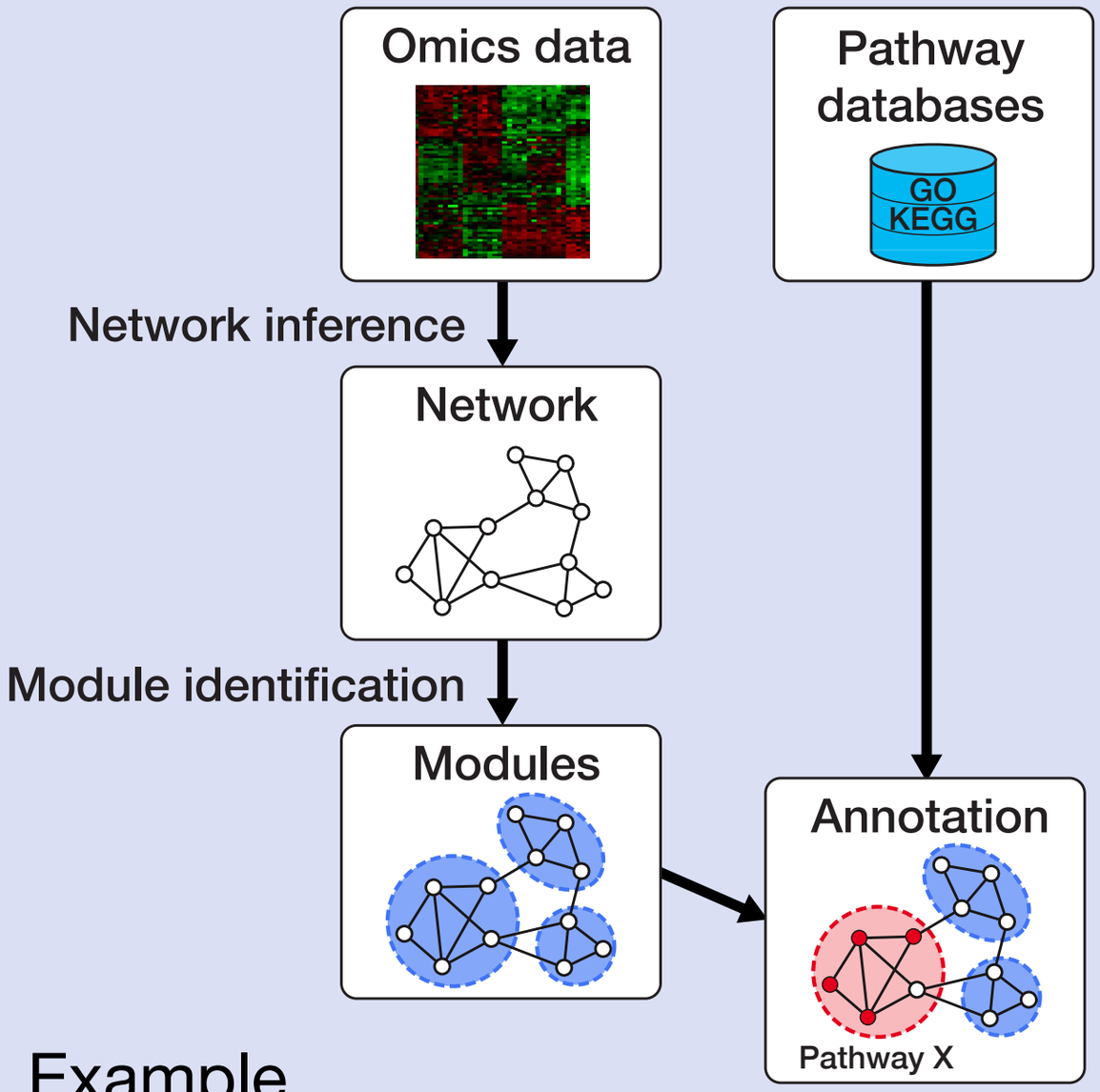
- Multiple genes
- Common



What are the pathways involved in my process/disease of interest?

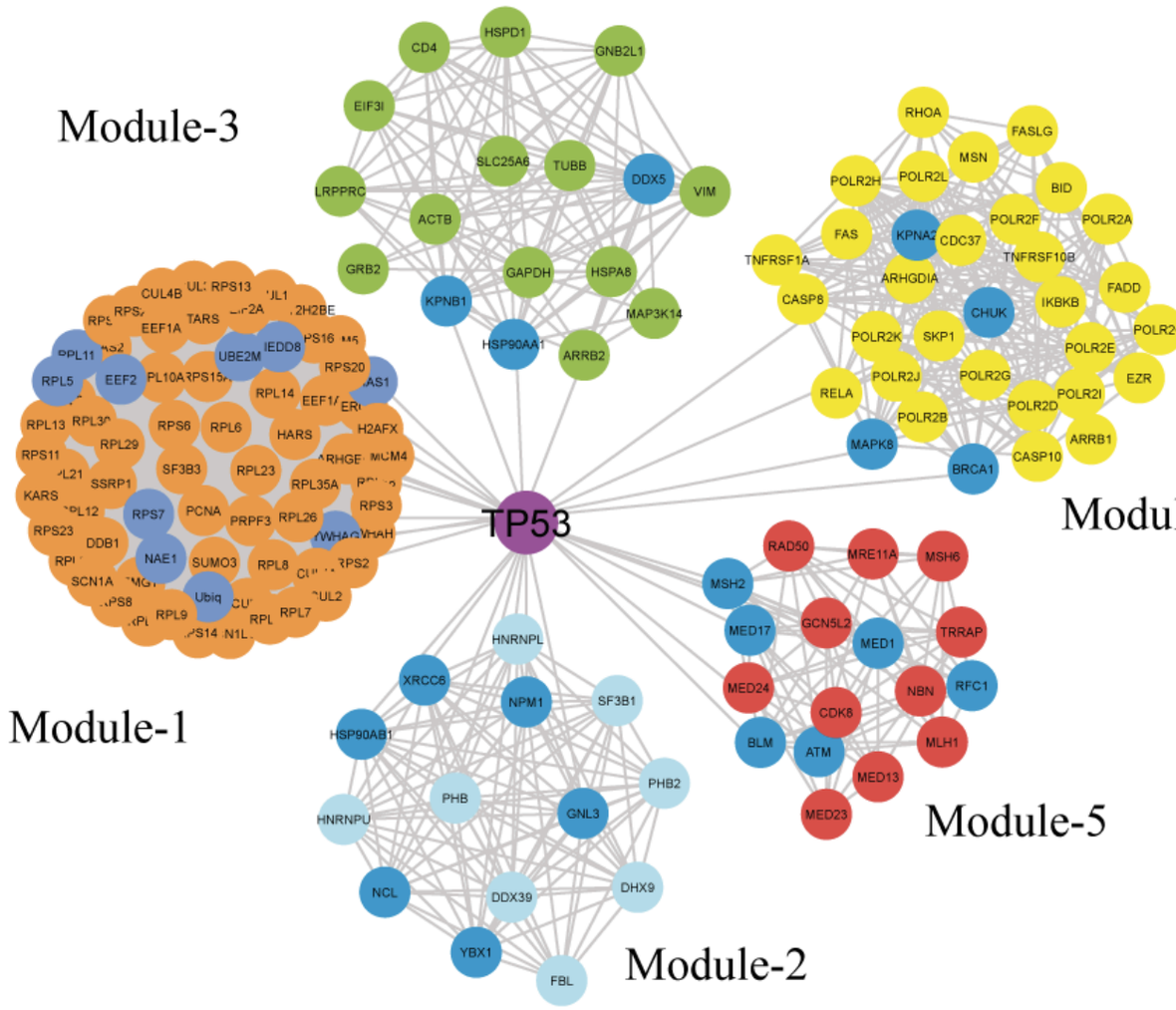
Approach

1. Build network from your data
2. Identify network modules
3. Analyze modules



Example

- Weighted Gene Co-expression Network Analysis (WGCNA)
  (Langfelder & Horvath, 2008)



Example: visualization of modules