

Graphical Models

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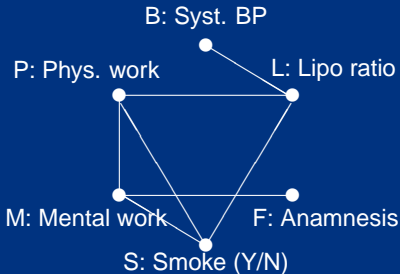
EPSRC visit, Oxford, June 2004

What is a graphical model?

- Models interrelationships among variables in complex systems
- Represents variables with nodes in a graph and links between directly interrelated variables
- Enables modular specification and analysis
- Clear and well-defined meaning through encoding conditional independence relations
- Efficient computation algorithms exist which enable fast computation even in very complex systems.

Undirected graphical models

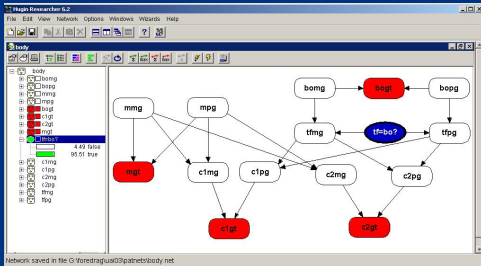
Associations between risk factors for coronary heart disease among car factory workers.



Given L , B is independent of S, F .

Directed graphical models

Identification of unknown body using DNA



Is a recovered body also the body of the father of these two children?

Research topics

Causal inference Understand and explain concepts of causation natural to directed graphical models

Genetics Family relationships between individuals lend themselves naturally to be described in terms of graphical models, e.g. in forensic genetics

Structure estimation Develop theory, algorithms and implementations to learn relationships from large amounts of data

gR Develop software abstractions and algorithms which fully exploits modular structure.