Special Topics in Computational Network Biology Fall 2016
Syllabus

1 Background

1.1 Foundations
- Introductory graph theory
- Introductory probability theory
- Introduction to molecular networks

1.2 Readings

2 Graph structure learning for network inference

2.1 Foundations
- Probabilistic graphical model representation of molecular networks
- Bayesian networks
- Dependency networks
- Bootstrap and stability selection
- Statistical Regression

2.2 Readings
3 Integrative network inference

3.1 Foundations

- Models for integrating diverse data types
- Prior-based approaches
- Regularized regression

3.2 Readings


4 Dynamics and context-specificity of networks

4.1 Foundations

- Models to represent dynamics in networks
- Dynamic Bayesian networks
- Hidden Markov Models
- Multi-task learning
- Graphical Gaussian models.

4.2 Readings


5 Graph clustering to detect network modules

5.1 Foundations
- Introductory linear algebra
- Clustering
- Modularity measures on graphs
- Spectral clustering
- Dense subgraph mining/attributed subgraph mining
- Hierarchical agglomerative graph clustering

5.2 Readings

6 Graph comparison and alignment

6.1 Foundations
- Types of graph alignment problems
- Scoring and seeding in graphs
- Matrix completion and factorization

6.2 Readings
7 Information flow on graphs for prioritization, integration and interpretation

7.1 Foundations

- Random walk on the graph
- Nested effect models
- Factor graphs
- Steiner tree, max flow

7.2 Readings


