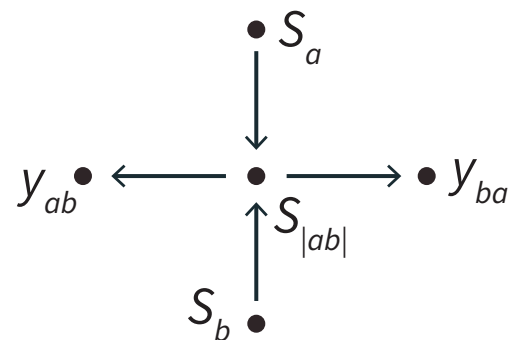
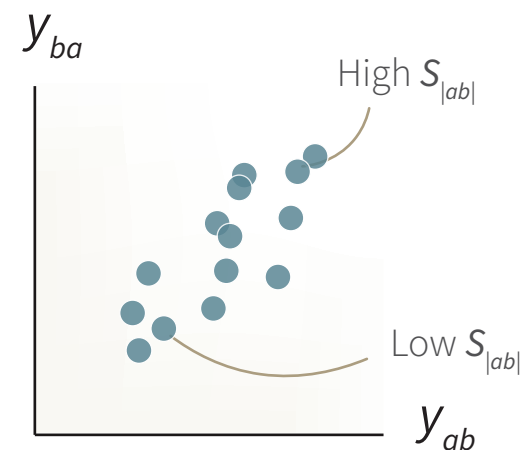


Causal process

A. Sampling effort

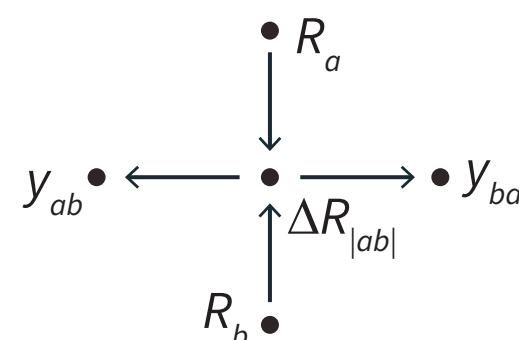


Statistical pattern

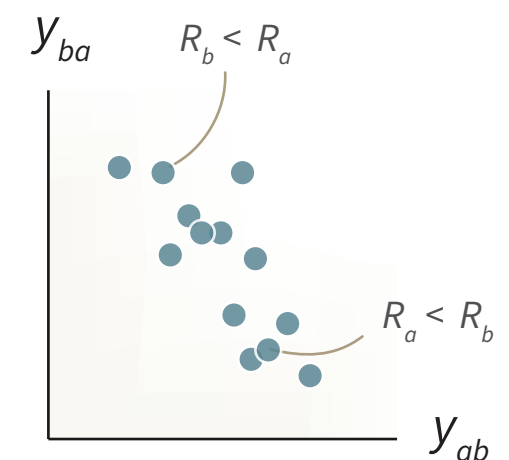


Causal process

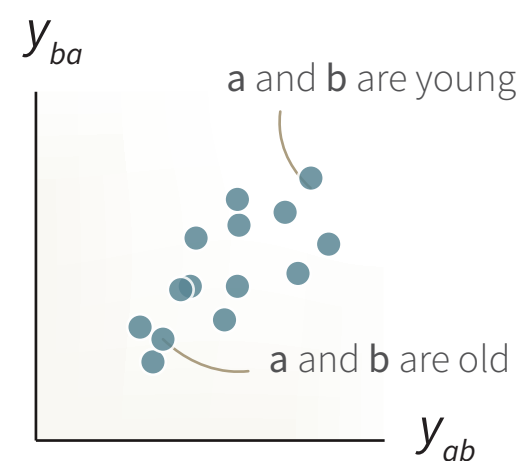
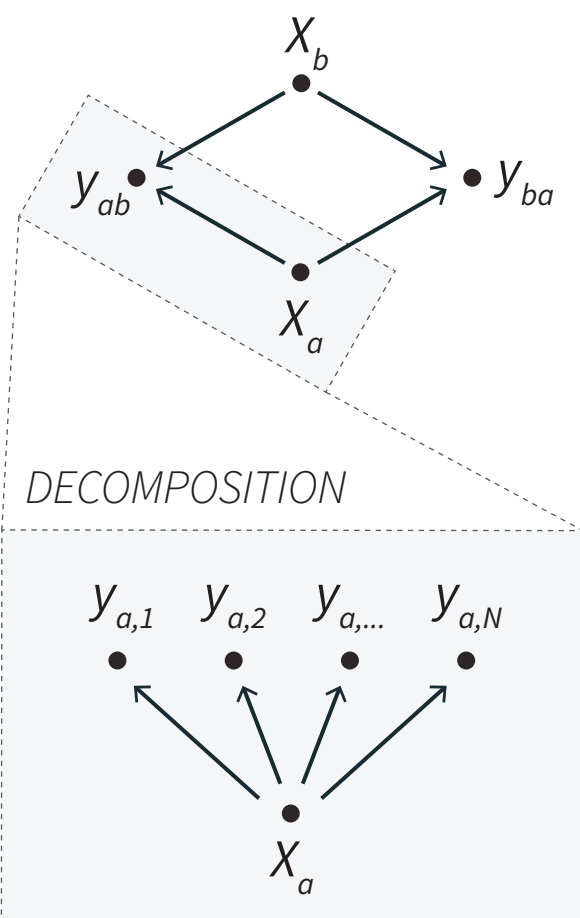
C. Dyad features (e.g., dominance)



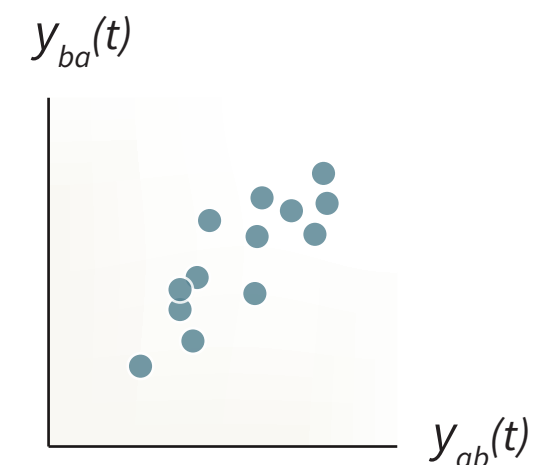
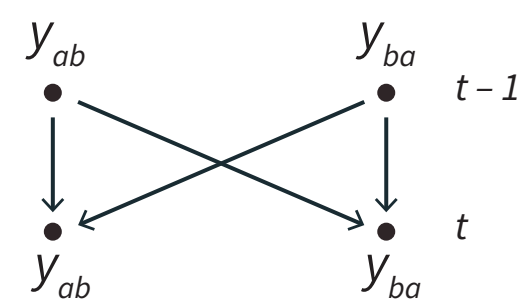
Statistical pattern



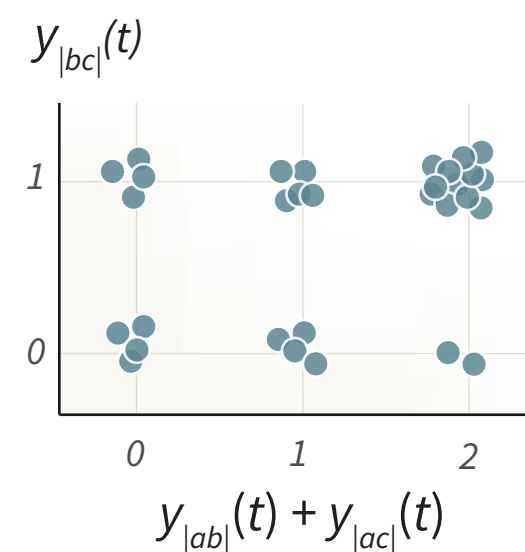
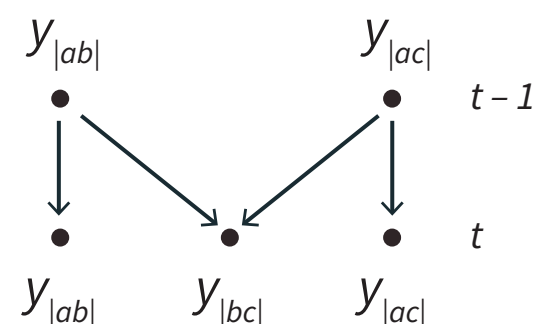
B. Individual features (e.g., age)



D. Dyadic reciprocity



E. Triadic closure



Causal diagram

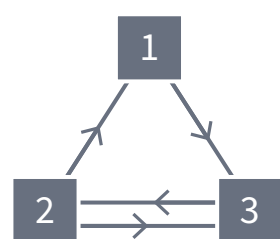
Causal assumptions



The *variable* X influences the *variable* Y

Social network

Social interactions among $N = 3$ individuals



Squares represent *individual animals*

a	b	y_{ab}	y_{ba}	X_a	X_b
1	2	0	1	2.1	4.8
1	3	1	0	2.1	7.0
2	3	1	1	4.8	7.0

Symbols

Variable names

a, b	Identifier <i>variable</i>
y_{ab}	Observed interactions from a to b
y_{ba}	Observed interactions from b to a
$y_{a,1}$	Observed interactions from a to 1
$y_{a,N}$	Observed interactions from a to N

$y_{ ab }$	Undirected edge between a & b
S_a, S_b	Individual-level sampling effort
$S_{ ab }$	Dyad-level sampling effort
X_a, X_b	Individual-level trait (e.g., age)
R_a, R_b	Dominance rank
$\Delta R_{ ab }$	Difference in rank between a & b