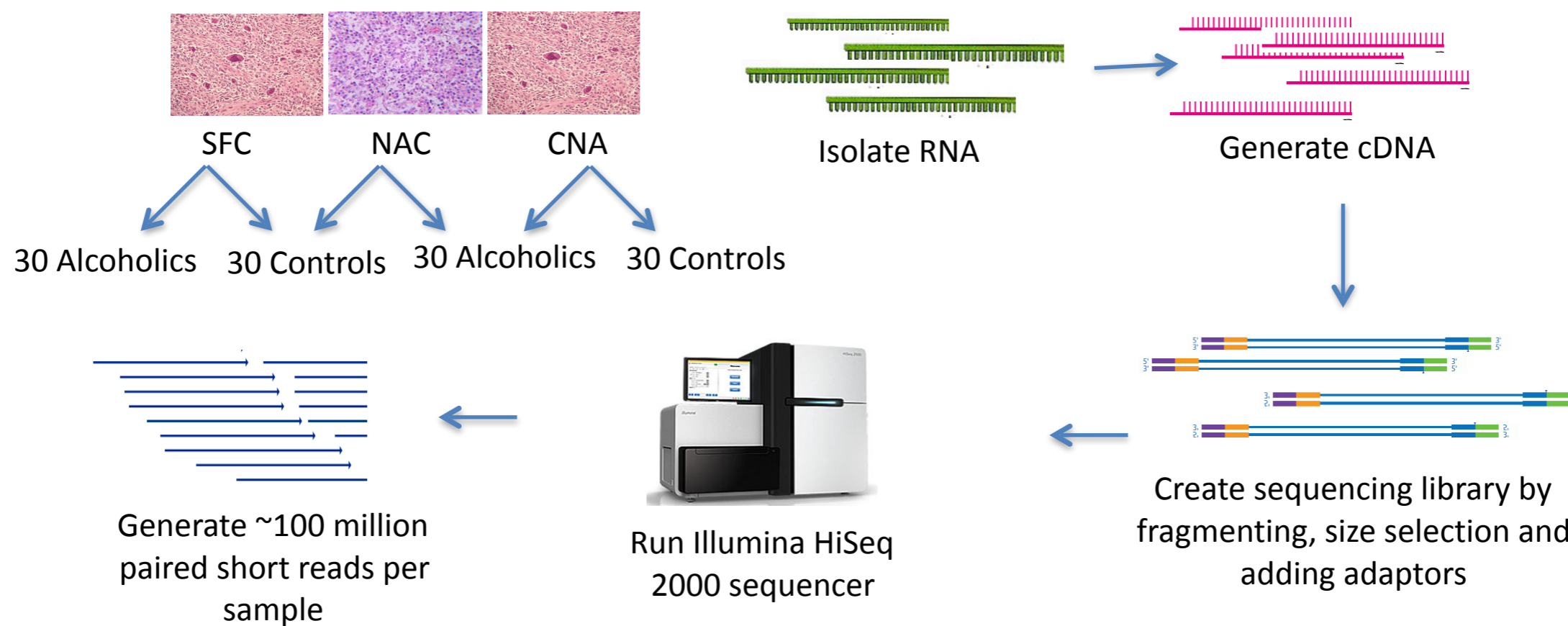# Downstream Analysis of RNA-Seq Data
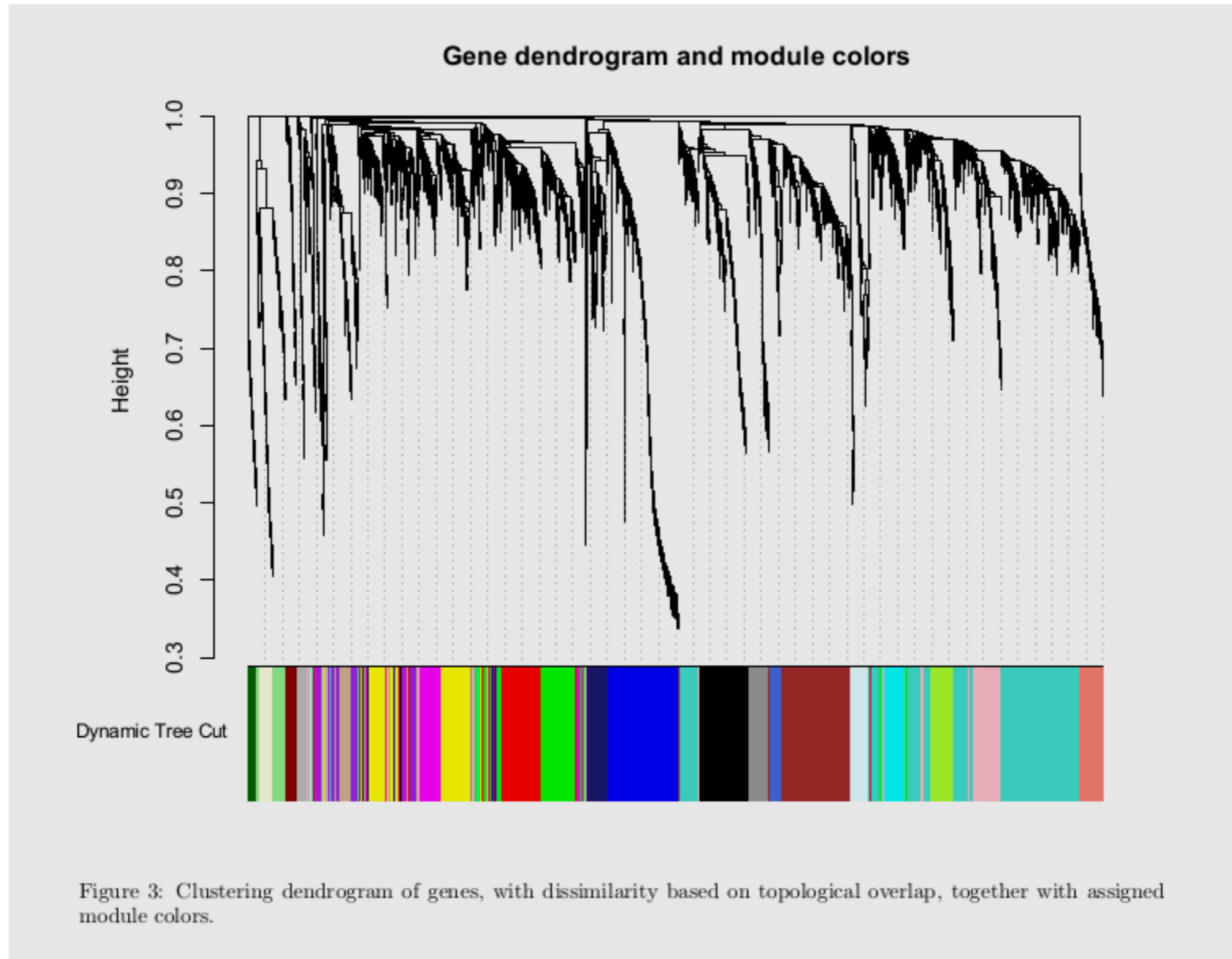
Example RNA-Seq Project

Transcriptome profiling of alcoholism

How does gene expression differ in Alcoholics vs. Healthy brains? How do these gene expression profiles vary across three different brain regions?
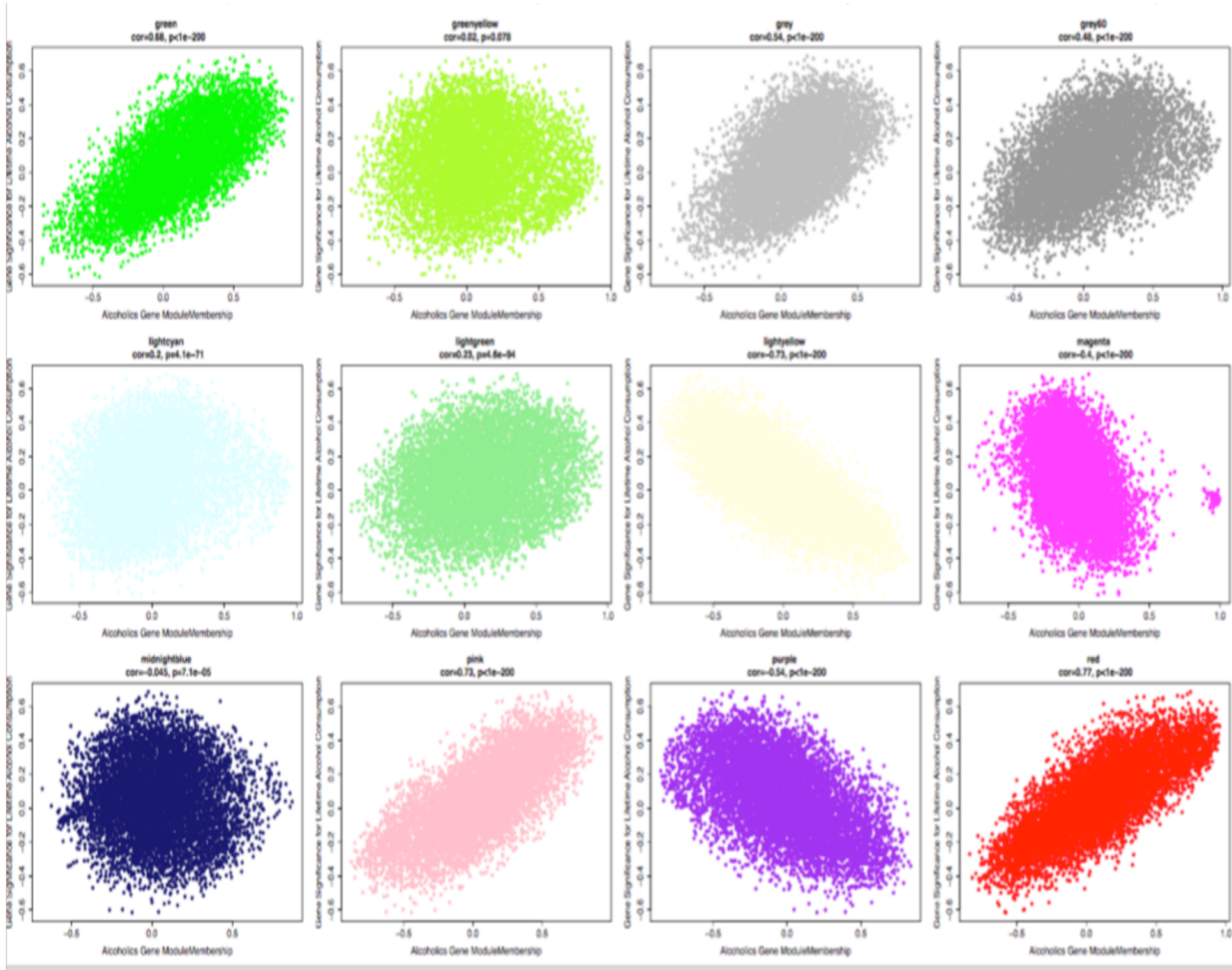
Identify groups of genes with correlated expressions

Figure 3: Clustering dendrogram of genes, with dissimilarity based on topological overlap, together with assigned module colors.

Identify groups of genes with correlated expressions
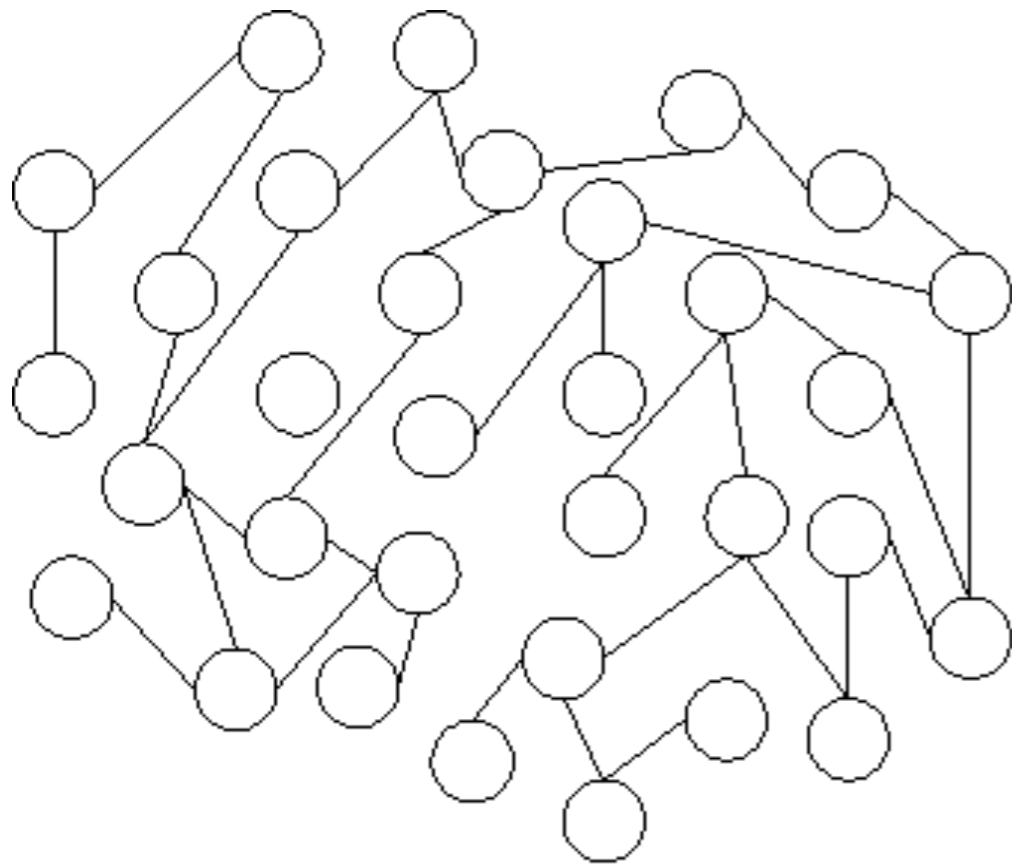
Module Correlation to Lifetime Alcohol Consumption in CNA Brain Region
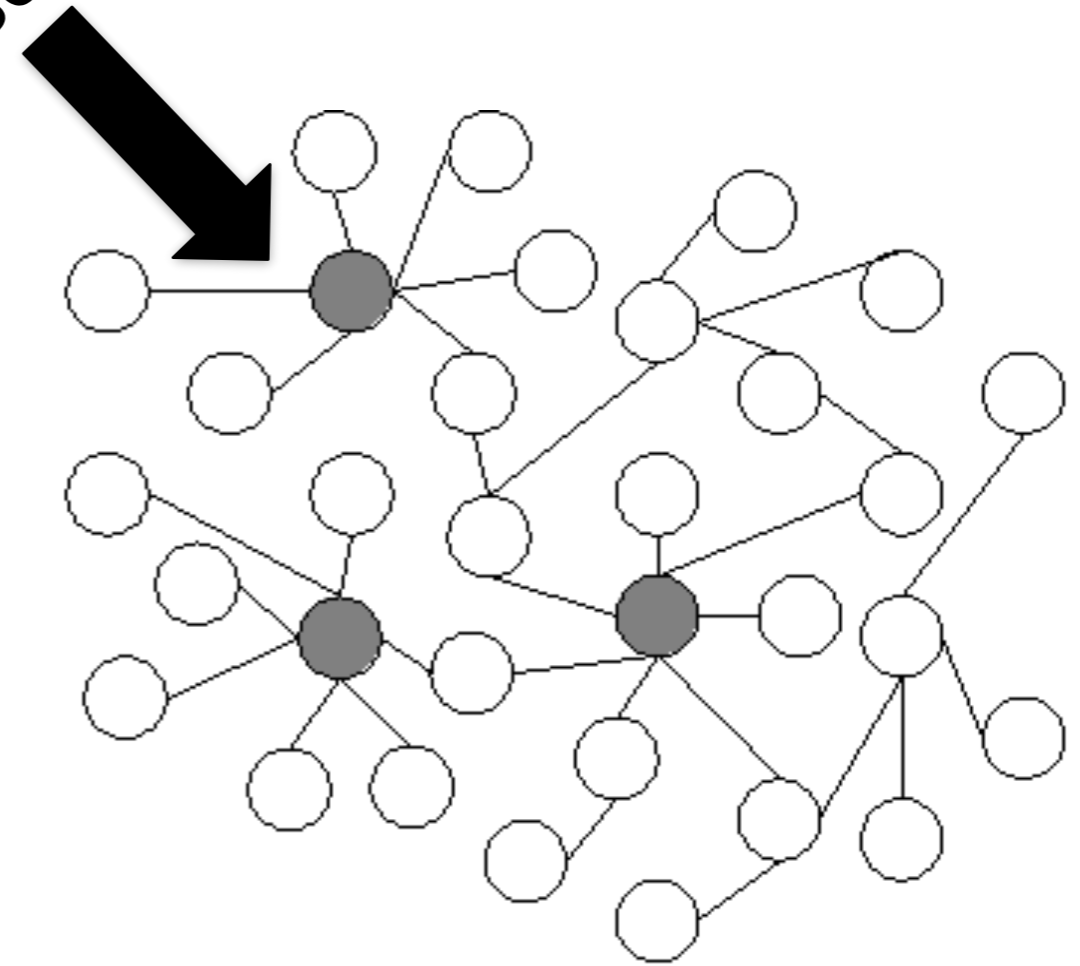

COEXPRESSED GENE MODULES

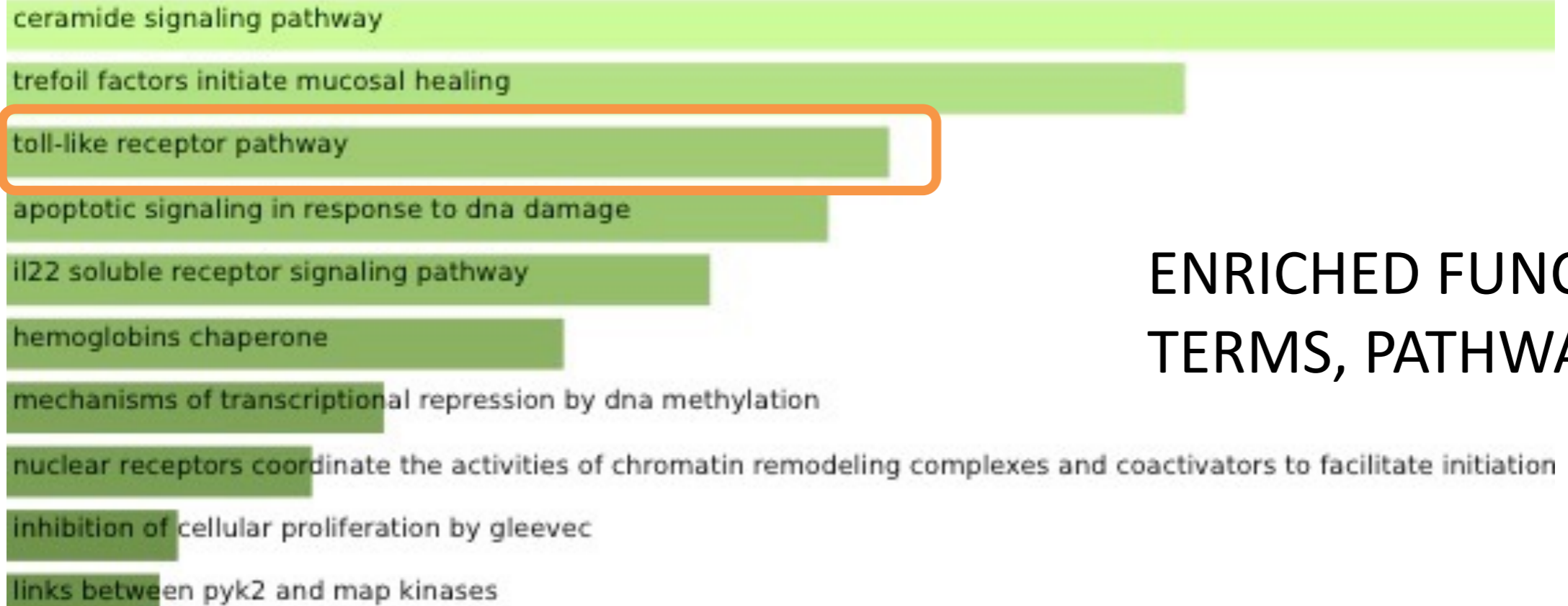# Identify groups of genes with correlated expressions

GENES DRIVING
CHANGE

transcription factor?

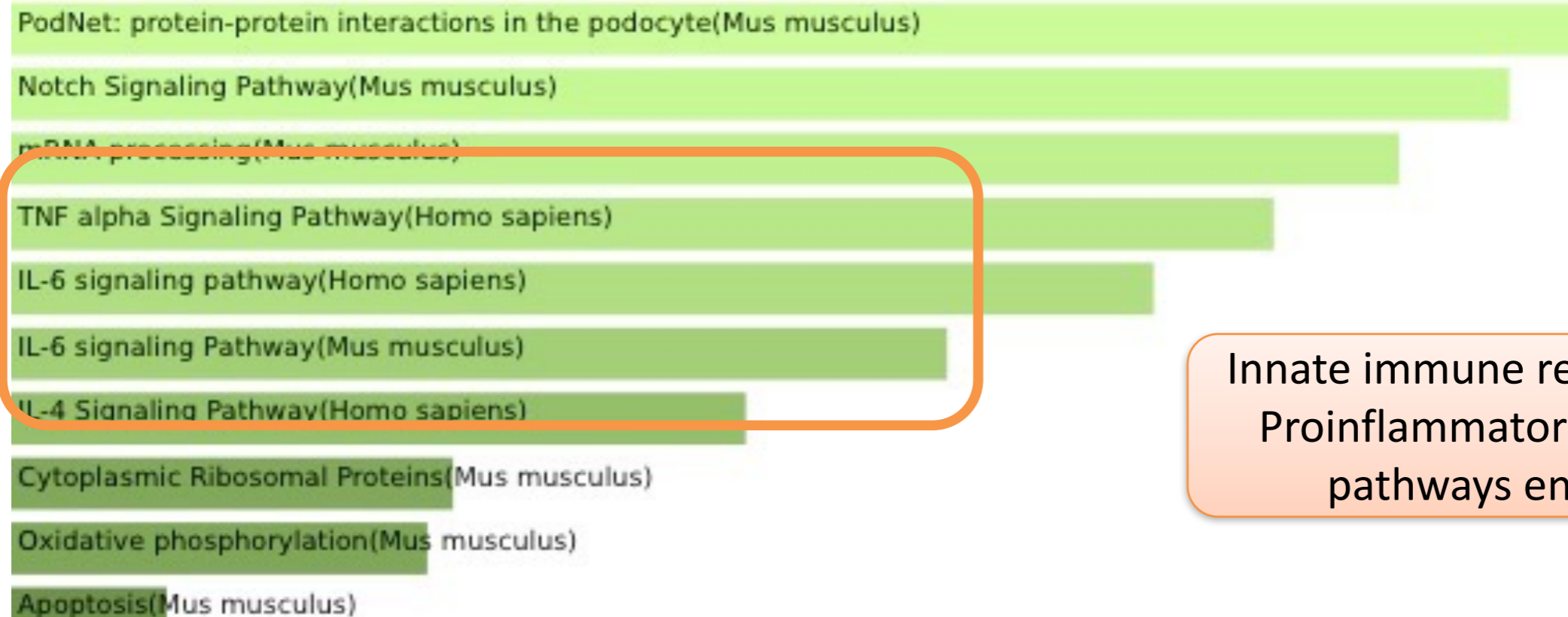(a) Random network

(b) Scale-free network

Pathway/Functional Group Analysis

ceramide signaling pathway

trefoil factors initiate mucosal healing

toll-like receptor pathway

apoptotic signaling in response to dna damage

il22 soluble receptor signaling pathway

hemoglobins chaperone

mechanisms of transcriptional repression by dna methylation

nuclear receptors coordinate the activities of chromatin remodeling complexes and coactivators to facilitate initiation

inhibition of cellular proliferation by gleevec

links between pyk2 and map kinases

PodNet: protein-protein interactions in the podocyte(Mus musculus)

Notch Signaling Pathway(Mus musculus)

mRNA processing(Mus musculus)

TNF alpha Signaling Pathway(Homo sapiens)

IL-6 signaling pathway(Homo sapiens)

IL-6 signaling Pathway(Mus musculus)

IL-4 Signaling Pathway(Homo sapiens)

Cytoplasmic Ribosomal Proteins(Mus musculus)

Oxidative phosphorylation(Mus musculus)

Apoptosis(Mus musculus)

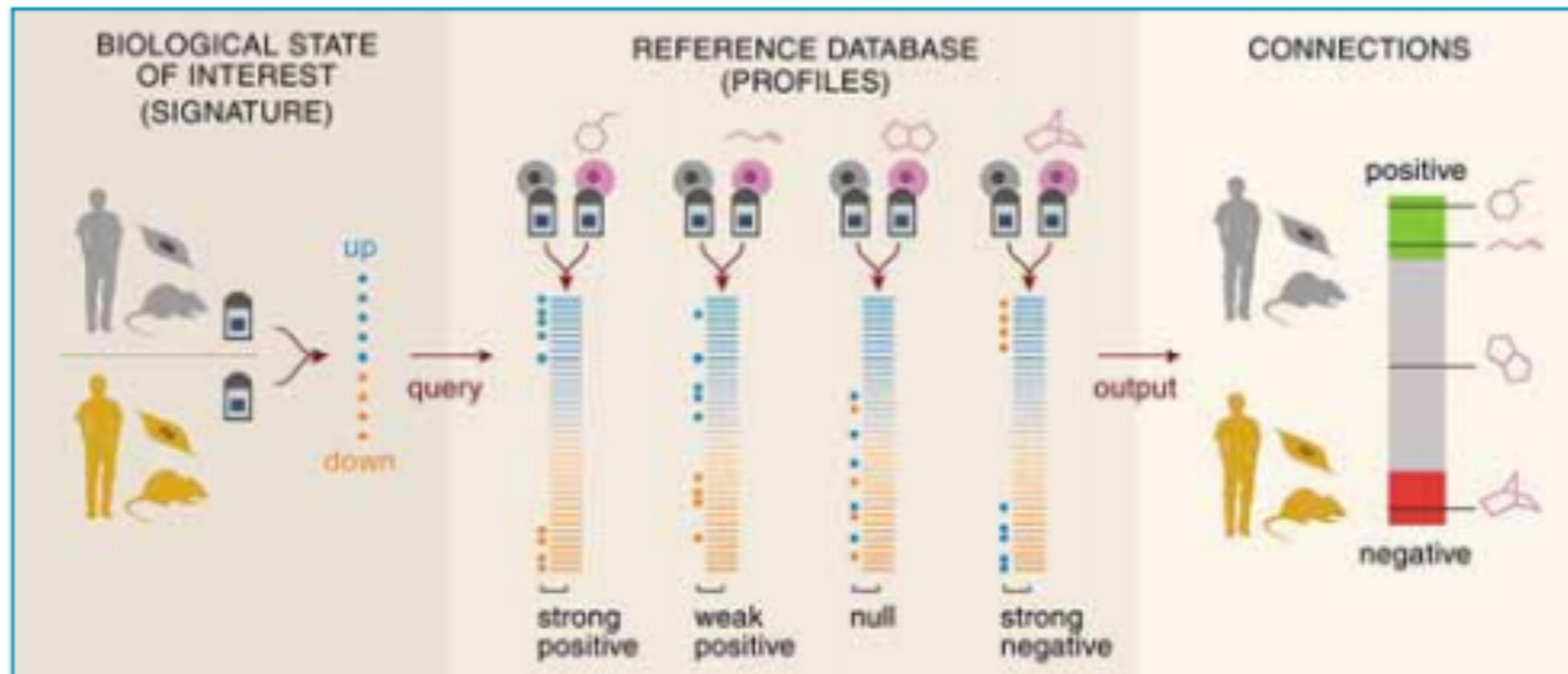ENRICHED FUNCTIONAL TERMS, PATHWAYS

Innate immune response and Proinflammatory cytokine pathways enriched

Connecting Expression to Drug Compounds

DRUG COMPOUNDS WHICH CAN REGULATE GENE CHANGES

USING LINCS DATABASE (library of integrated cellular signatures)

Connecting Expression to Drug Compounds

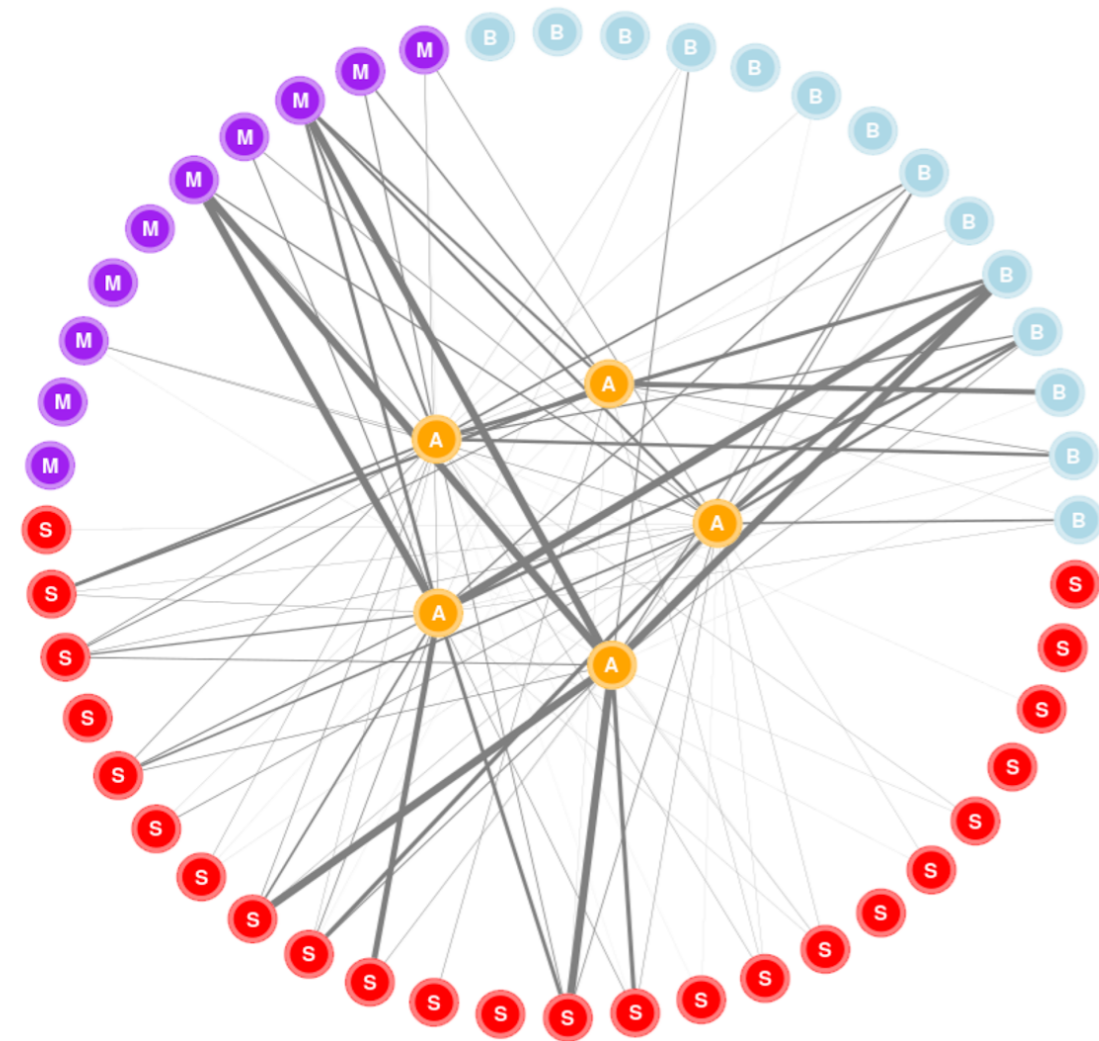DRUG COMPOUNDS WHICH CAN REGULATE
GENE CHANGES

FDA Approved drugs in NAC Module

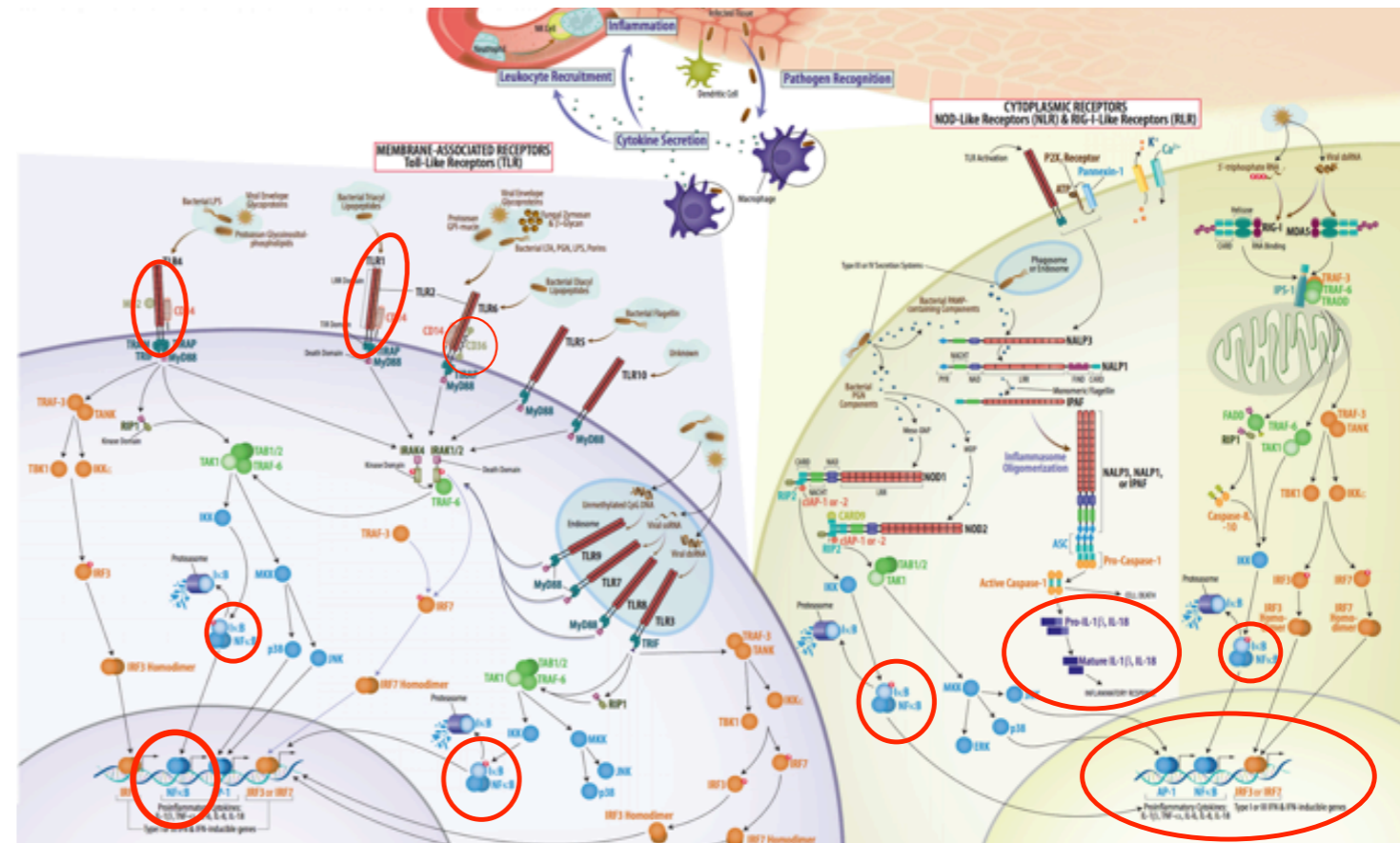| Drug Name	FDA Status	Connectivity Score
formestane	Approved, Investigational, Withdrawn	-95.11
metolazone	Approved	-96.17
Erlotinib	Approved	-96.38
timolol	Approved	-95.3
finasteride	Approved	-95.65
flunarizine	Approved	-98.77
alprazolam	Approved, Illicit, Investigational	-95.95
ipratropium bromide	Approved	-96.71
labetalol	Approved	-95.56
etodolac	Approved, Investigational, Vet Approved	-95.18
clofibrate	Approved	-95.91

Contributed by Bo Miller

Comparing to Other Datasets

Comparison of genes co-expressed in alcohol abuse to other psychiatric disorders (Bipolar, depression, schizophrenia) using publicly available data

Modules
- BPD
- MDD
- SCH
- Alcoholism

Contributed by Khoi Le, Lee Rao