

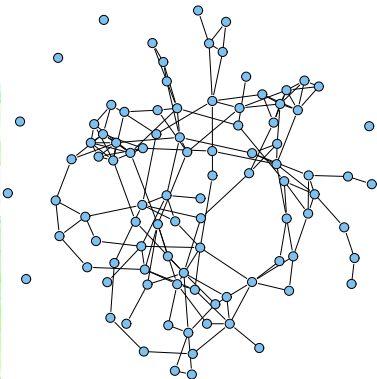
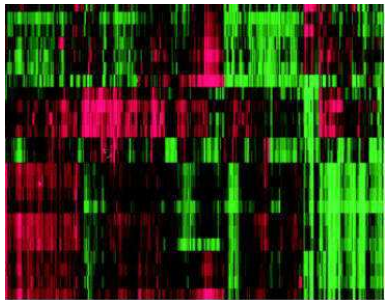
Composite Graphical Model

Frank Jian Guo

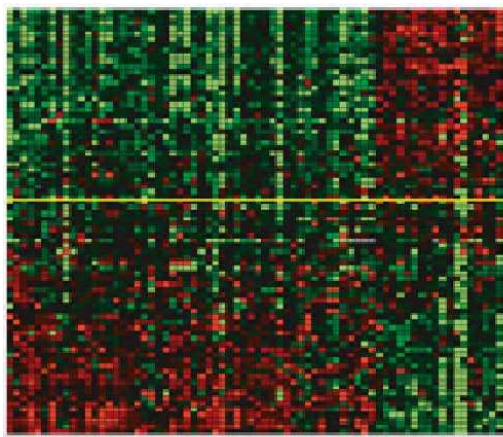
Department of Statistics, University of Michigan, Ann Arbor, MI 48105, USA

- Joint work with Elizaveta Levina, George Michailidis and Ji Zhu

Illustrated example: microarray data



Heterogeneous data: leukemia cancer

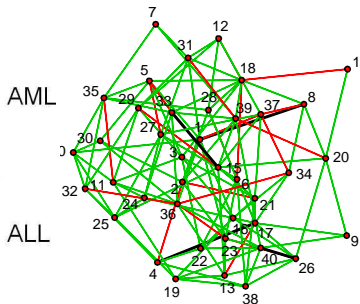
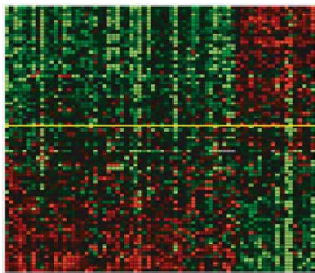


AML

ALL

Separate estimation

- Relative small sample size in each category.
- This may result in completely different network structure that do not share any common common links and hence resulting in making interpretation difficult.



Composite graphical model — Joint estimation

Idea

Jointly learns K individual graphical models while encouraging individual links to be removed. Specifically, we treat $\omega_{j,j'}^{(1)}, \dots, \omega_{j,j'}^{(K)}$ as a group and encourage them to be removed simultaneously.

$$\Omega^{(1)} = \begin{bmatrix} \omega_{1,1}^{(1)} & \omega_{1,2}^{(1)} & \omega_{1,3}^{(1)} \\ \omega_{2,1}^{(1)} & \omega_{2,2}^{(1)} & \omega_{2,3}^{(1)} \\ \omega_{3,1}^{(1)} & \omega_{3,2}^{(1)} & \omega_{3,3}^{(1)} \end{bmatrix} \quad \Omega^{(2)} = \begin{bmatrix} \omega_{1,1}^{(2)} & \omega_{1,2}^{(2)} & \omega_{1,3}^{(2)} \\ \omega_{2,1}^{(2)} & \omega_{2,2}^{(2)} & \omega_{2,3}^{(2)} \\ \omega_{3,1}^{(2)} & \omega_{3,2}^{(2)} & \omega_{3,3}^{(2)} \end{bmatrix}$$

Thank you all very much!