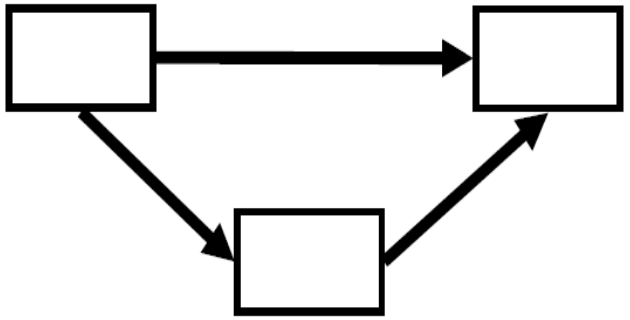
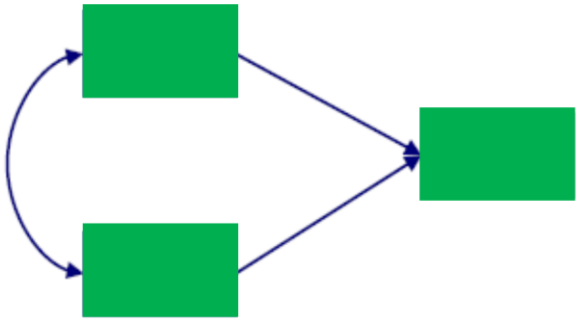
STRUCTURAL EQUATION MODELING (SEM)

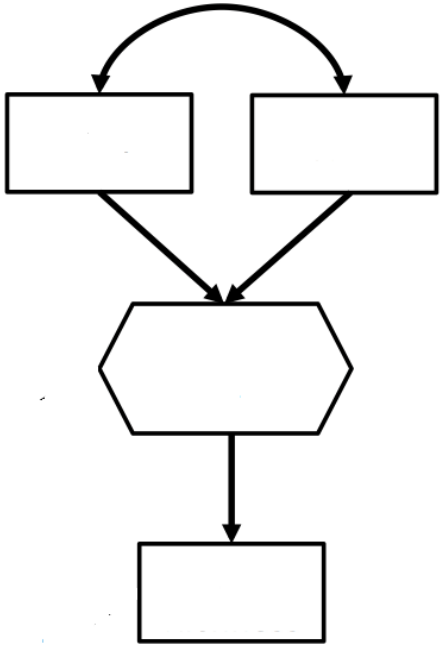
- Provides a framework for learning about casual processes
- The use of 2 or more structural equations to model multivariate relationships
- Evaluation of networks of direct and indirect effects



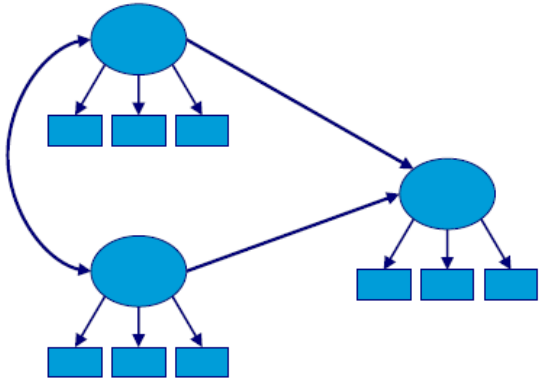
STRUCTURAL EQUATION MODELING (SEM)



Observed variables = Path analysis



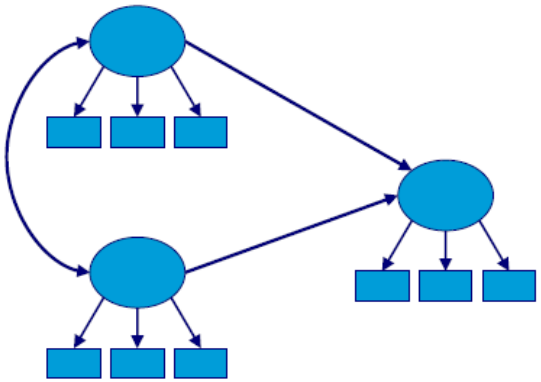
Latent variables



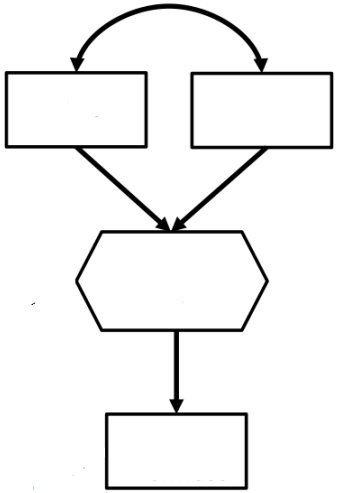
Composite variables

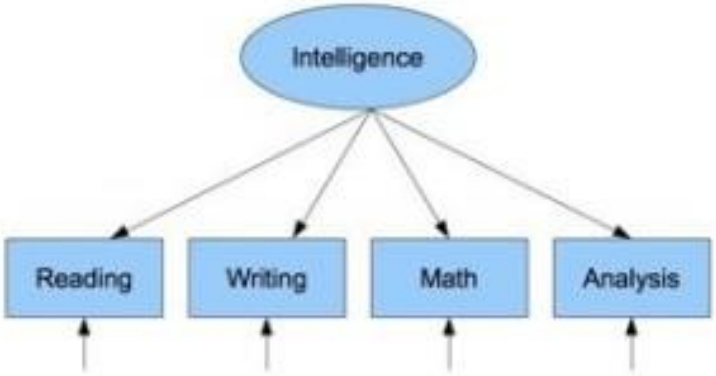
STRUCTURAL EQUATION MODELING (SEM)

Latent variables



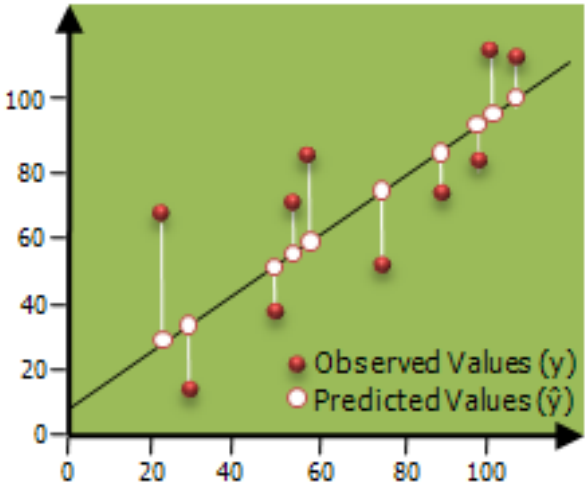
Composite variables



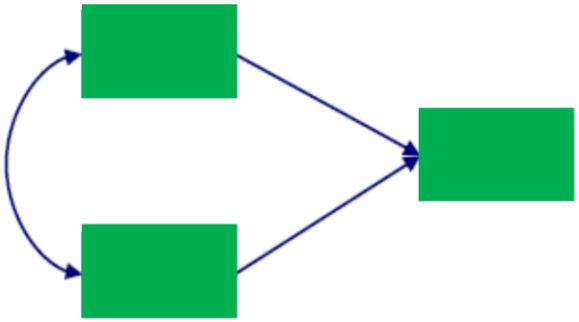


IVI: density, frequency, dominance
CEC: pH, MO, atomic weights of elements

SEM WITH OBSERVED VARIABLES: OR PATH ANALYSIS



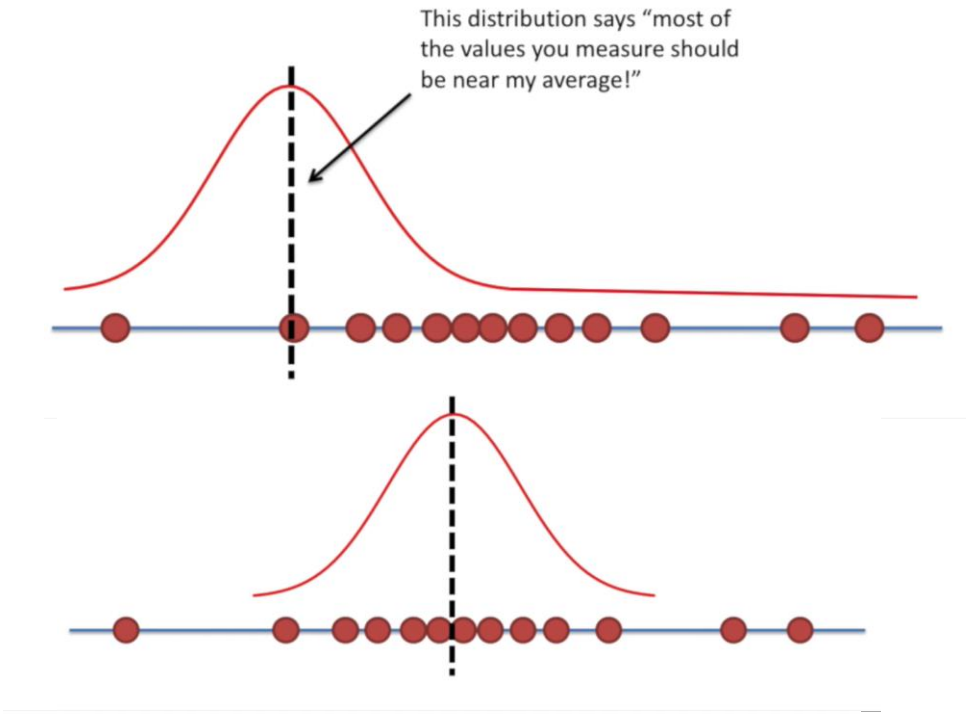
Classical path analysis:
Ordinary least squares

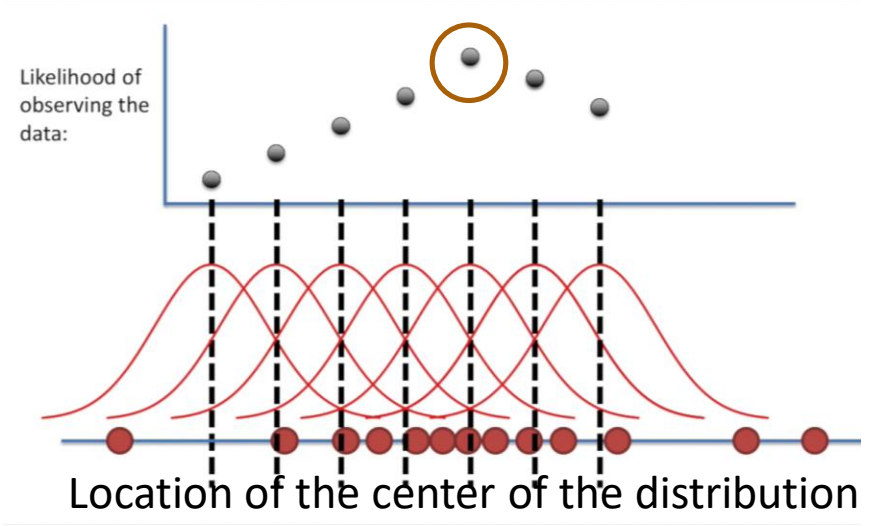


Moderm path analysis in SEM:
Maximum likelihood

is a method of estimating the parameters of a statistical model given observations, by finding the parameter values that maximize the likelihood of making the observations given the parameters.

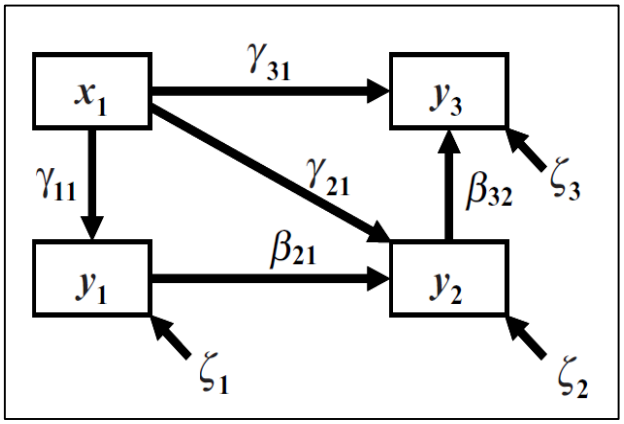
Understanding máximum likelihood





We want the location that "maximizes the likelihood" of observing the weights we measured

In SEM data informs the model and no the other way around



Understanding mediation

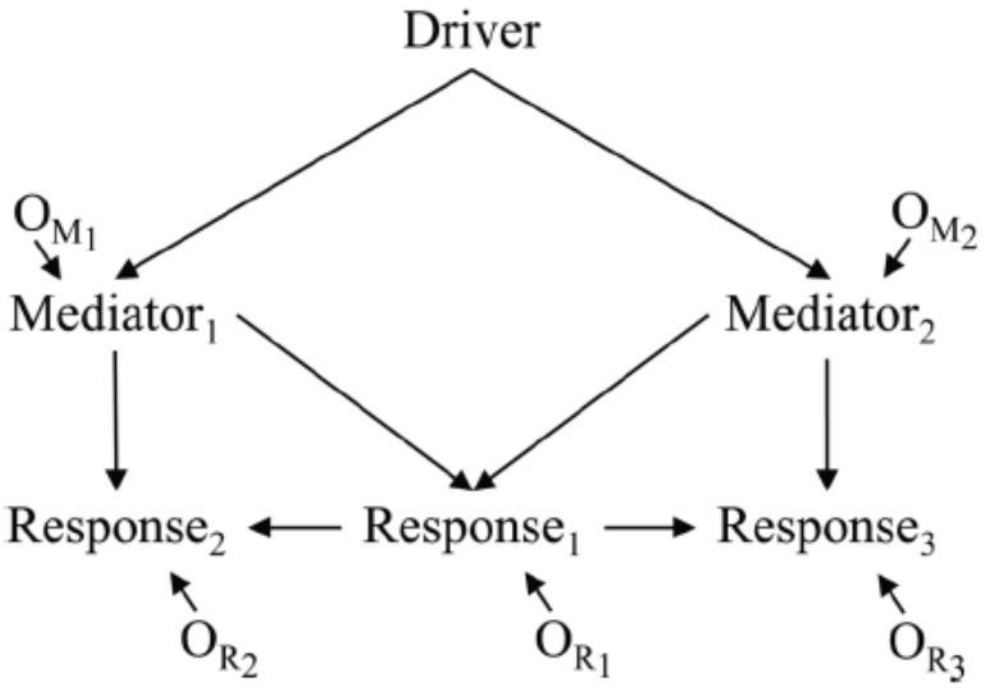
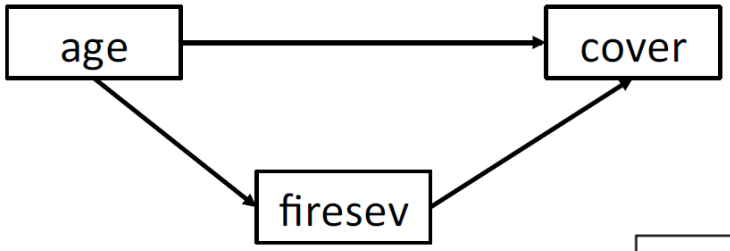
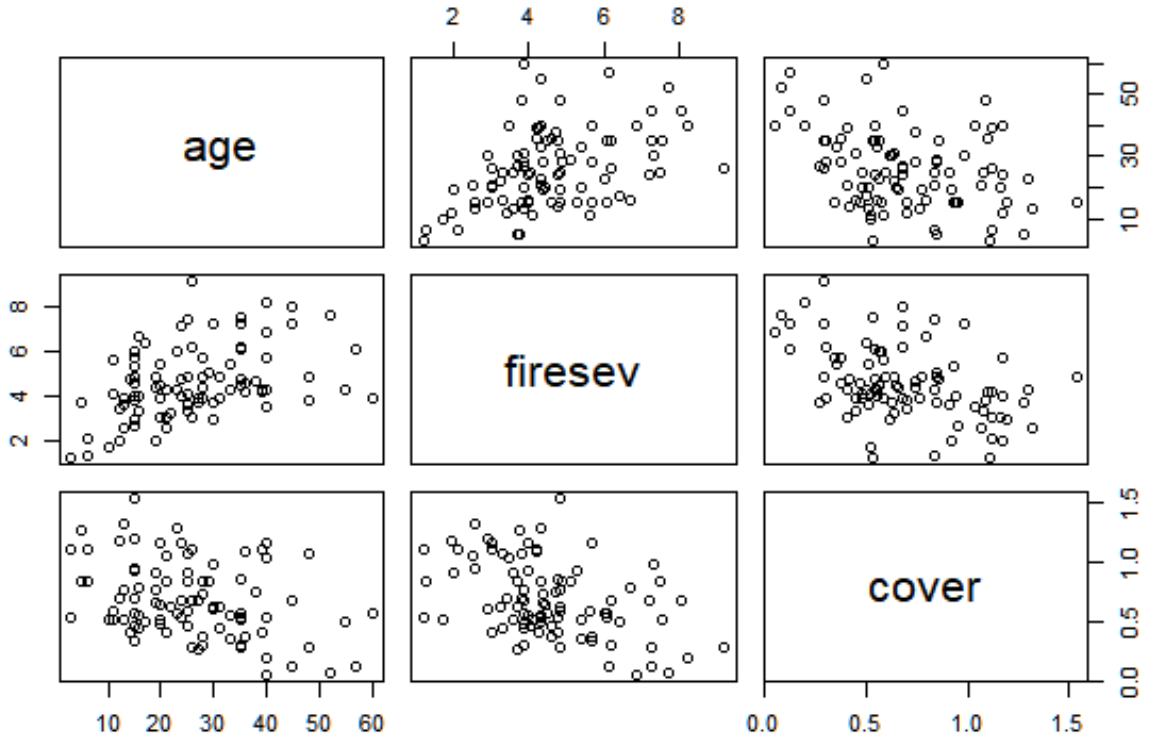


Fig. 2. Hypothetical causal diagram showing a hypothesized graph showing relations between a Driver, two Mediators, and three Responses of interest

Hypothetical cusa

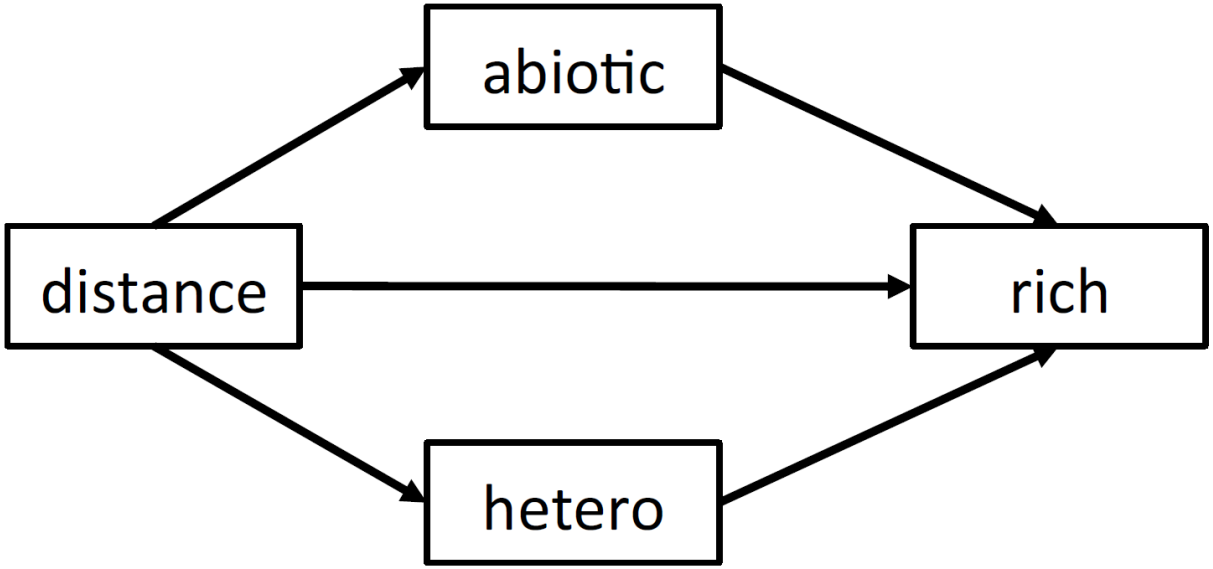
Understanding mediation



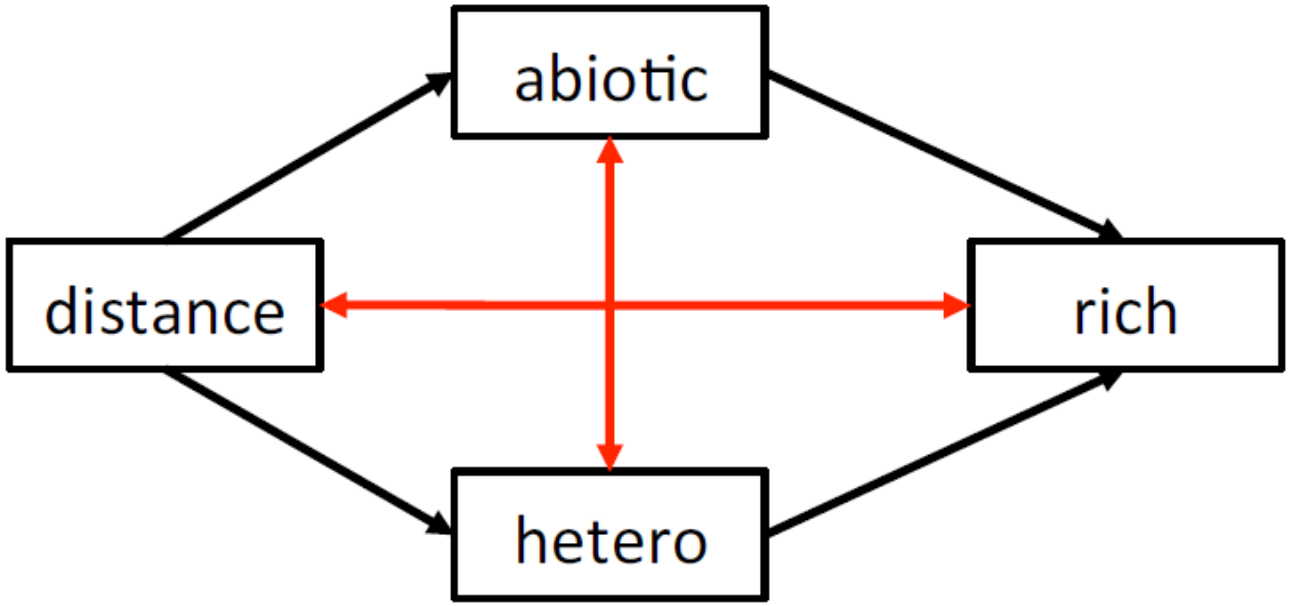


Exercise

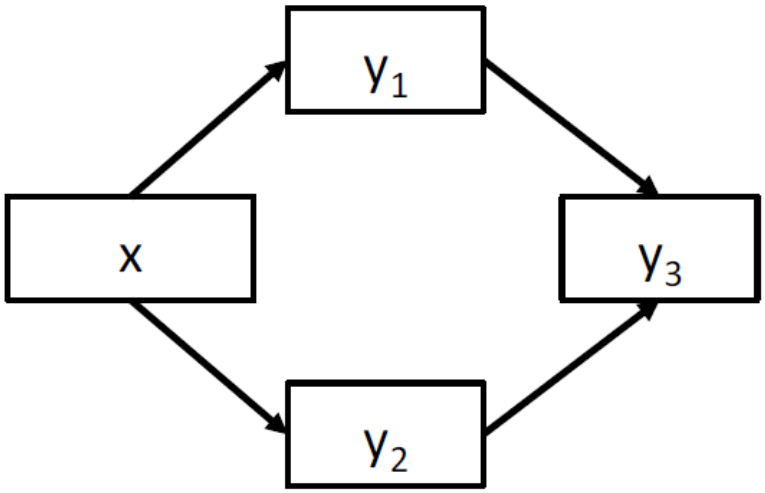
1. Evaluate the following model
2. Fill the standardized coefficients
3. Test for mediation for the richness~distance relationship



Are we missing other paths?

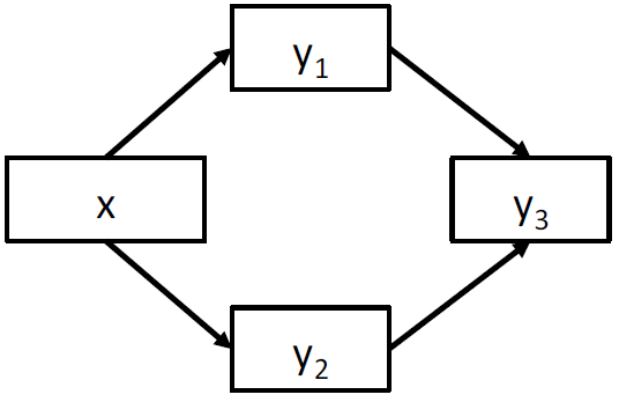


Directed separation or *d*-separation



Two nodes are d-separated if they are conditionally independent

Which relationships to test: the *basis set*



The basis set is the smallest possible set of d-separation relationships from a graph.

1. $x \perp y_3 \mid (y_1, y_2)$

2. $y_1 \perp y_2 \mid (x)$