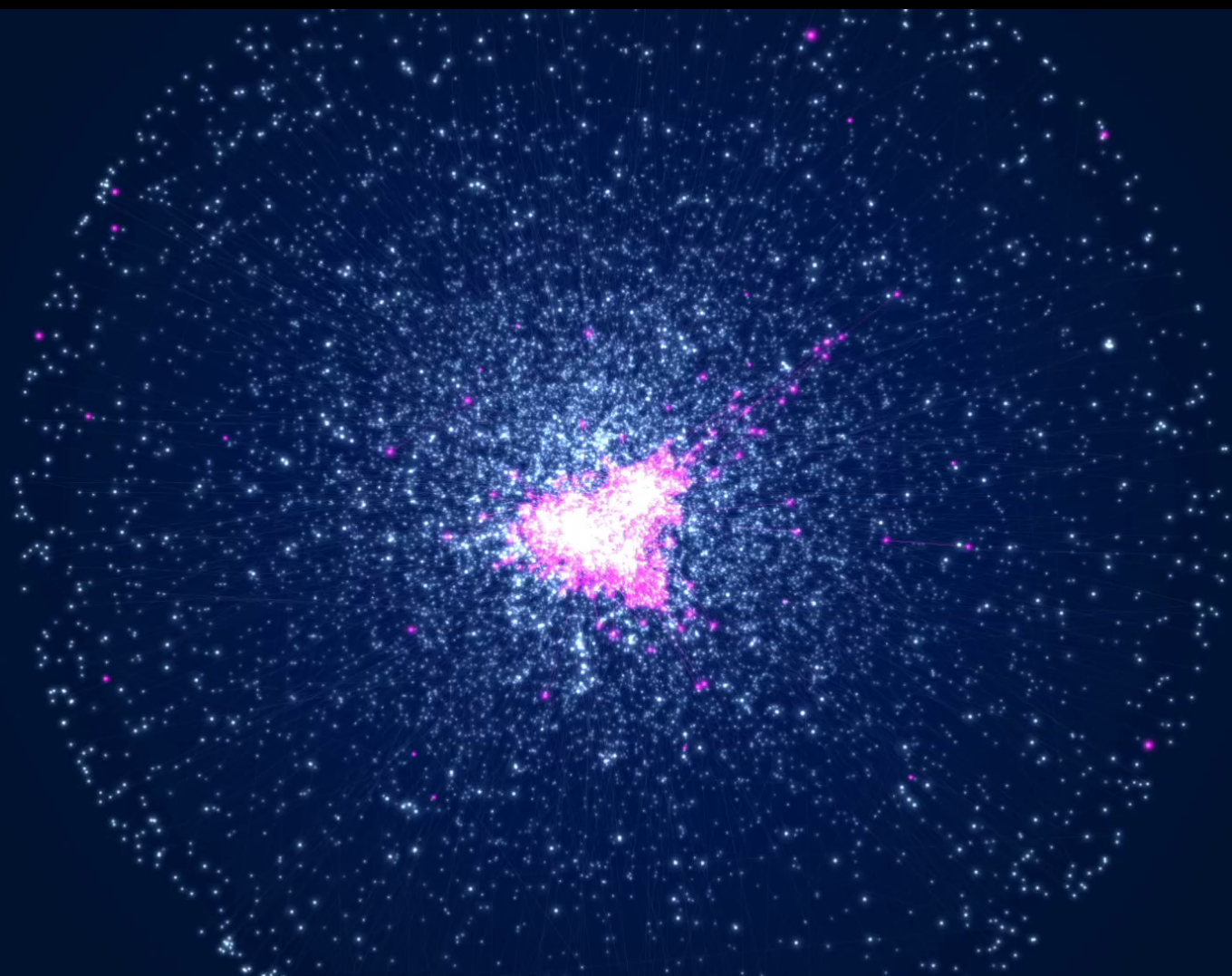
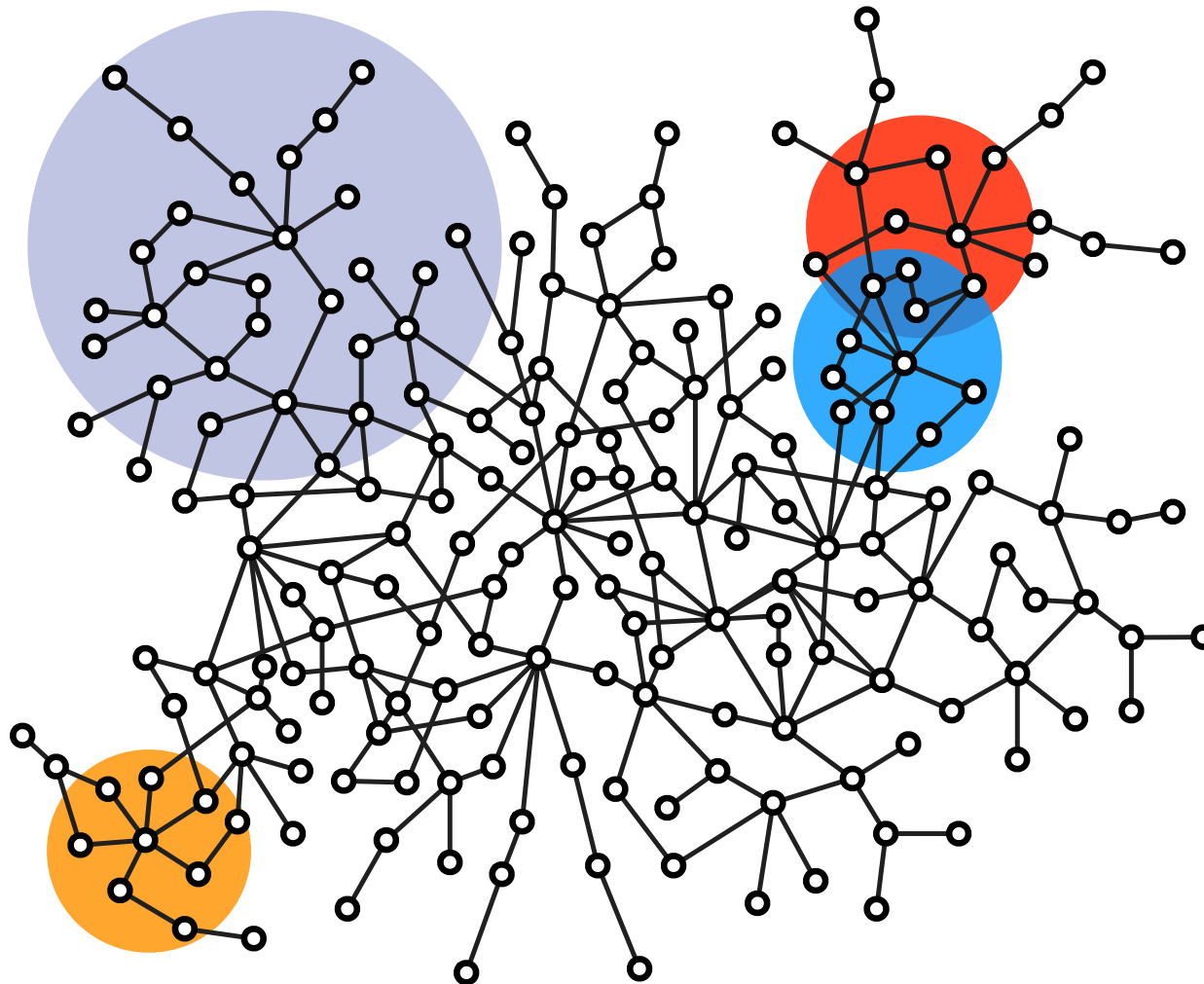


Human diseases within the Interactome



The Interactome & Disease Modules

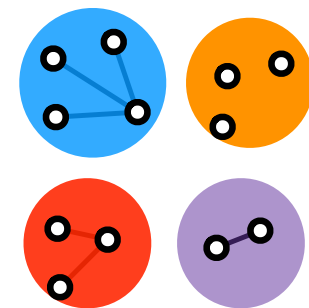


protein x

protein y

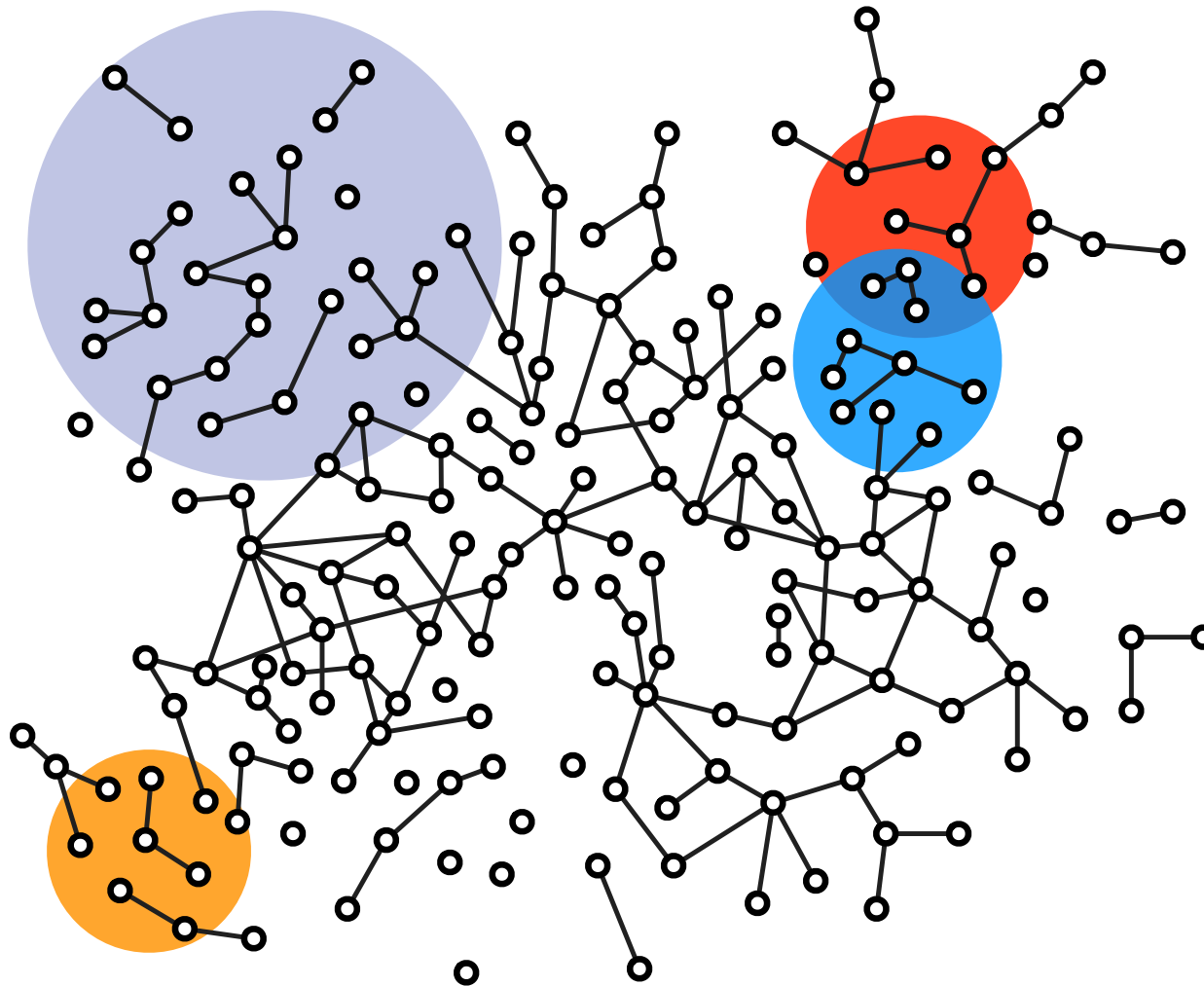


- binary interactions
- protein complexes
- regulatory interactions
- metabolic interactions
- kinase-substrate pairs



proteins associated
to diseases A, B, C, D

The Interactome & Disease Modules

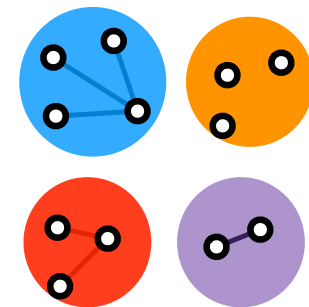


protein x

protein y



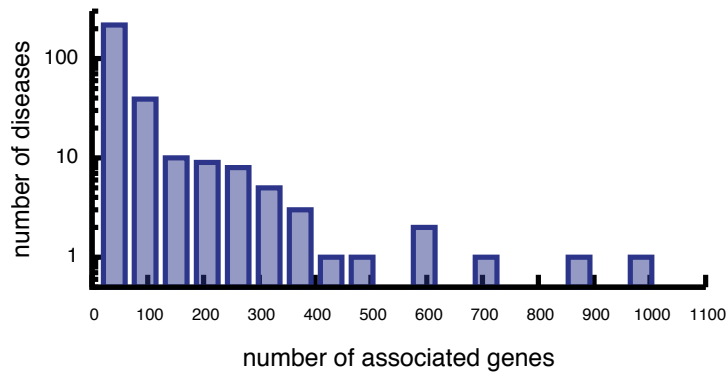
- binary interactions
- protein complexes
- regulatory interactions
- metabolic interactions
- kinase-substrate pairs



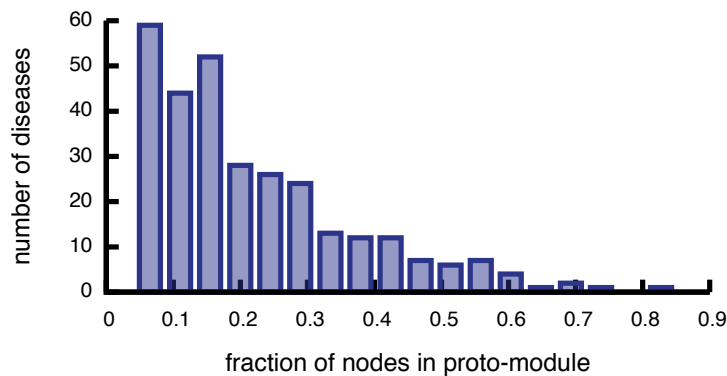
proteins associated
to diseases A, B, C, D

Disease Proteins in the Interactome

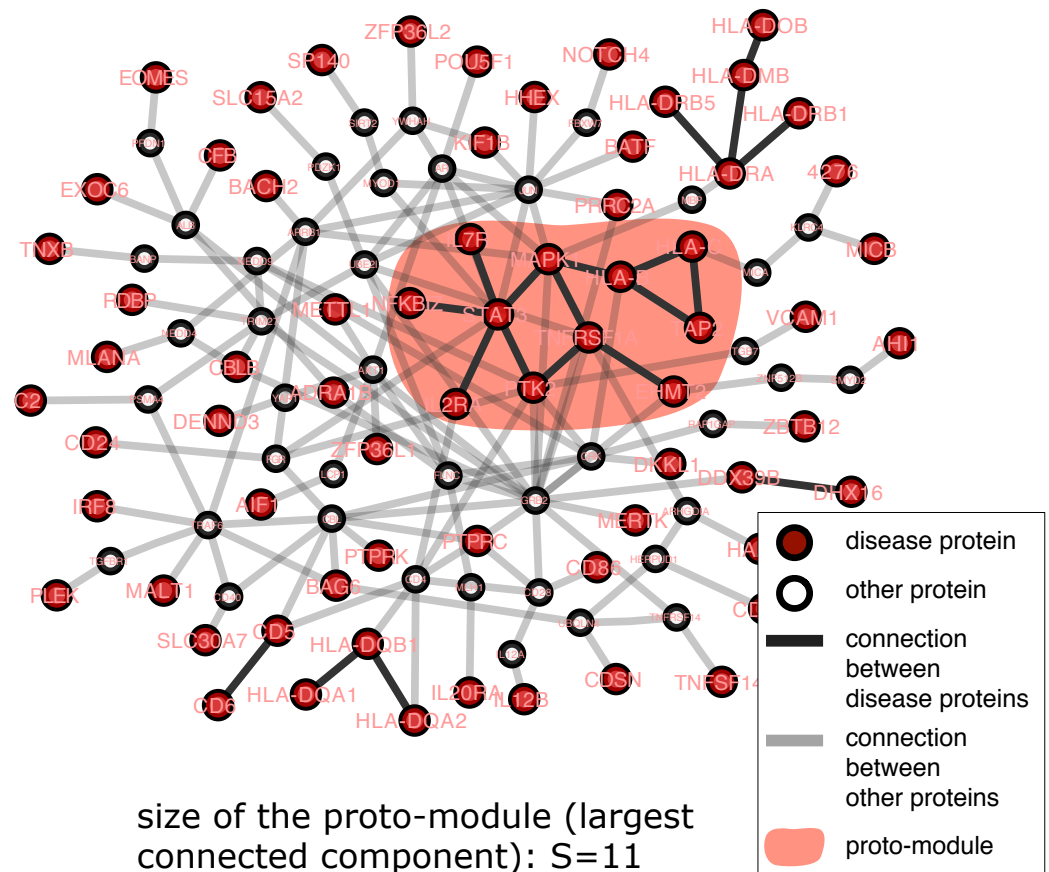
We study 299 complex diseases with at least 20 associated proteins:



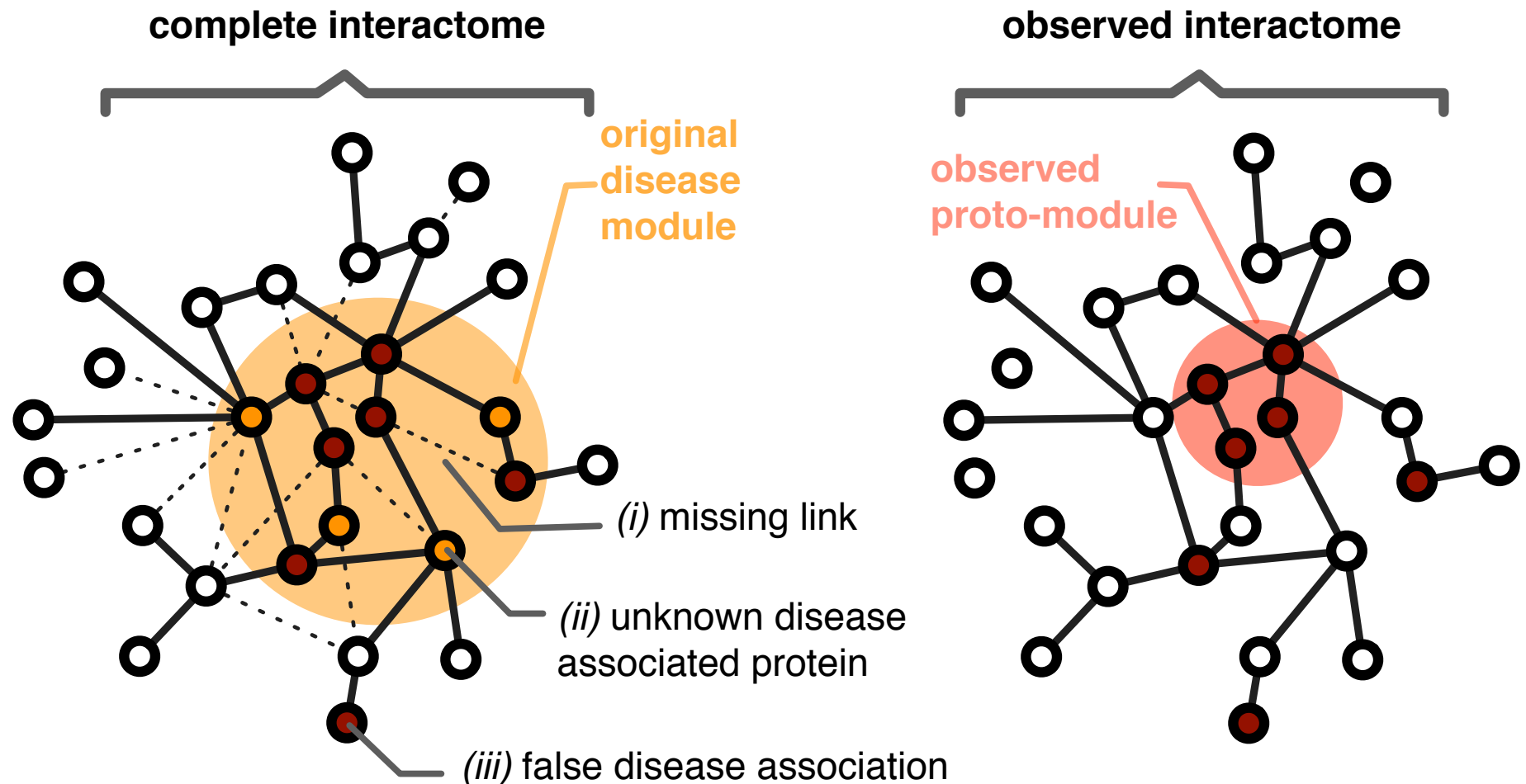
How many of the proteins of a particular disease are connected to each other?



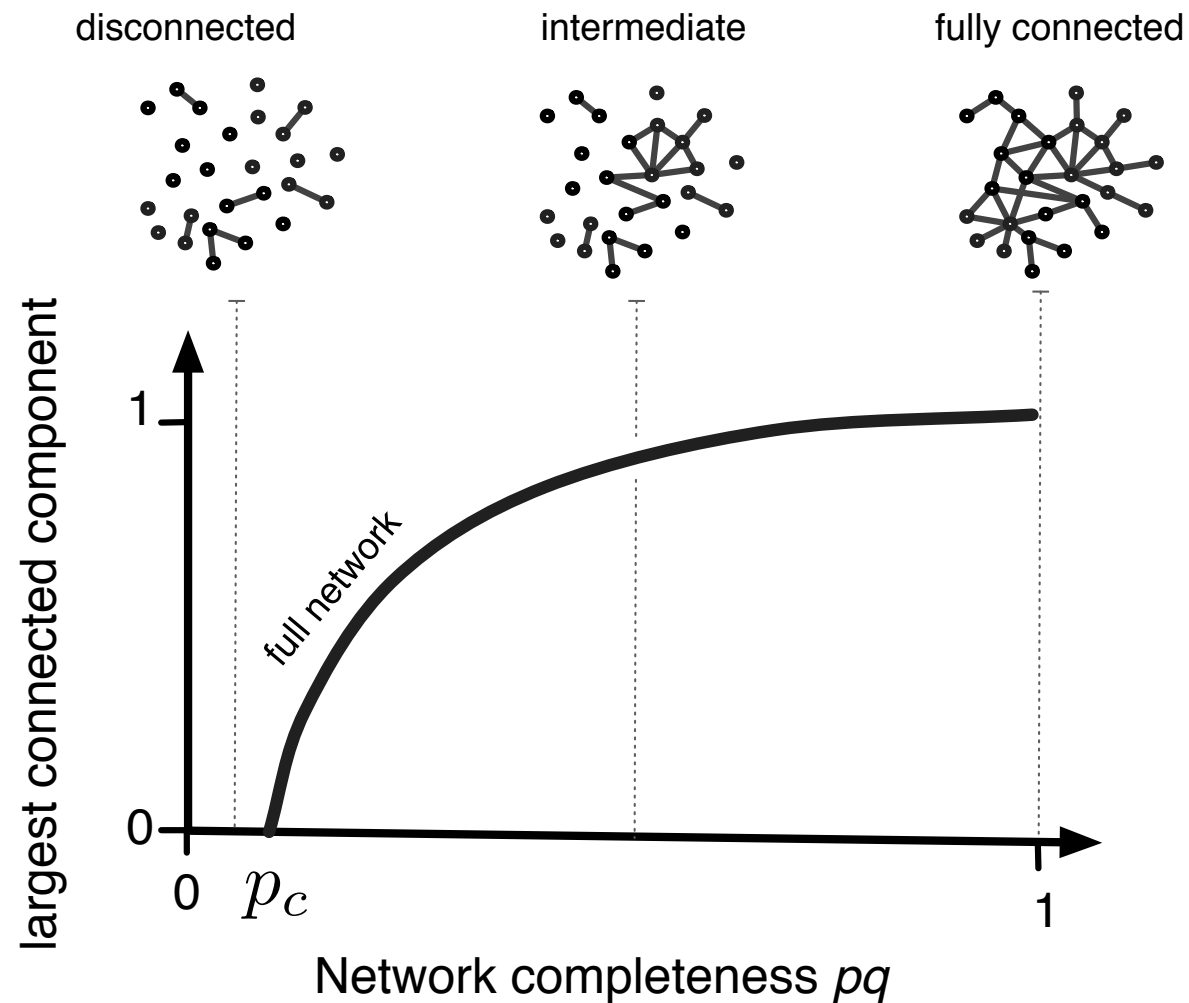
Subnetwork with 69 proteins associated with Multiple Sclerosis:



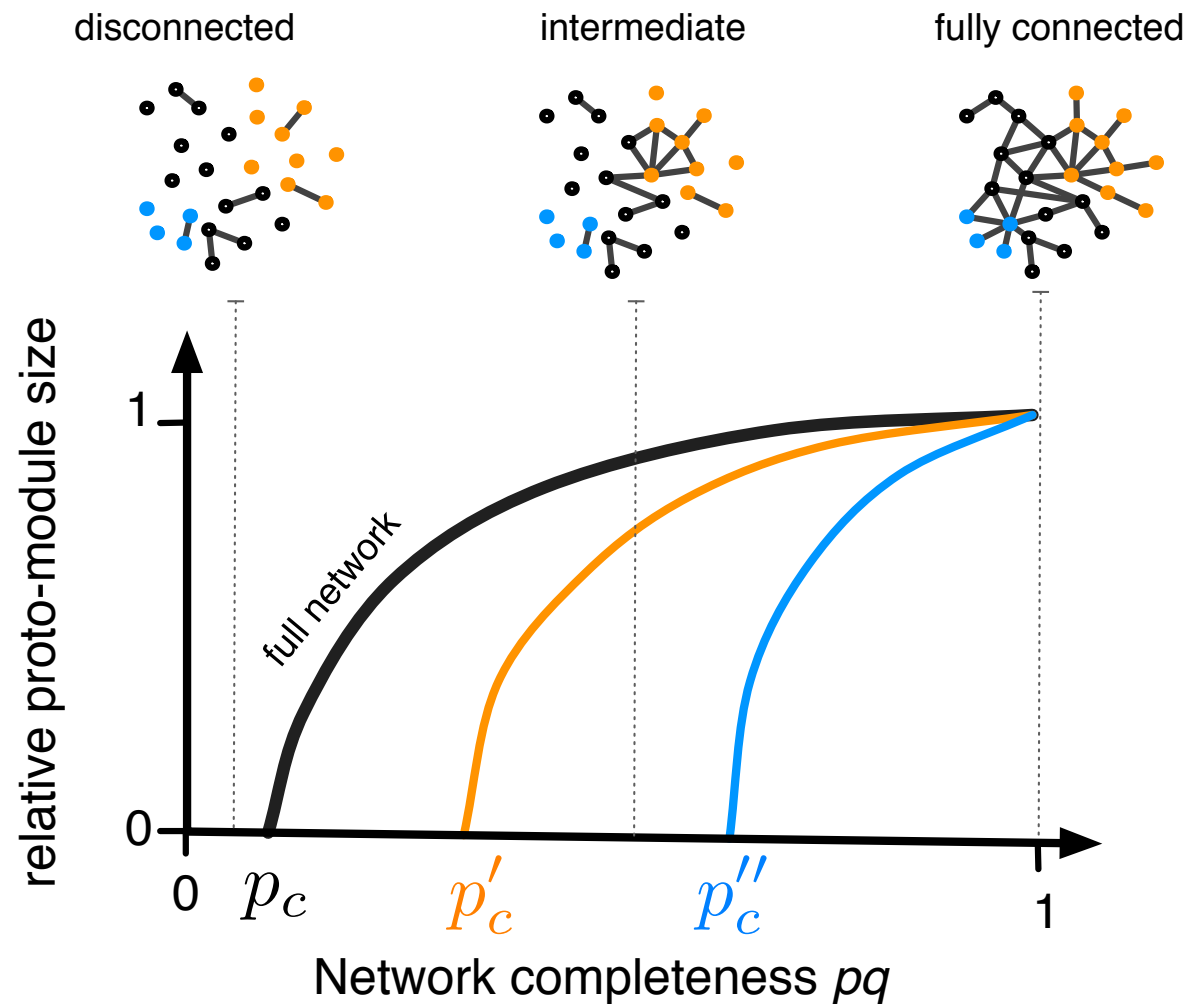
Disease Clusters and Incompleteness



Incompleteness and percolation theory



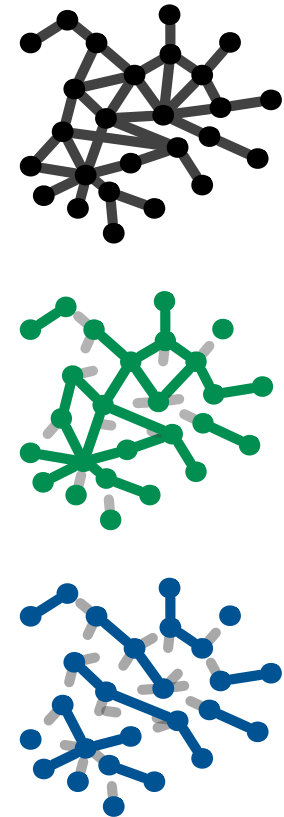
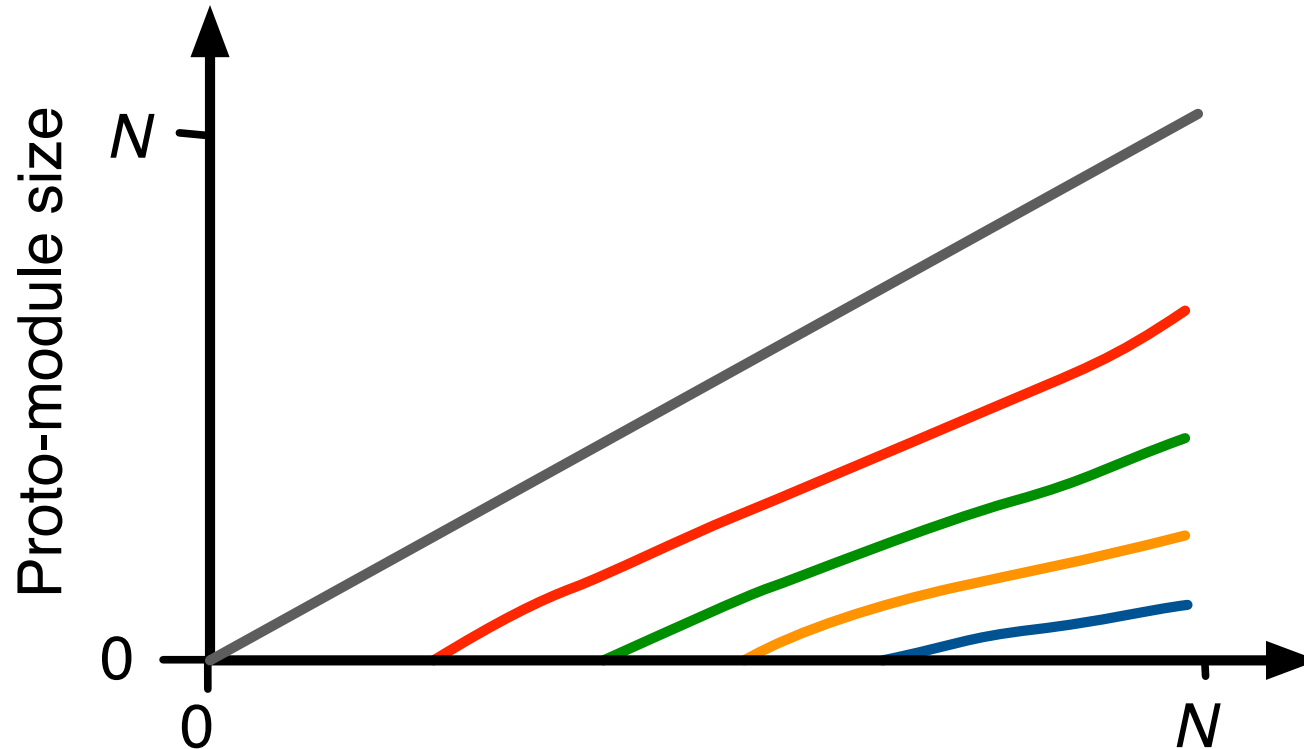
Incompleteness and percolation theory



Incompleteness and Percolation Theory

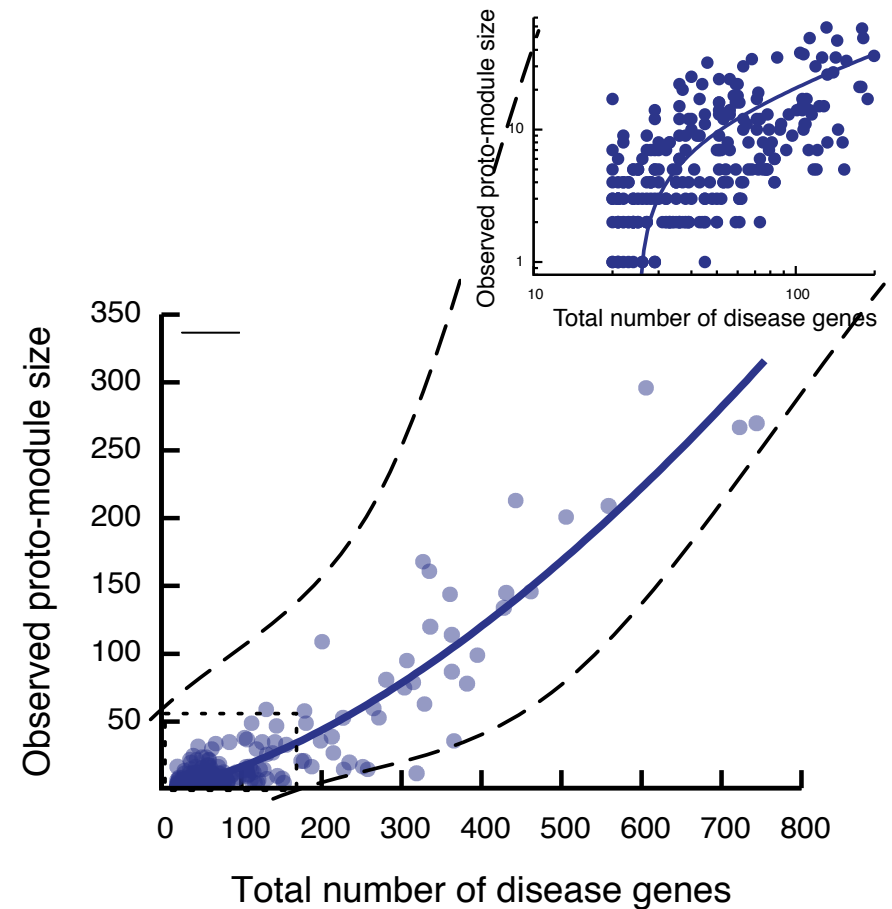
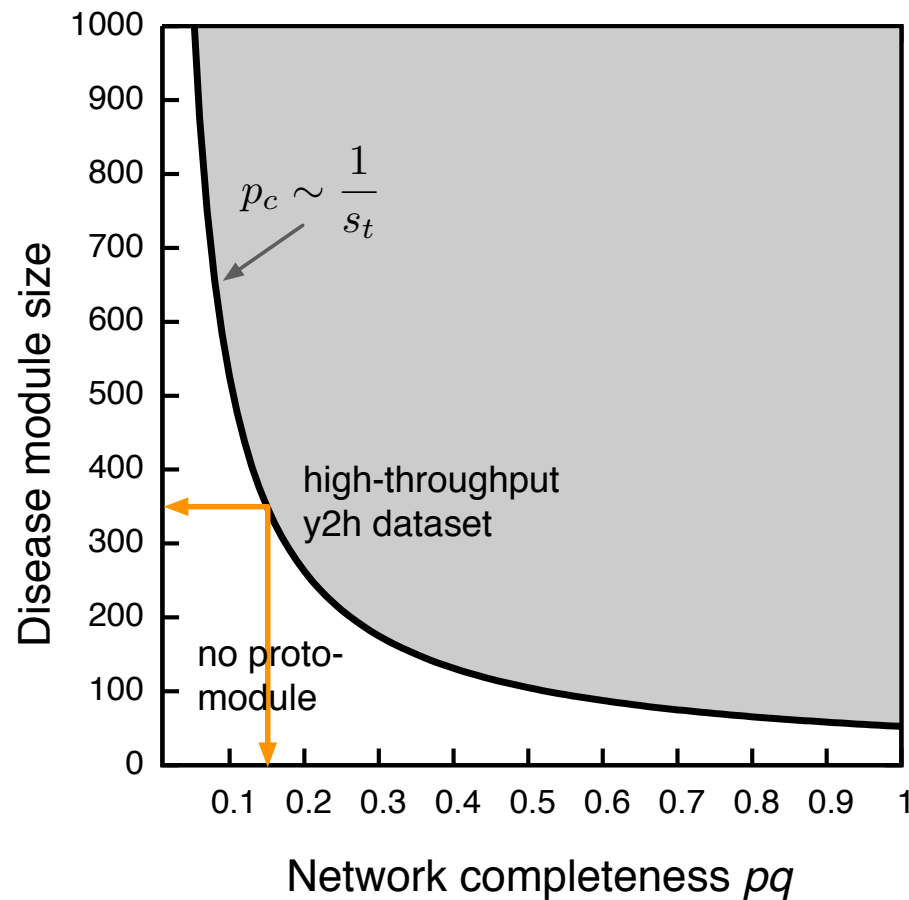
network completeness:

$$p_1 > p_2 > p_3 > p_4$$

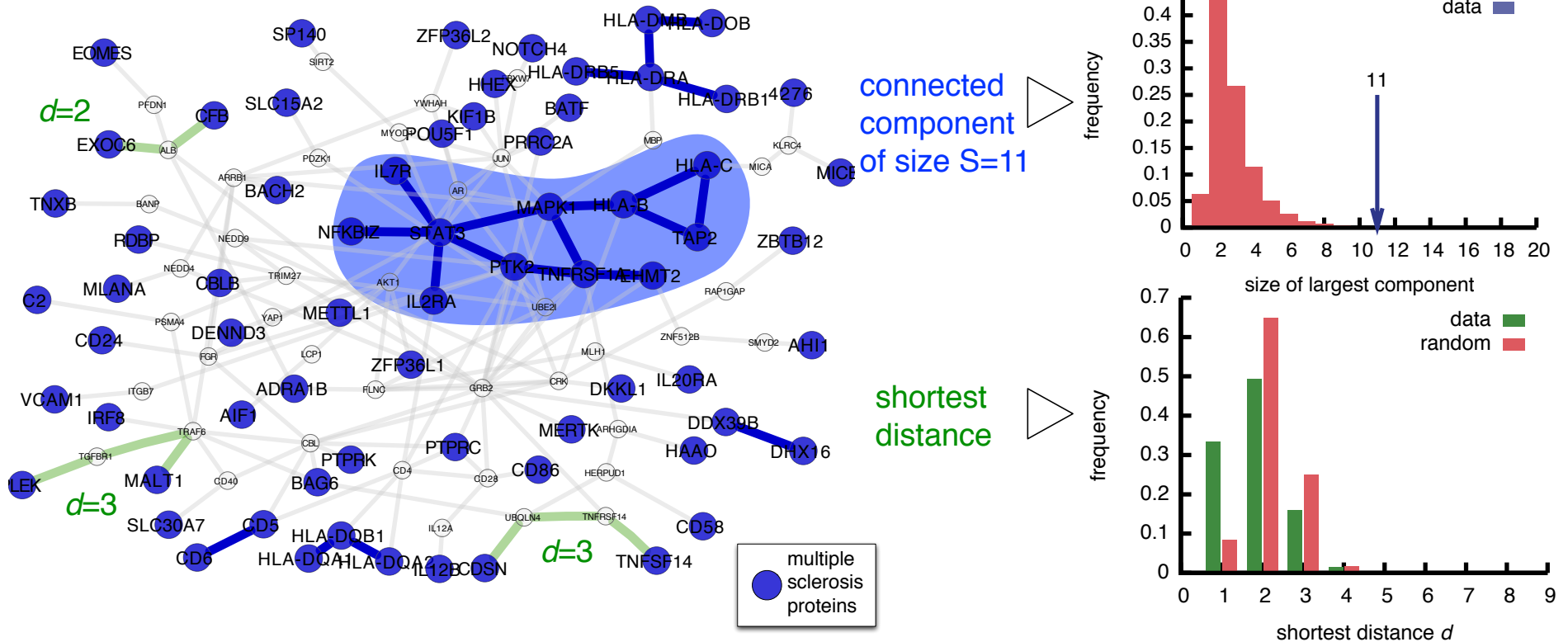


disease module size in full network

Incompleteness and Percolation Theory

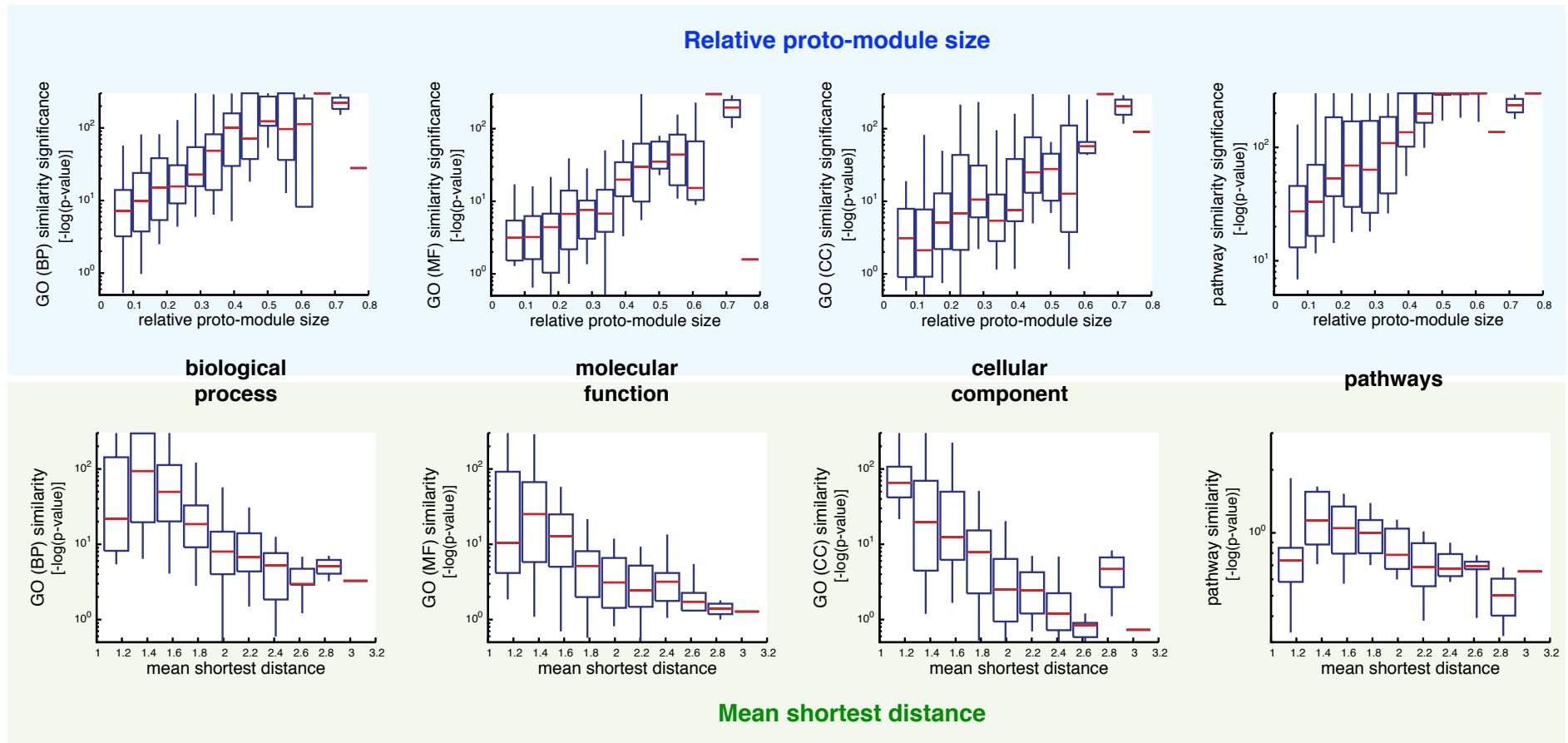


Quantifying Network Localization



226 out of 299 diseases show significant localization according to both measures

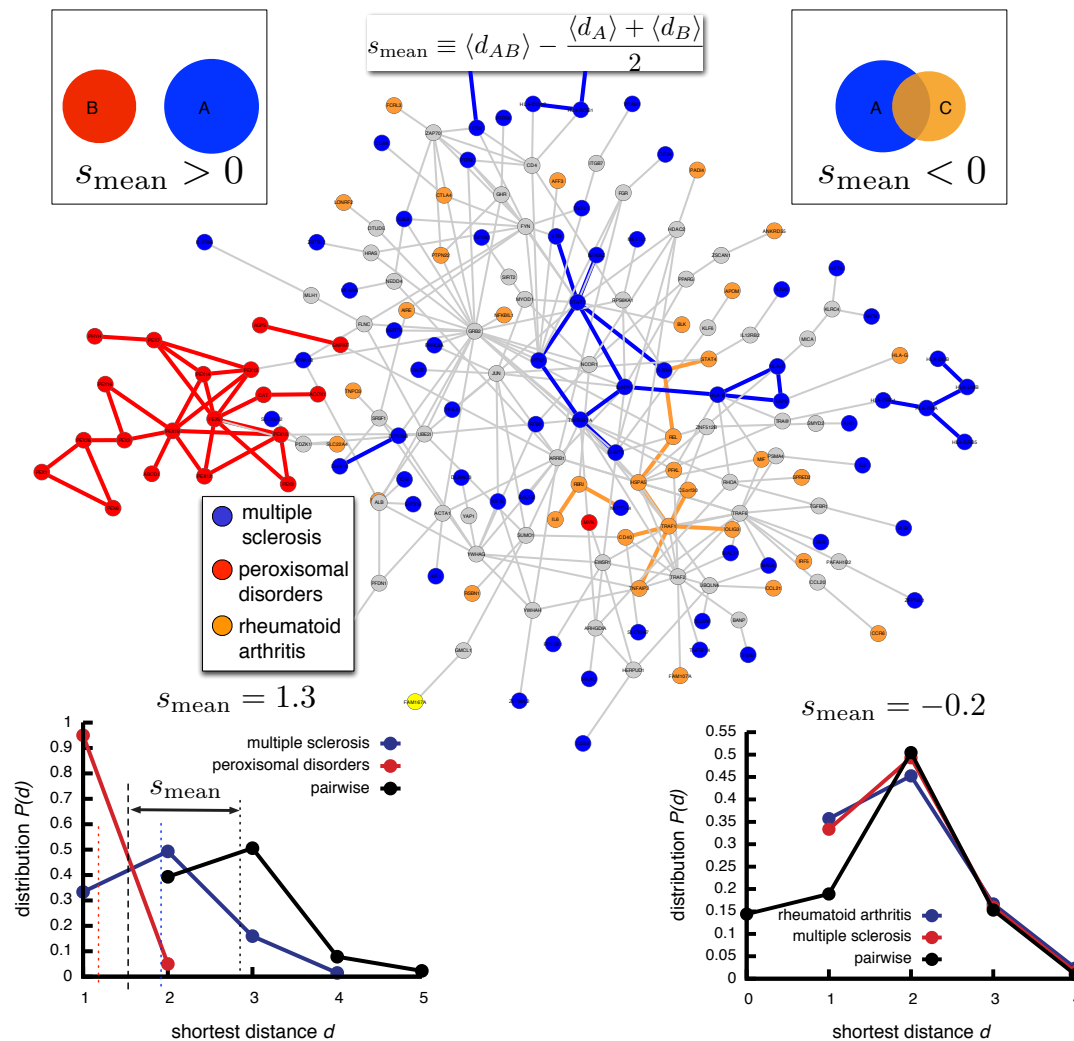
Network Localization and Biological Homogeneity



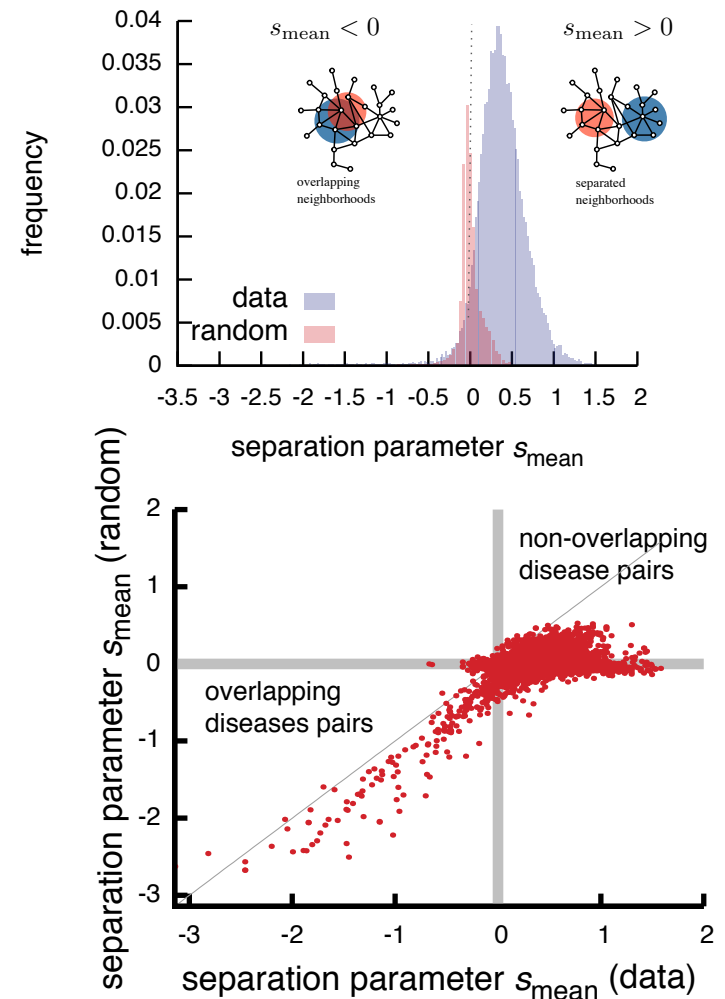
The more localized a disease is, the more significant is the biological similarity of its genes

Network Distance between Diseases

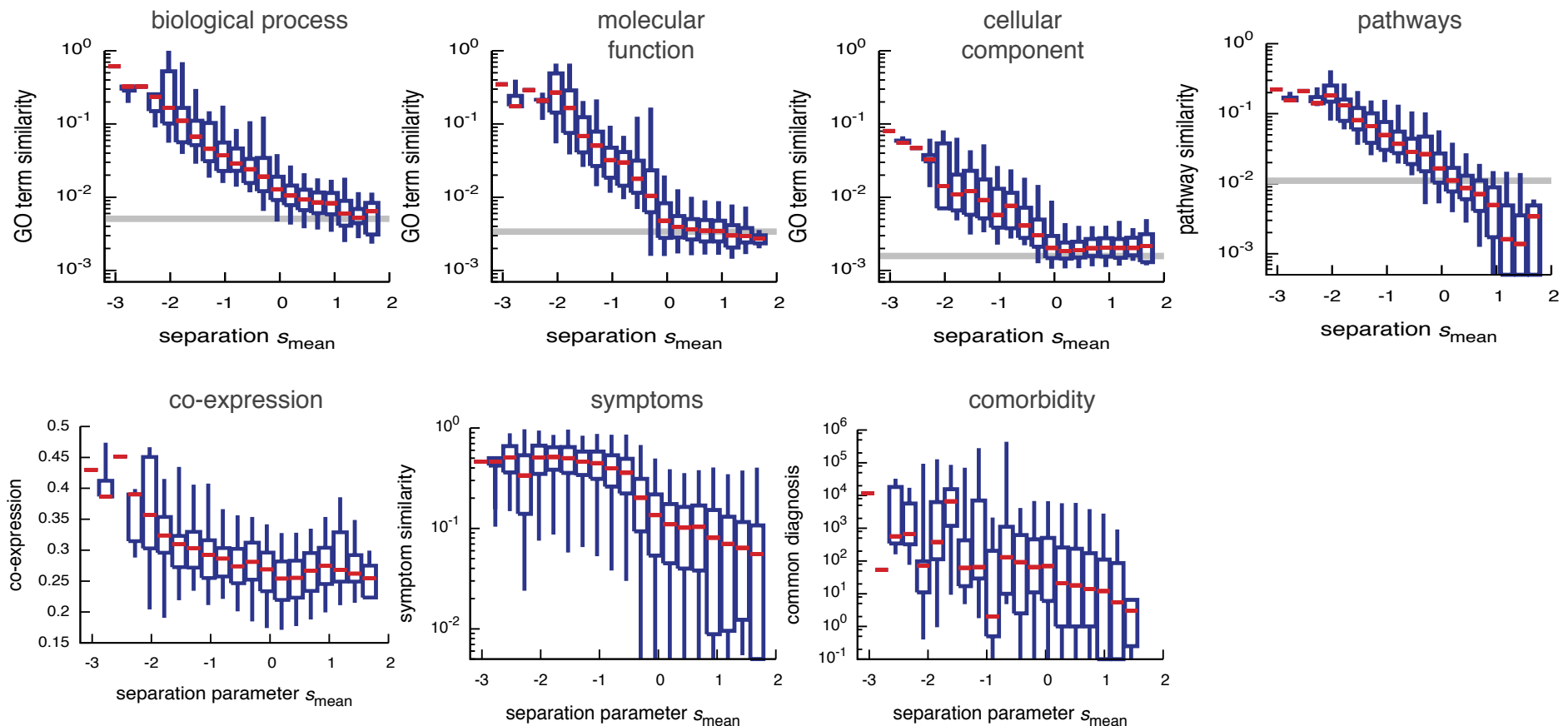
Measuring disease separation



Topological separation for all disease pairs

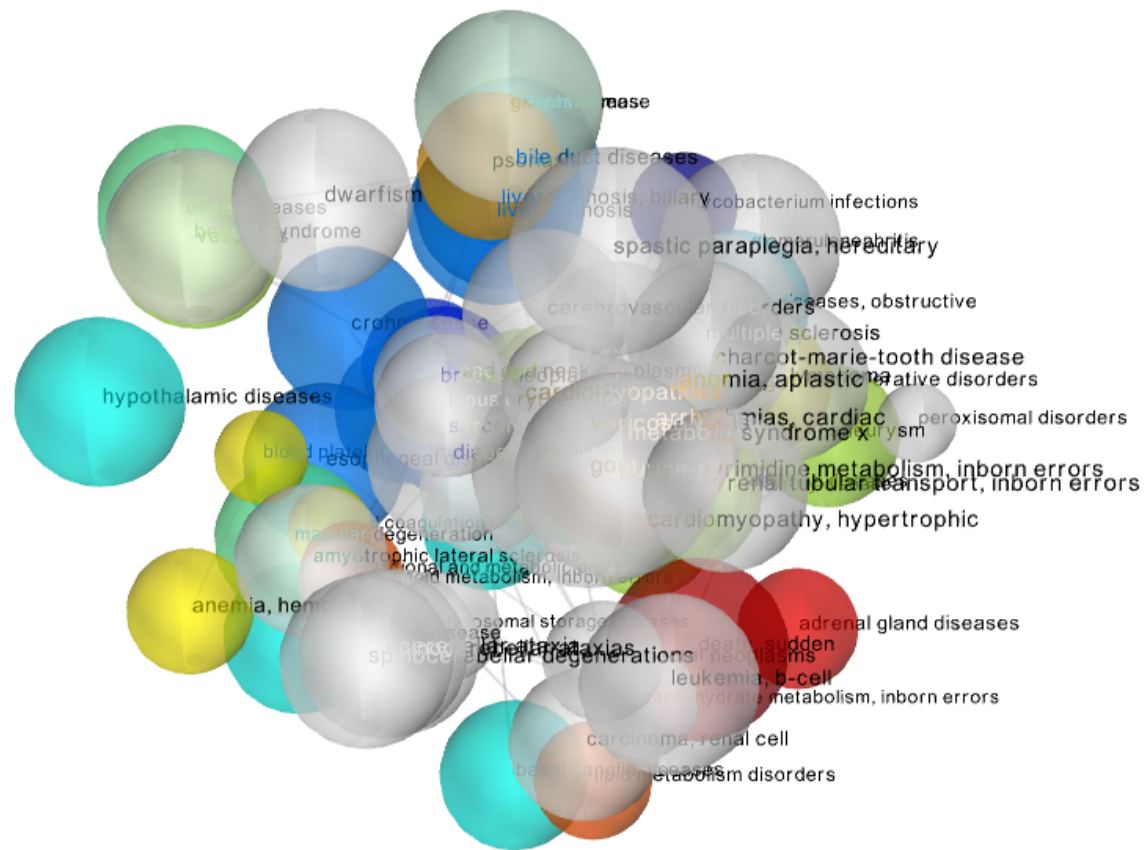


Network Distance and Biological Similarity



The more separated two diseases are on the network, the less similar are their biological features, from gene similarity to co-expression to symptoms and comorbidity

Disease – Disease Space



Acknowledgements

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