

Biological Networks Across Scales: Course Overview

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Course Information

Course webpage

- <http://www.hcbravo.org/networks-across-scales/>
- Shortened: <http://bit.ly/hcb-nas>

Other sites

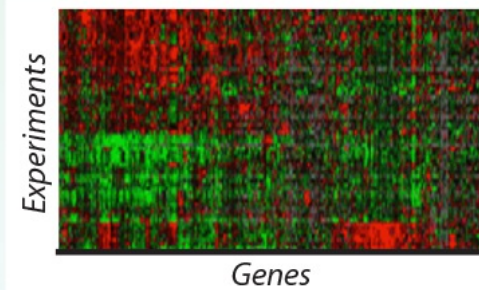
- **ELMS**: Grades, assignments, readings, etc.
- **Piazza**: Discussion and any other communication
- Links in course webpage

NETWORK BIOLOGY ACROSS SCALES



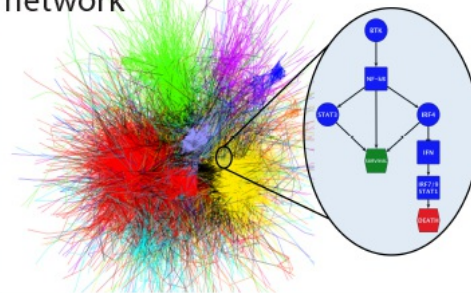
MOLECULAR/ CELLULAR

DATA Gene expression



INFORMATION

Reconstructed gene regulatory network



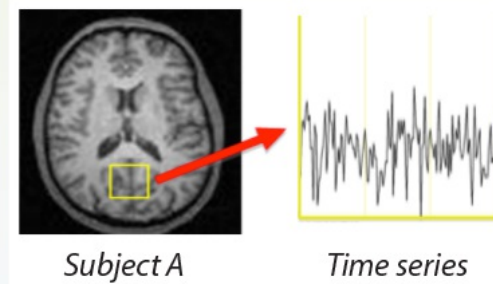
INSIGHT

Reconstructed gene networks reveal key differences between cell types



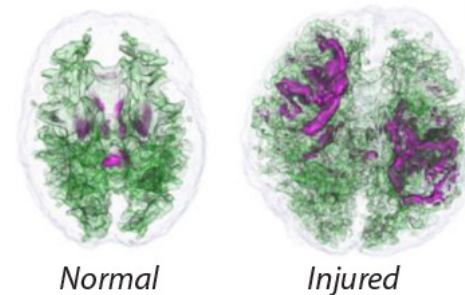
CELLULAR/ ORGANISMAL

DATA Brain activity



INFORMATION

Brain network diffusion



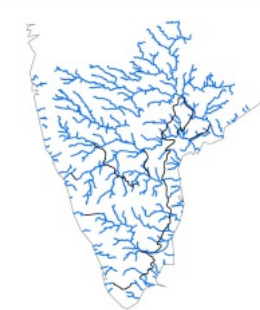
INSIGHT

Altered network diffusion patterns can help identify functional deficits



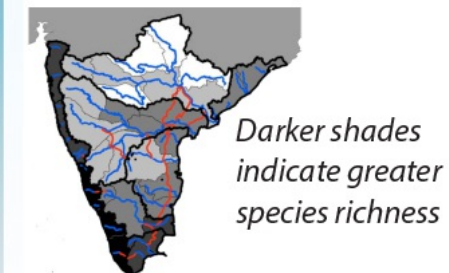
ECOLOGICAL/ BEHAVIORAL

DATA River network topology



INFORMATION

Model estimates for species richness

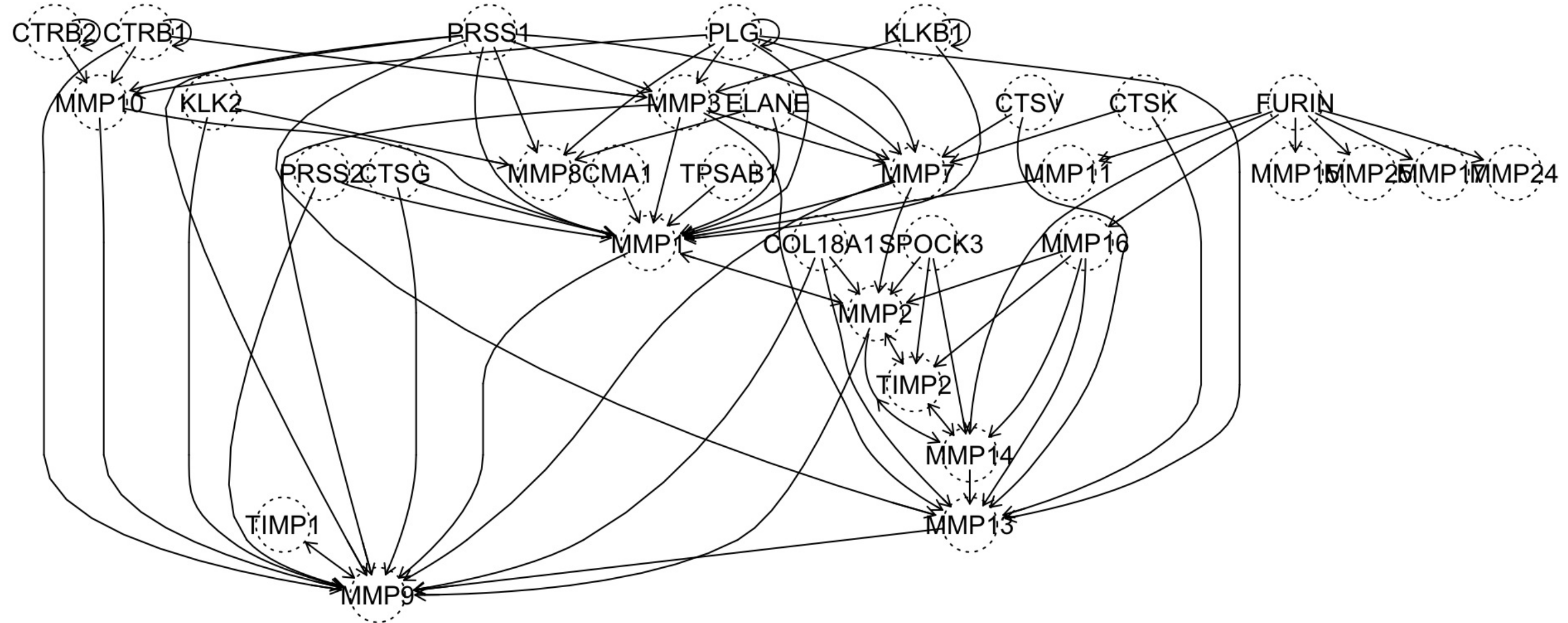


INSIGHT

We can assess biological turnover due to river network rewiring

FROM DATA TO INFORMATION TO INSIGHTS

A Molecular Pathway



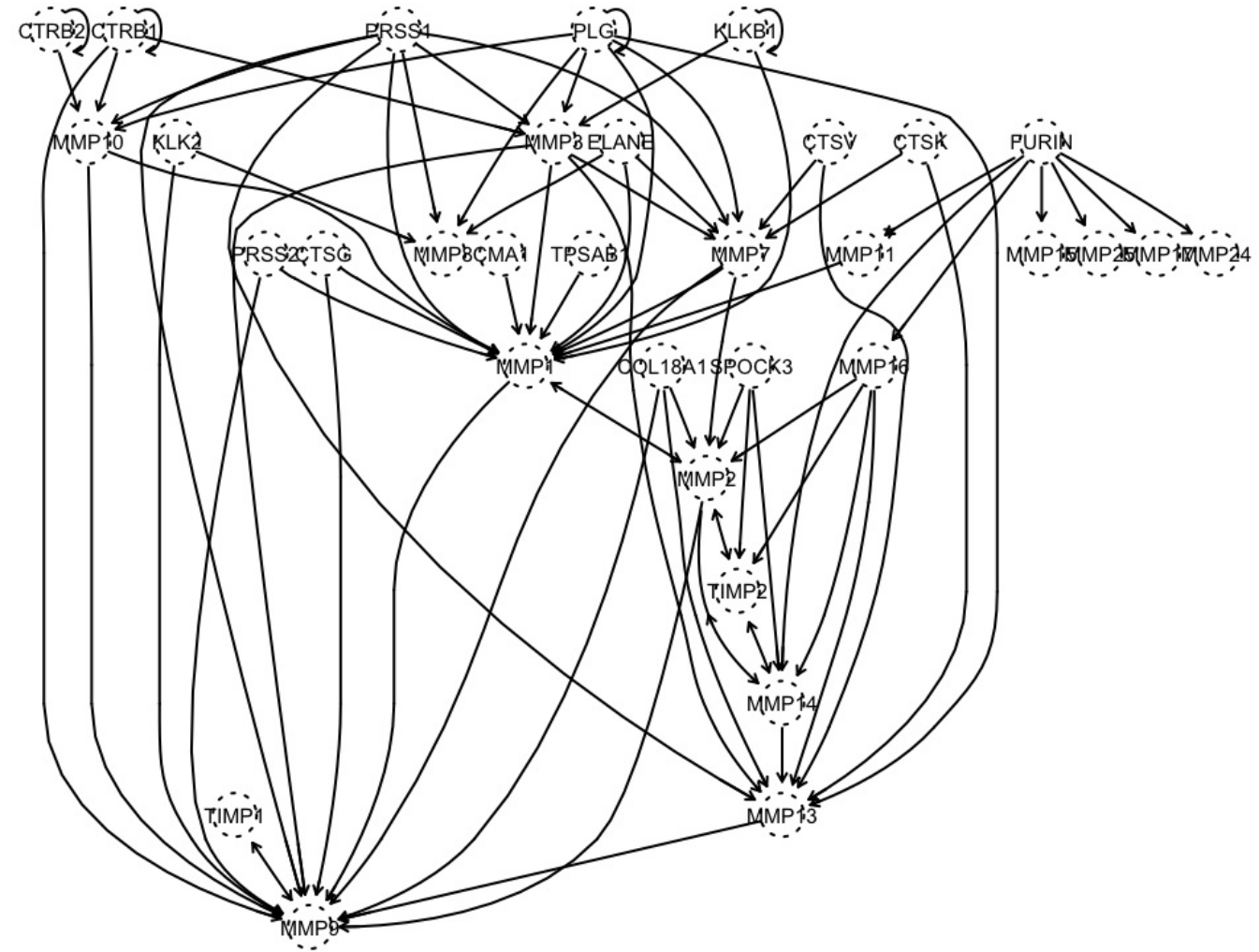
Activation of Matrix Metalloproteinases

Course Components

- Network Analysis Methods
- Biological Networks
- Data Projects

Networks Analysis Methods

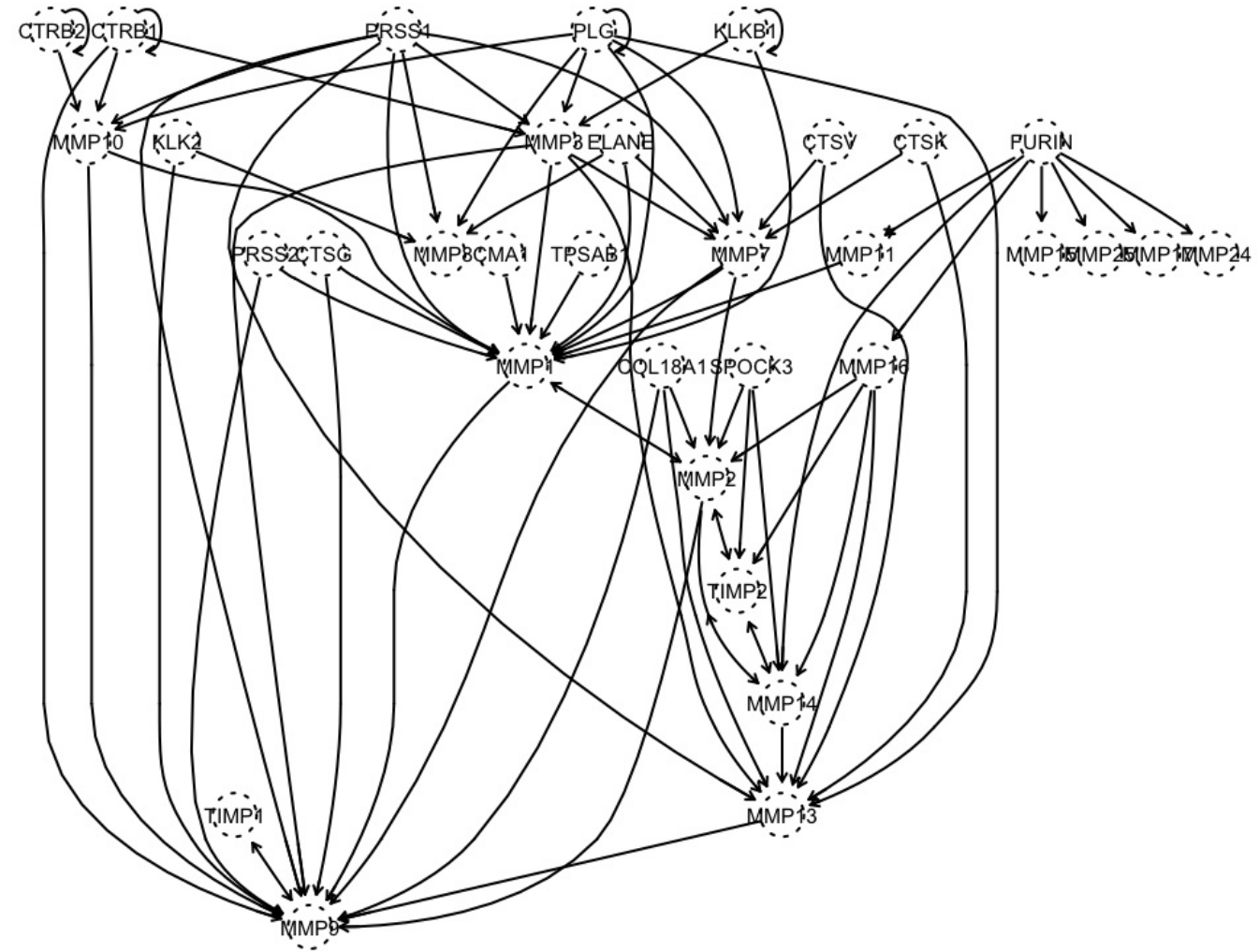
Module 1: Network Properties and Characteristics



Networks Analysis Methods

Module 2: Network Models

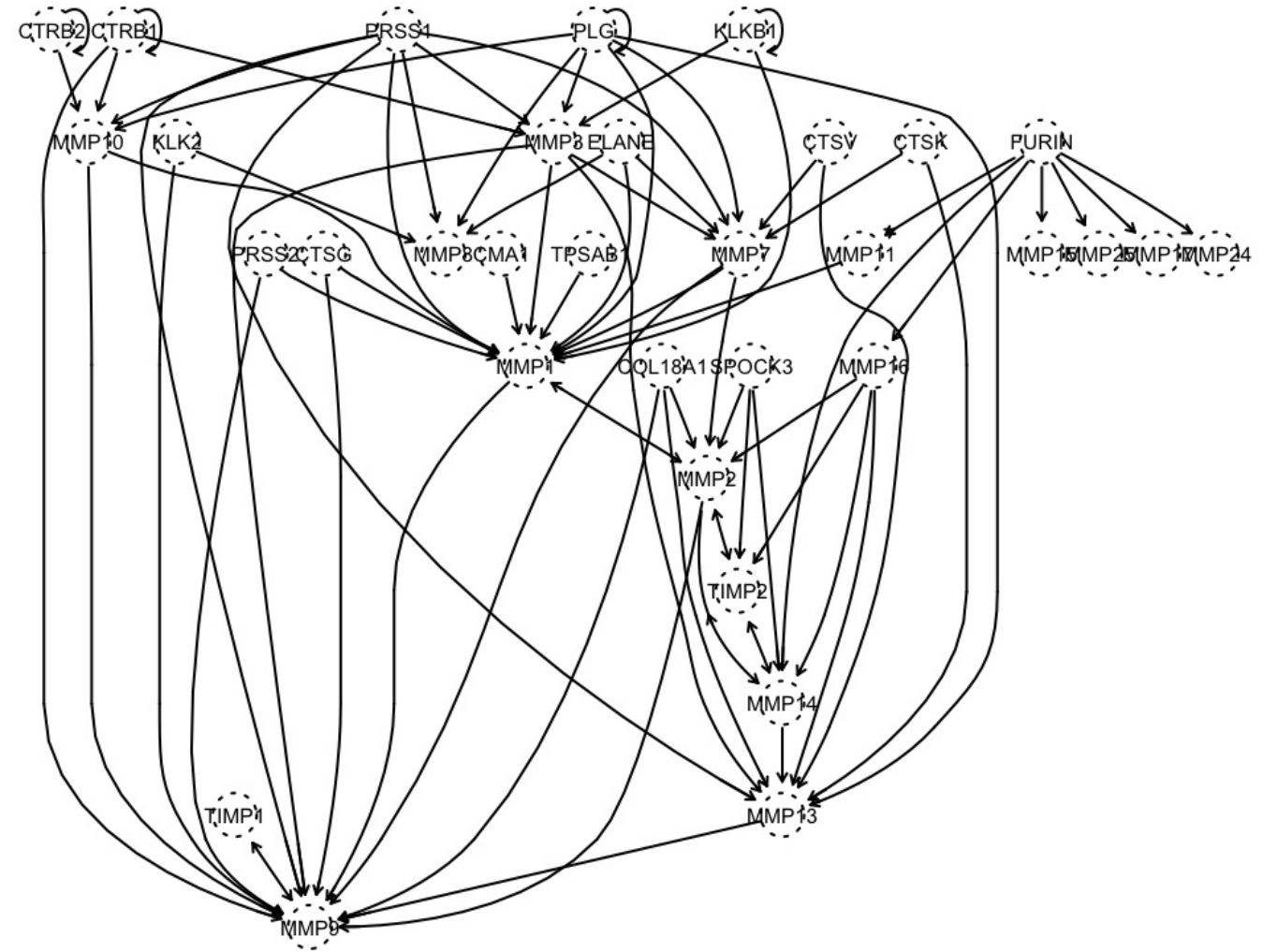
Networks as representation of systems



Networks Analysis Methods

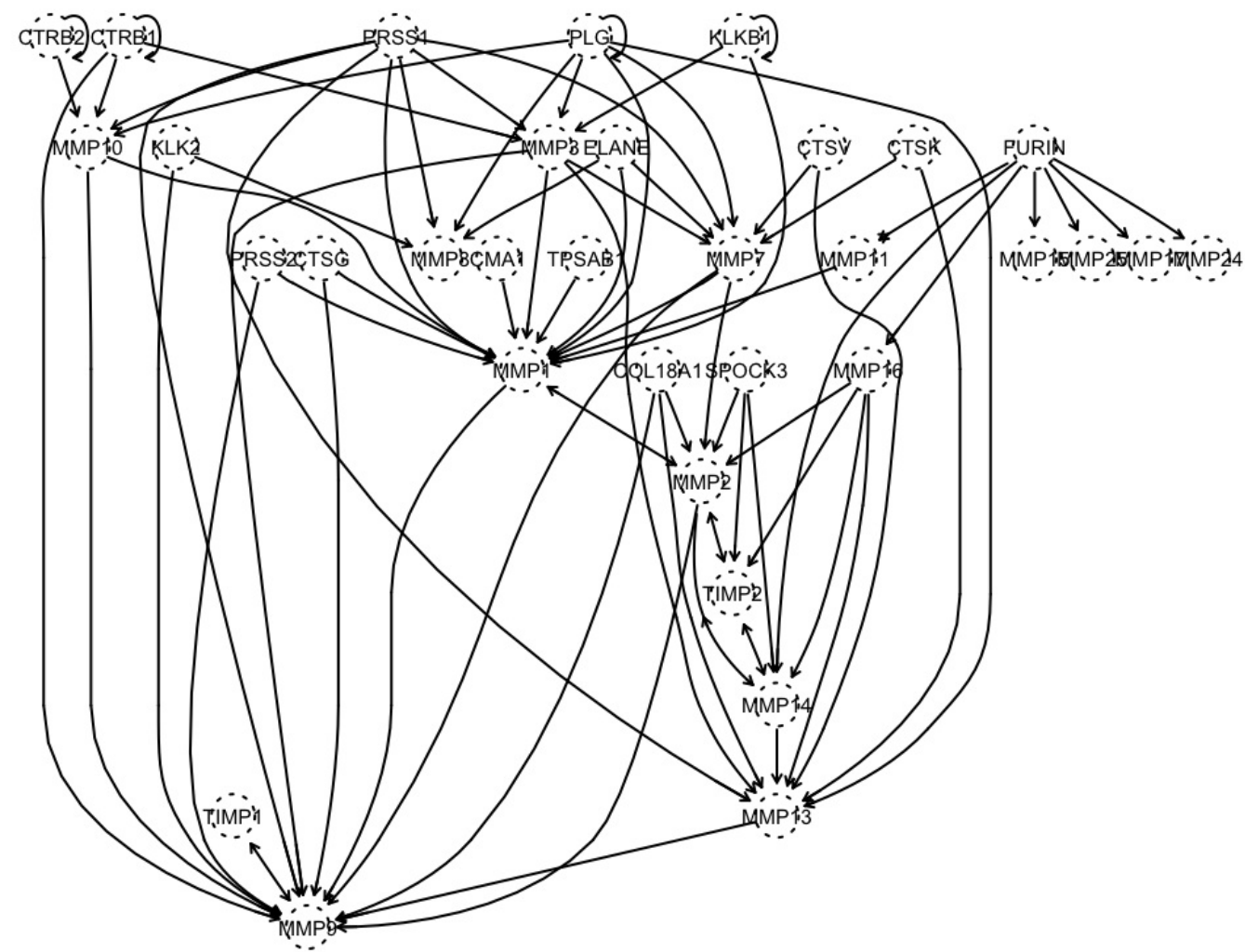
Module 3: Statistical Analysis of Networked Data

Networks as representation of (in)-dependence



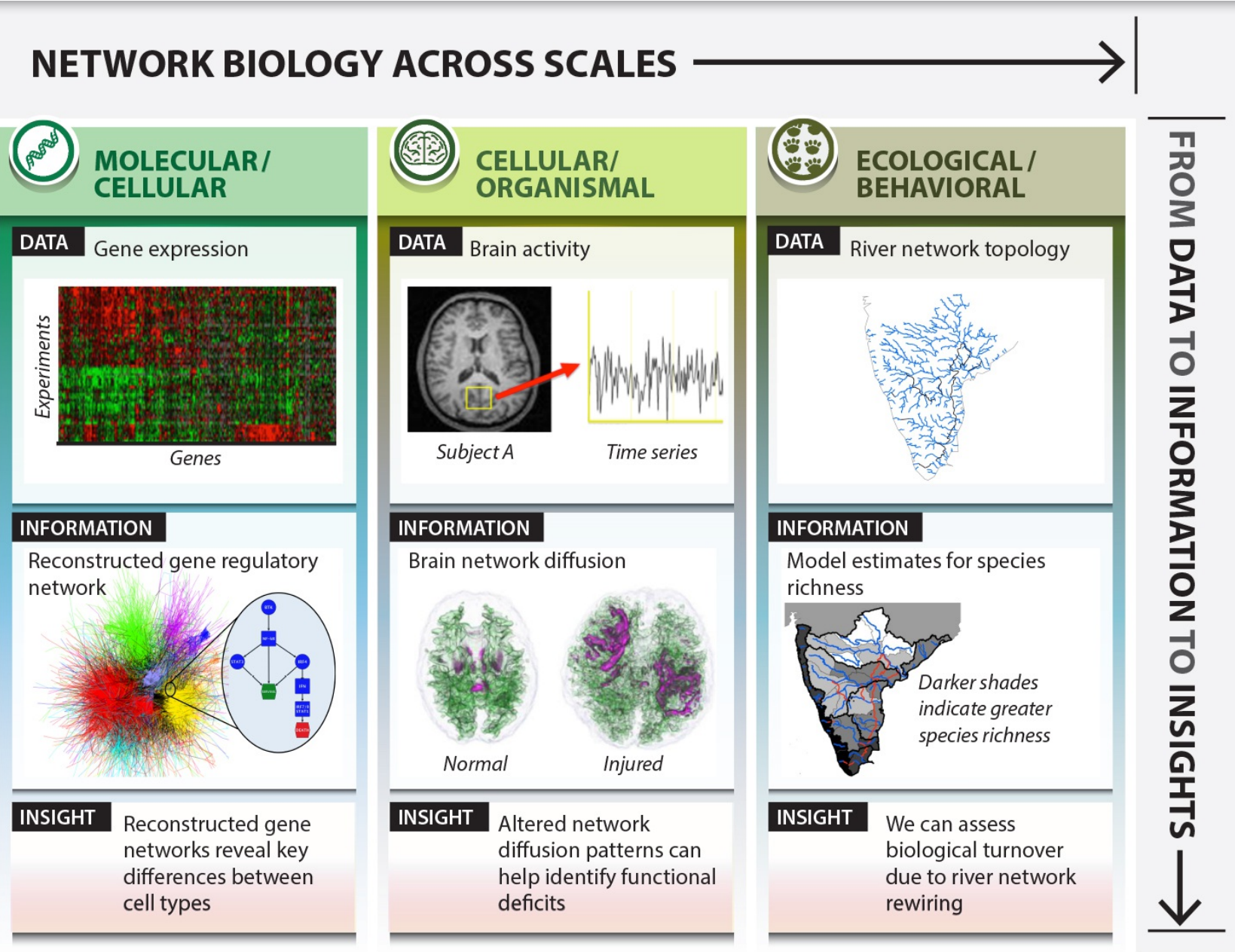
Networks Analysis Methods

Module 4: Network Visualization

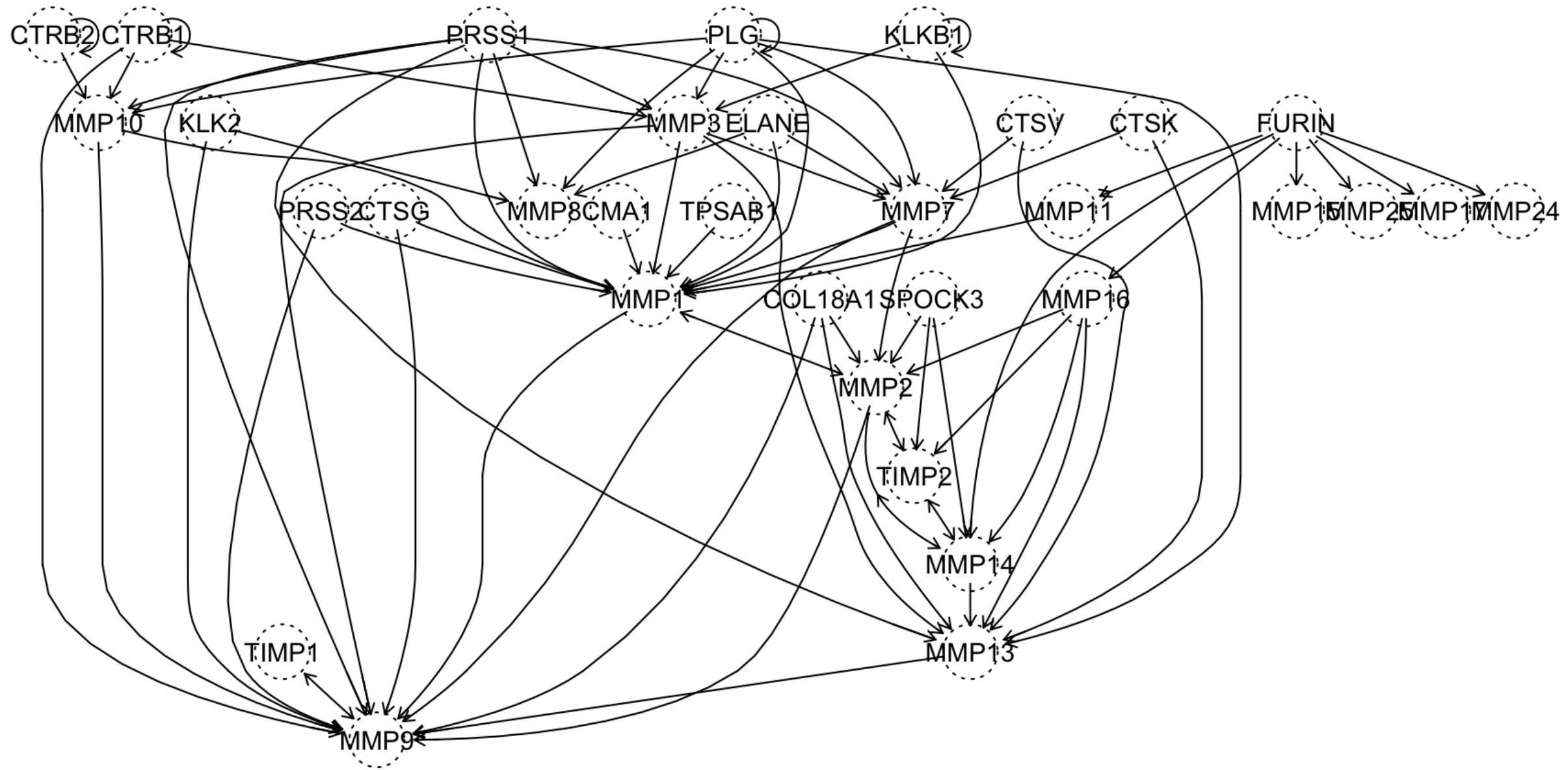


Biological Networks

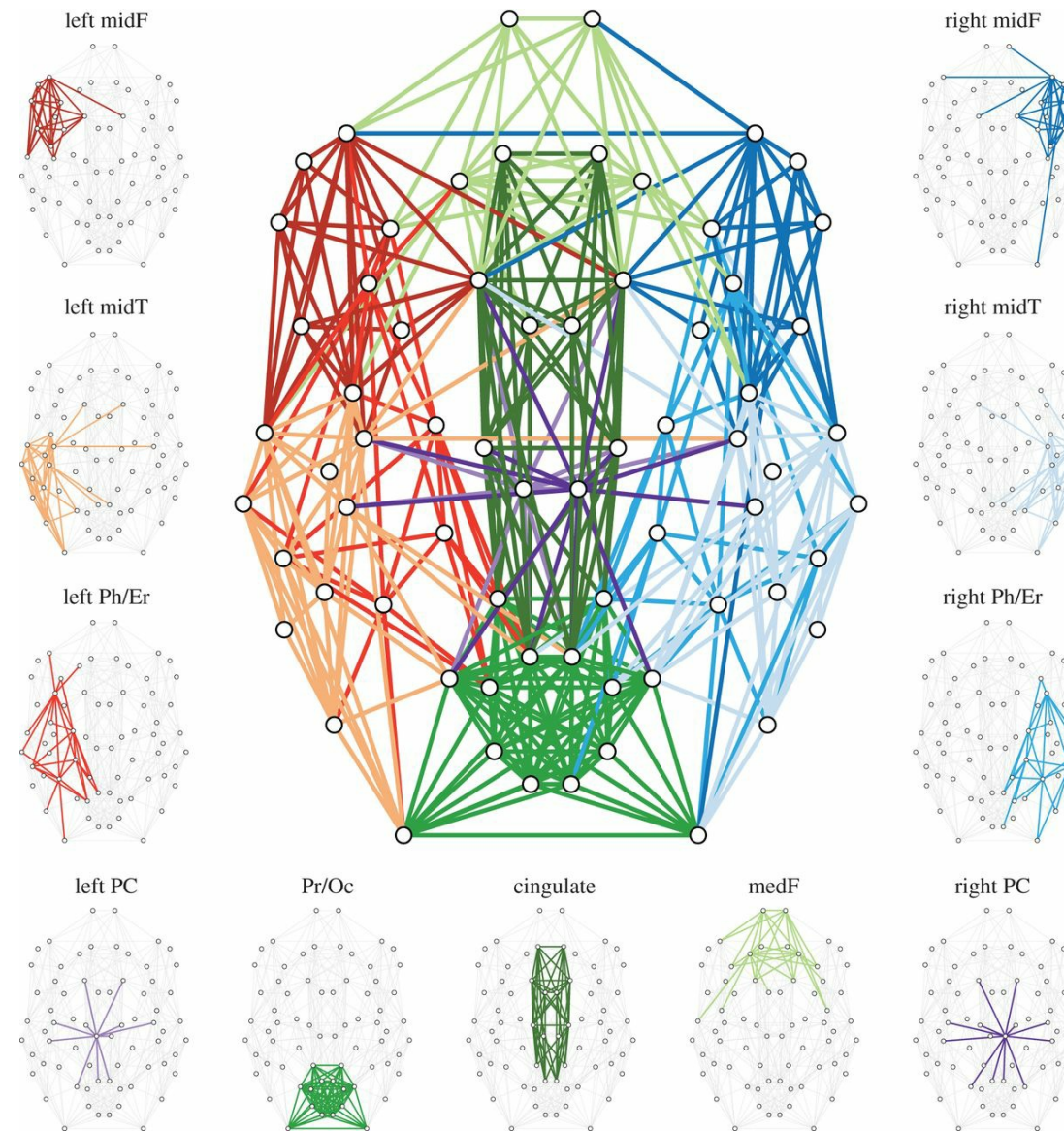
Student-led Presentations



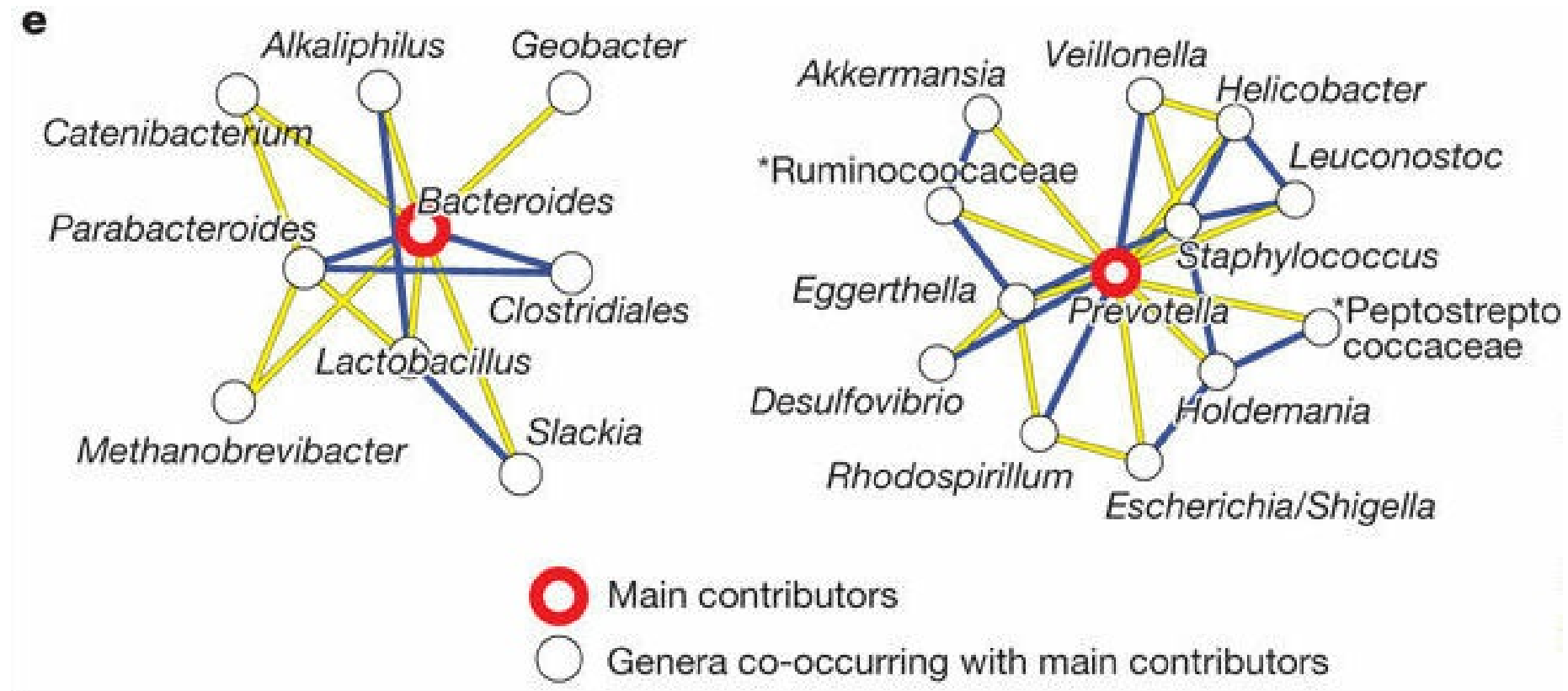
Molecular Networks



Cellular Networks



Ecological Networks



<https://doi.org/10.1038/nature09944>

Data Projects

Semester-long projects

- Data from Biological Networks
- Apply Methodology as we go along
- Milestone presentations (and submissions)
- Submit final report