

Structure & homophily

Structure and homophily

Homophily

McPherson, Smith-Lovin, and Cook (2001)

- ∴ (Canonical) review of research on types, rates, and causes of homophily
- ∴ More than 20 years old

Baseline homophily

- ∴ Homophily that is based just on who is available to connect with in some large population
- ∴ E.g., baseline homophily on country of birth for Canadian residents would be about 78.55% *for those born in Canada*

“Inbreeding” homophily

- ∴ **Choice**: preference to form, e.g., trust relations with people with similar experiences
- ∴ **Structural**: increased opportunities to form ties with similar alters due to, e.g., residential segregation, religious practices, homogenous professional networks, etc.

Structure and homophily

Homophily as *cause* or *consequence* of ties?



Structure and homophily

Homophily as *cause* or *consequence* of ties?

Similarity can lead to relations

- ∴ People with similar interests, experiences, tastes, beliefs may prefer to form and maintain ties with each other

Relations can lead to similarity

- ∴ People who are tied together in a social network may converge in characteristics
- ∴ E.g. transmission of behavior (smoking) or shared experiences (joining the same club)



Structure and homophily

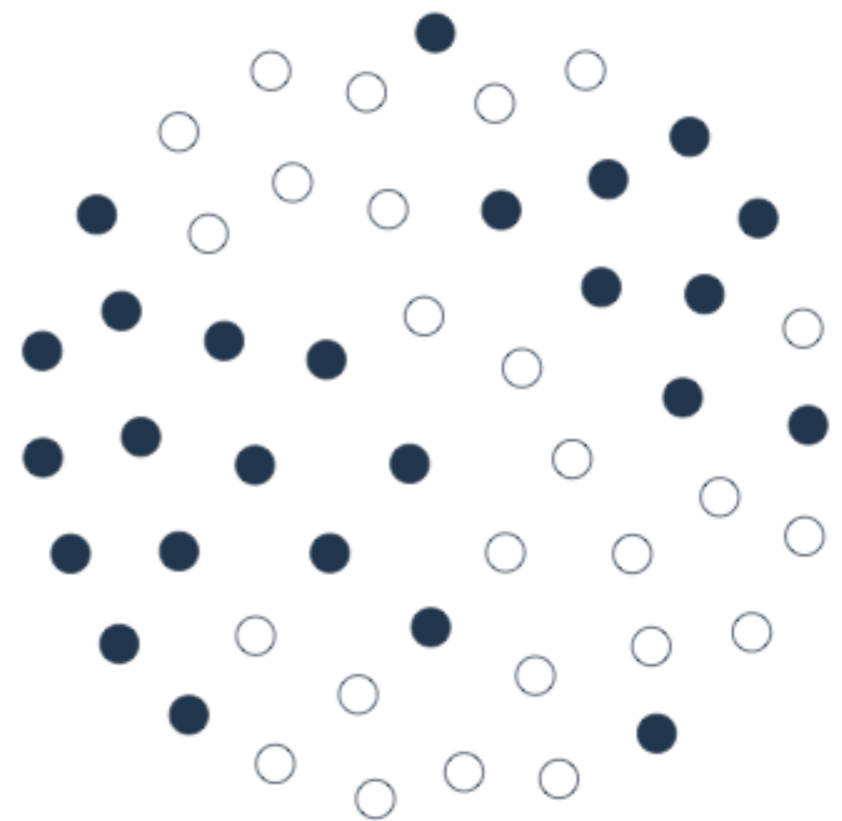
Homophily as structuring force

Tendency toward homophily can influence the overall structure of a network

- ∴ Dense ties within categories
- ∴ Sparse ties between categories

Simple example

- ∴ 50 nodes, ties are 9 times more likely within categories than between
- ∴ Quickly leads to bifurcated network
- ∴ This structure has consequences for the flow of information, opportunities, epidemiology, etc.



Structure and homophily

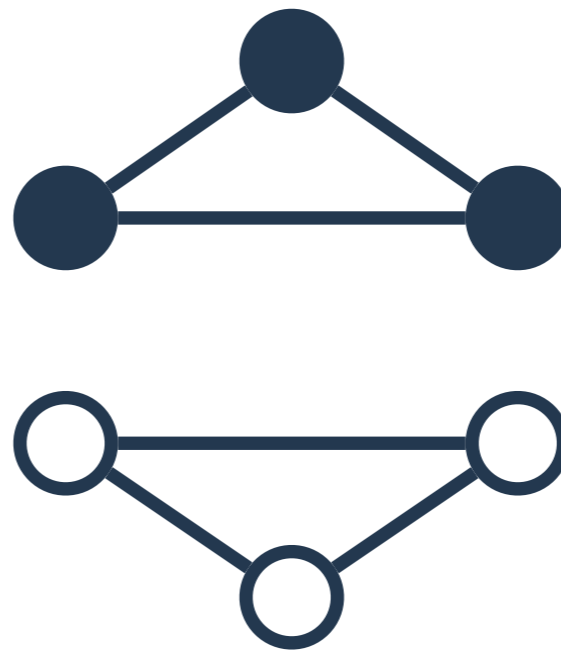
Measuring homophily

How similar are nodes at either end of a relation?

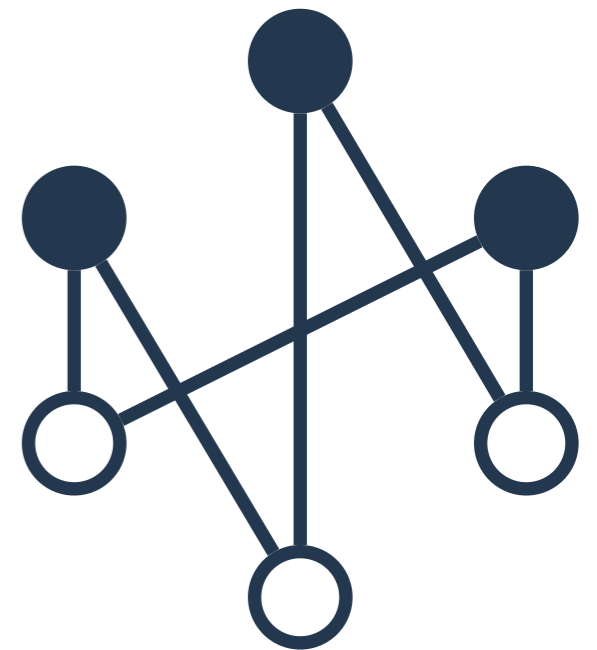
- ∴ Are friendships more common among people of similar age?
- ∴ Are sexual relations less common among people of the same gender?

Assortativity

- ∴ Assortativity is one common measure of homophily in a network
- ∴ Measure of *correlation* between attributes of different nodes
- ∴ Ranges from 1.0 (perfectly assortative) to -1.0 (perfectly disassortative)



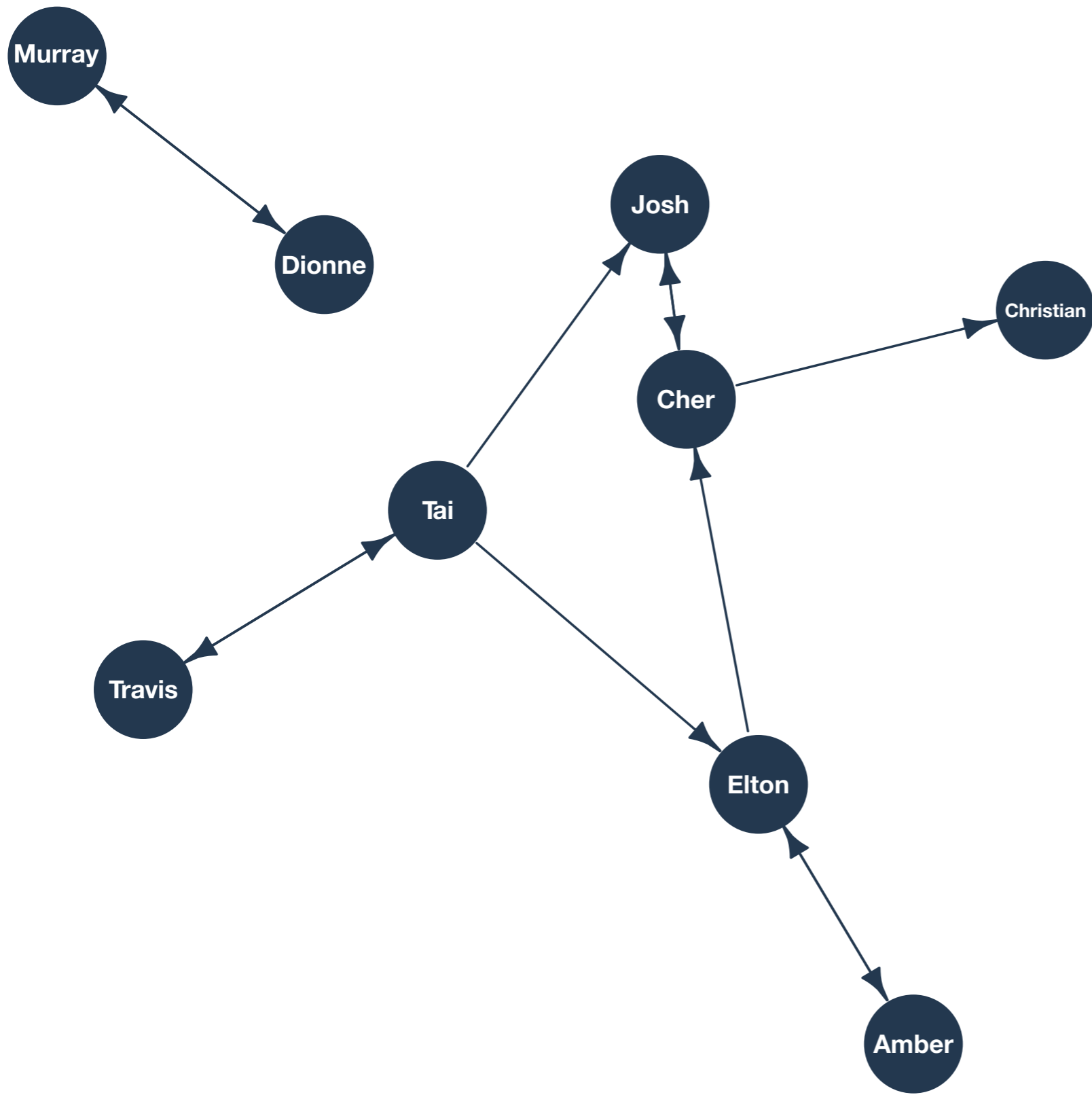
$$A = 1.0$$



$$A = -1.0$$

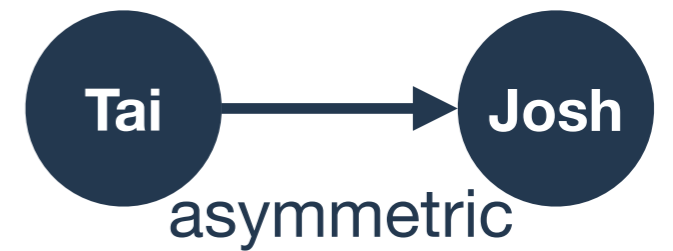
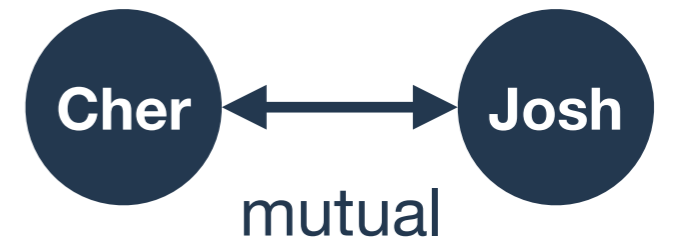
Dyads & triads

Dyads



Romantic interest network from *Clueless* (1995)

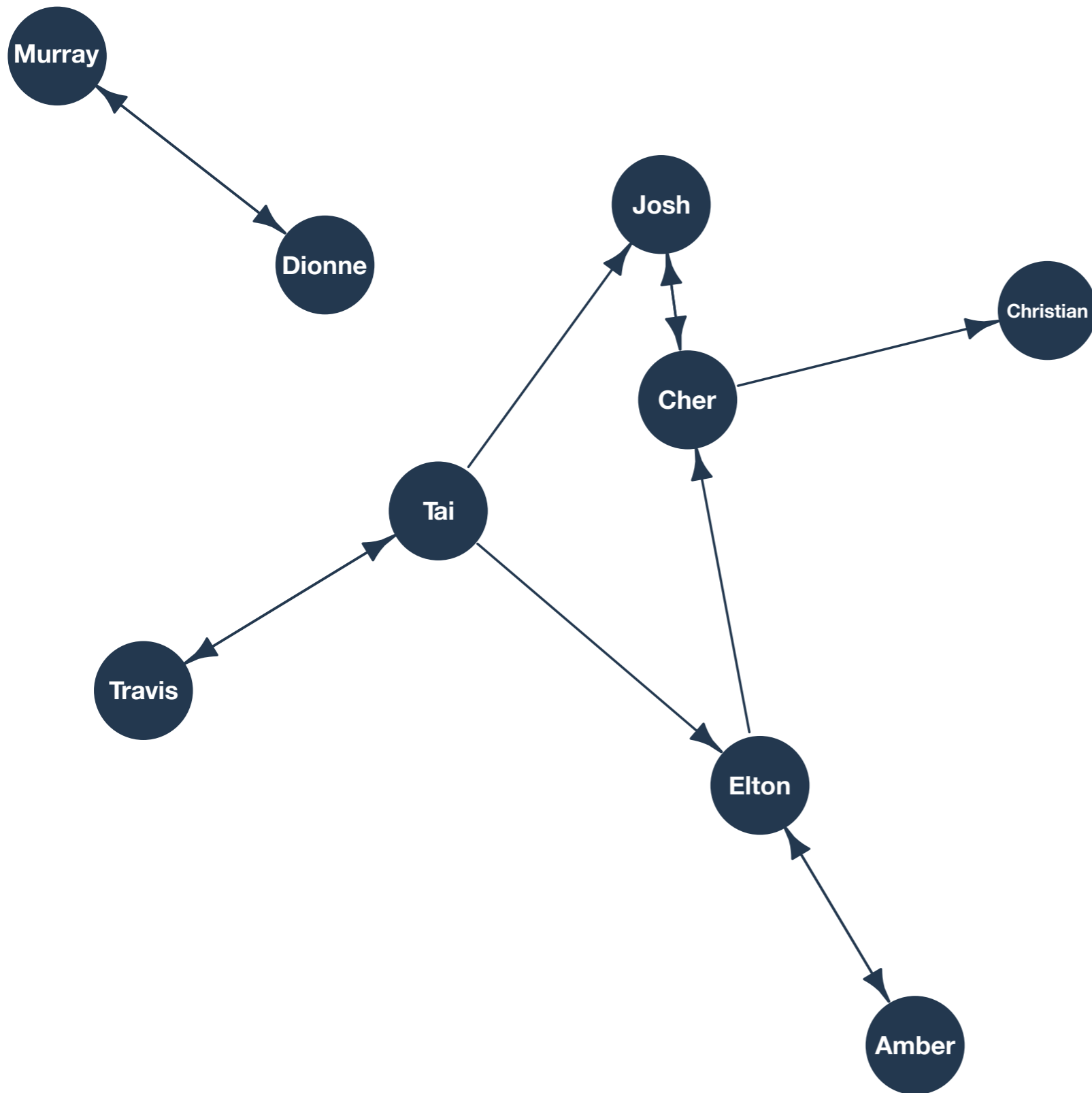
Types of dyads



Dyad census



Dyads



Reciprocity:

Probability that a directed edge is reciprocated

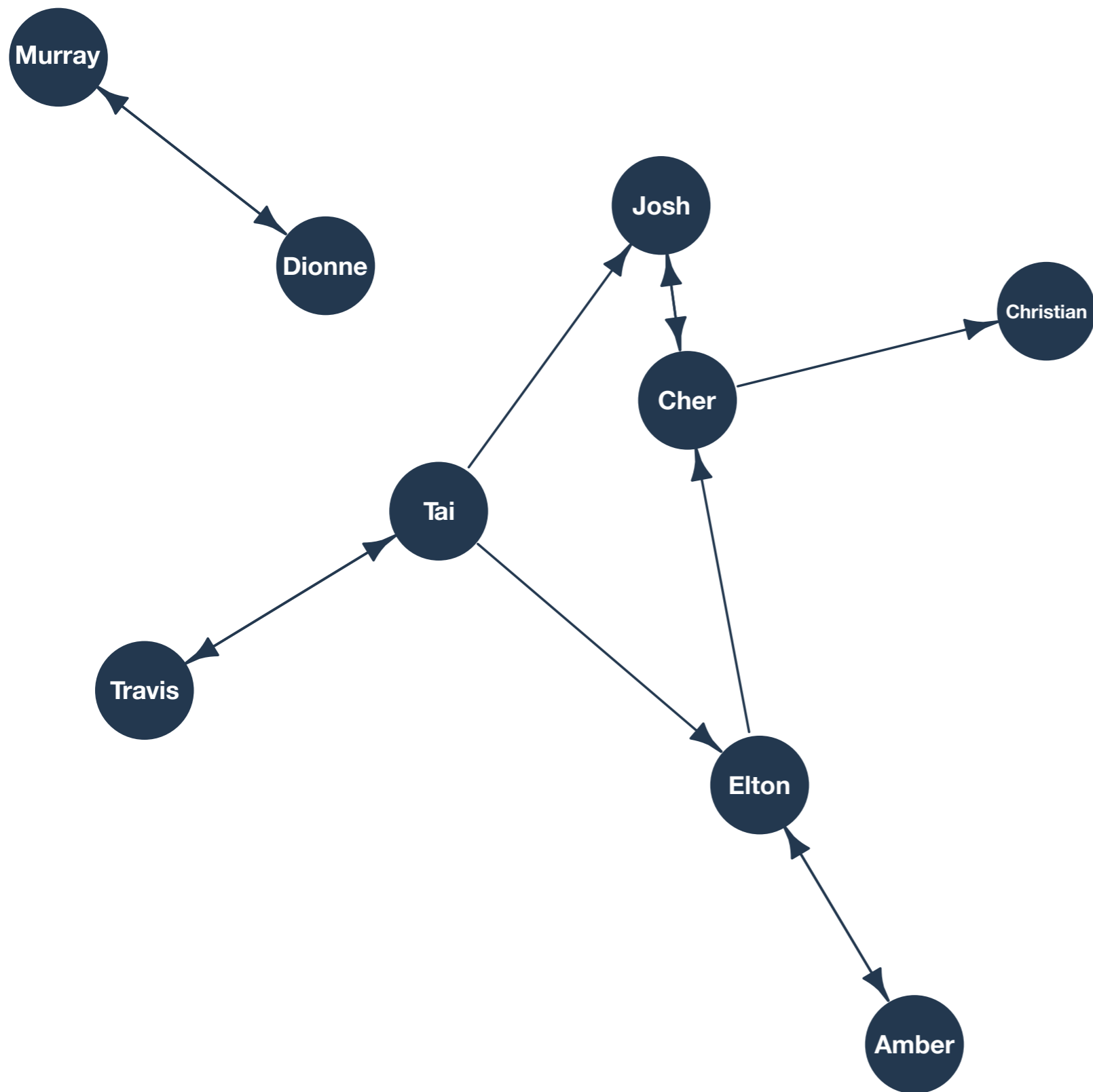
$$\frac{2 \times \updownarrow}{2 \times \updownarrow + \uparrow} = 2/3$$

Dyad census

	4
	4
	28

Romantic interest network from *Clueless* (1995)

Triads



Types of triads

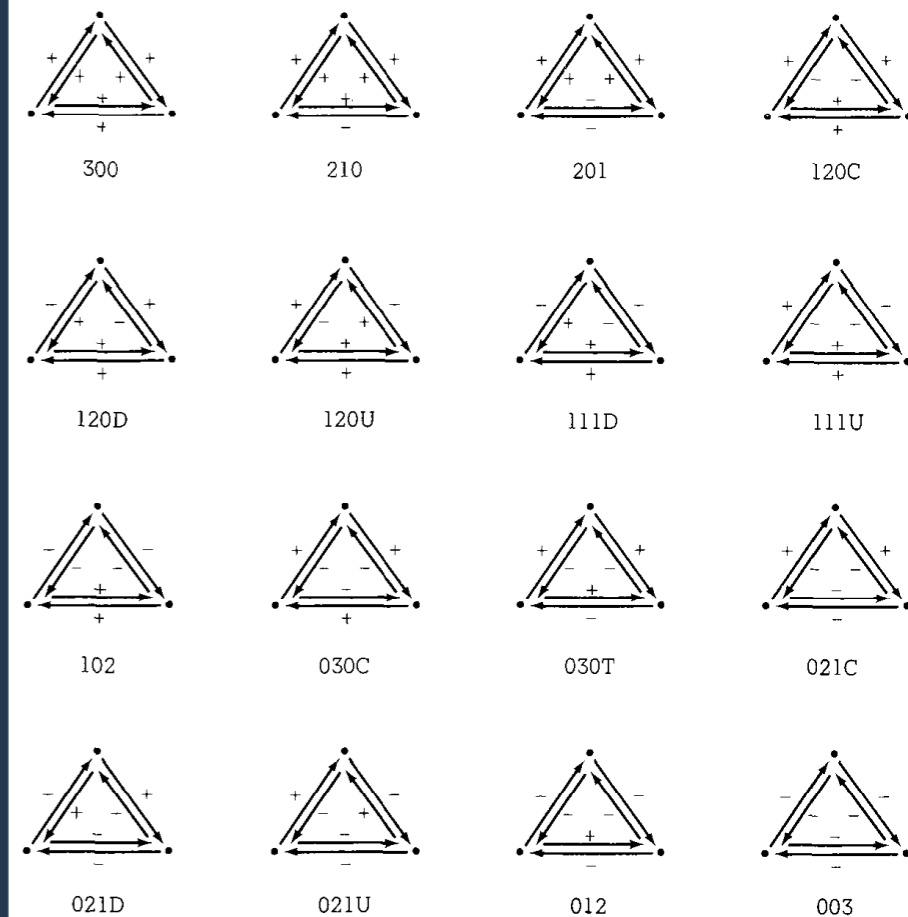
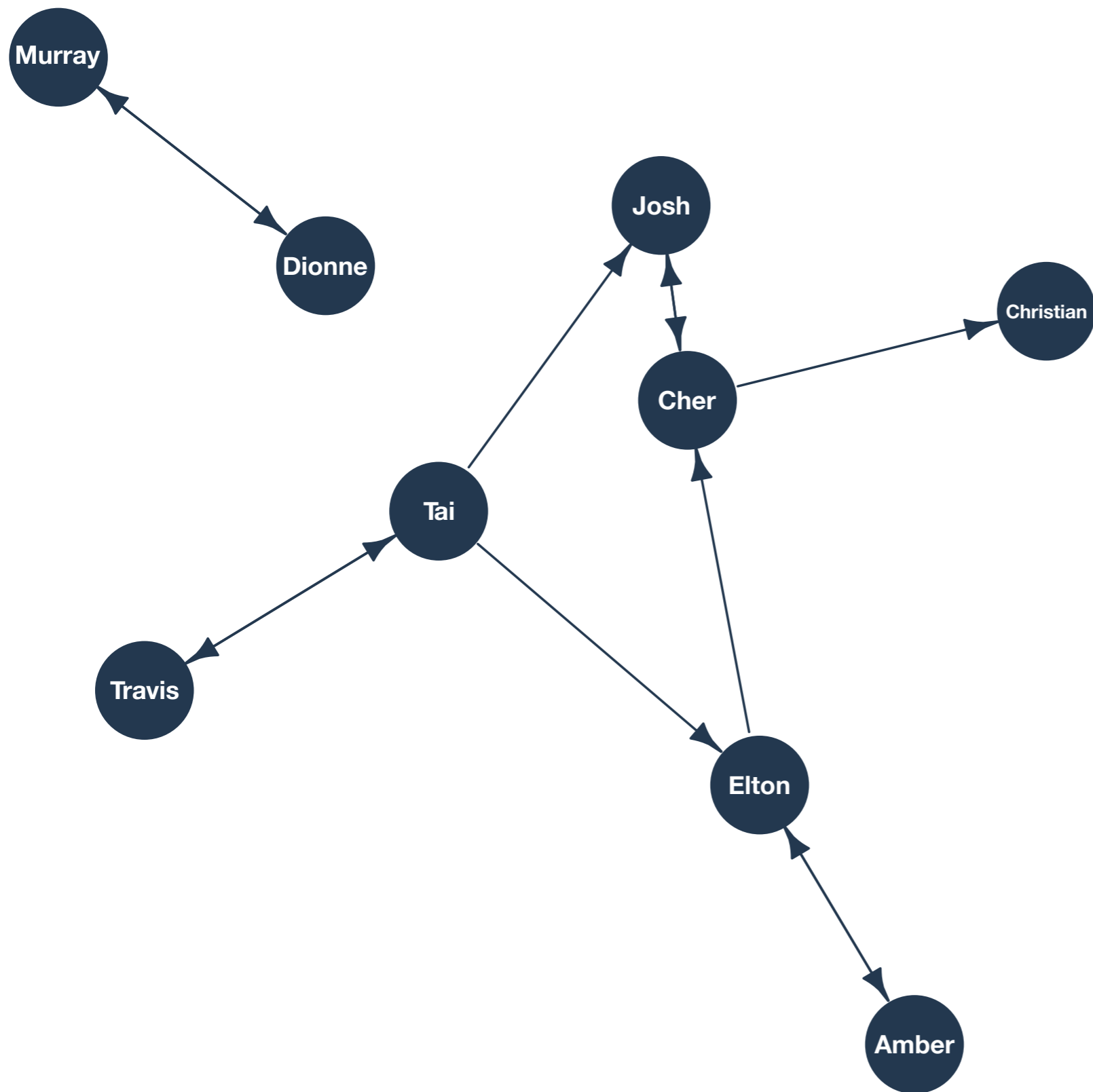


Fig. 1. The 16 triad types.

Johnsen, Eugene C. 1985. "Network Macrostructure Models for the Davis-Leinhardt Set of Empirical Sociomatrices." *Social Networks* 7 (3): 203–24.

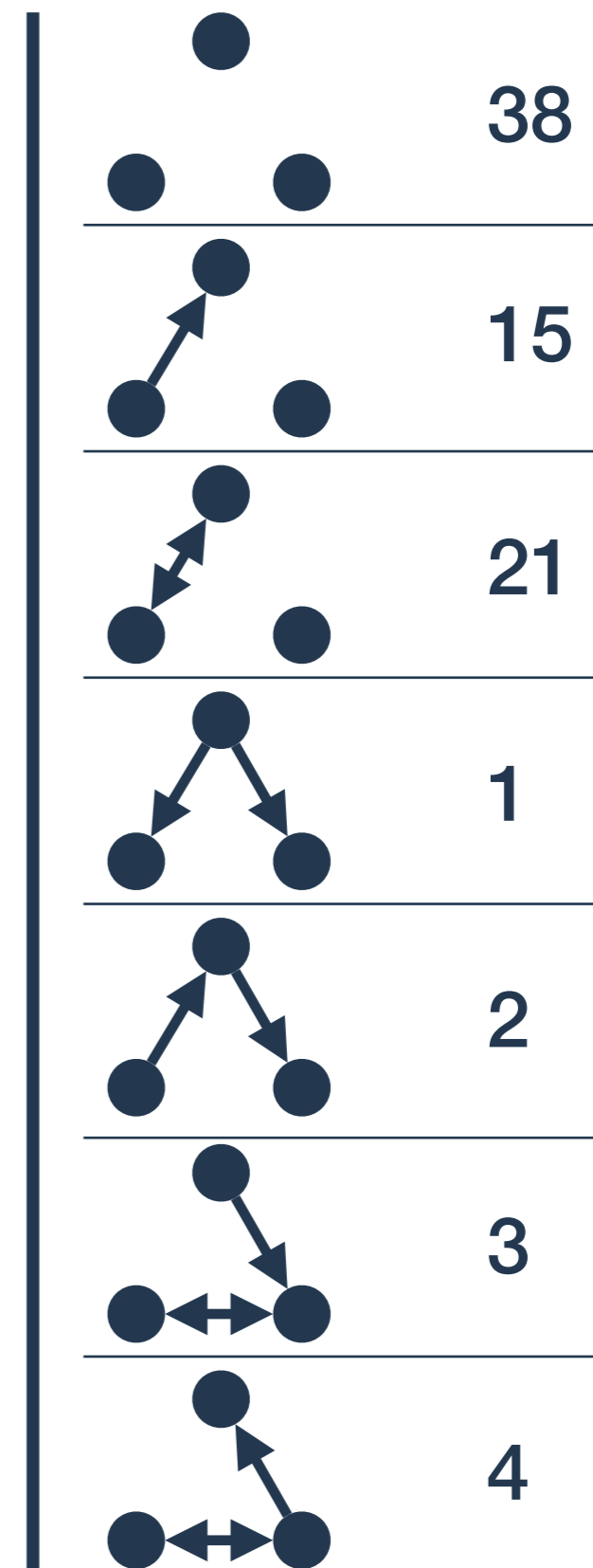
Romantic interest network from *Clueless* (1995)

Triads

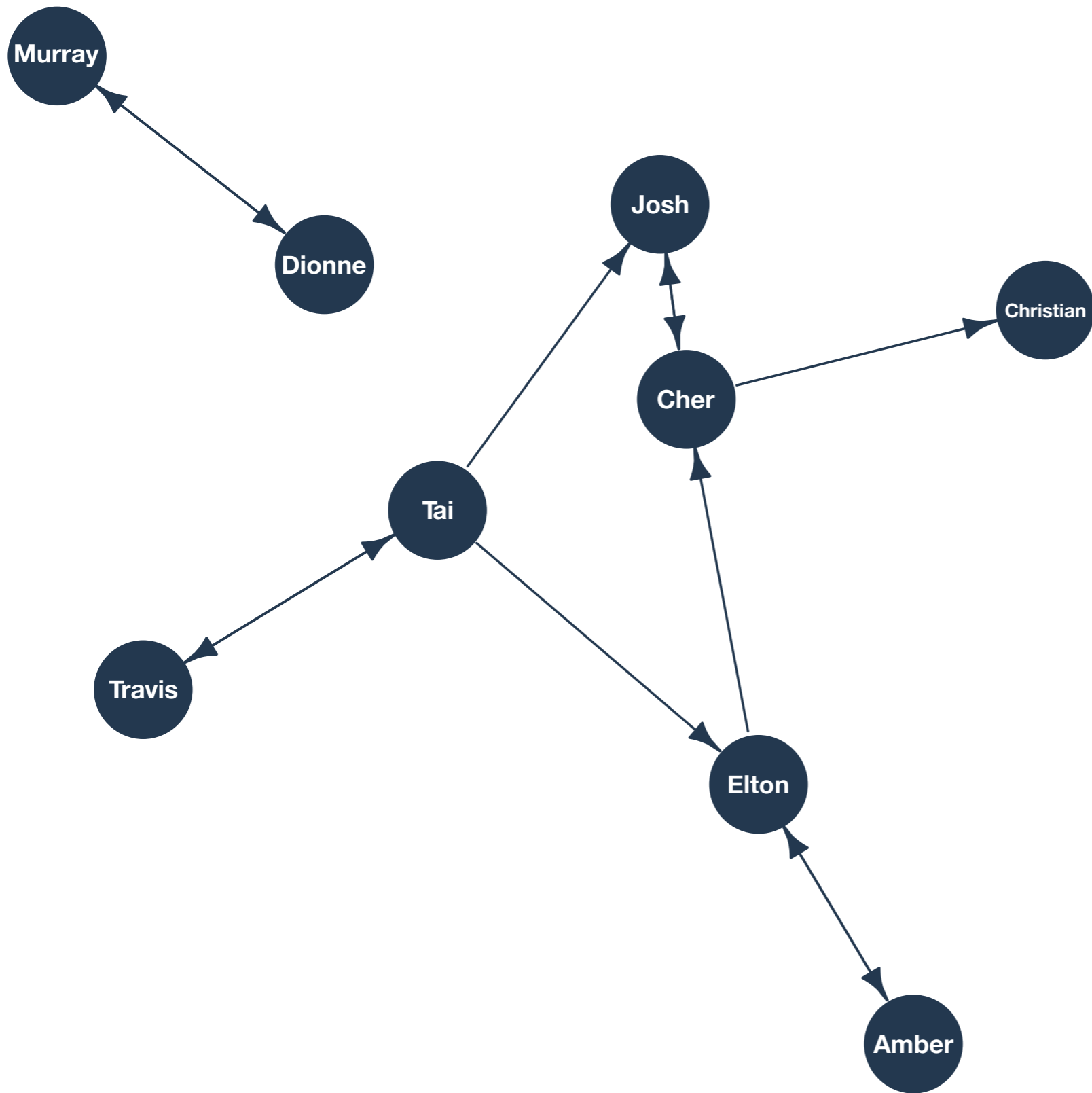


Romantic interest network from *Clueless* (1995)

Triad census



Triads



Transitivity:

Probability that a the neighbors of a node have an edge between them

$$\frac{\text{Number of triangles} - \text{Number of paths of length 2}}{\text{Number of triangles} + \text{Number of paths of length 2}} = 0$$

Triads, so what?

Triads can be explained in terms of behavior

- ∴ E.g. transitivity of close friendships
- ∴ E.g. intransitivity of hetero relationships
- ∴ (Always at most a *tendency*)

(Near) absence of certain types of triads limits overall social structures

- ∴ Theories of ‘structural balance’
- ∴ Whole body of literature on “forbidden triad” sets and their analytically implied structures
- ∴ E.g. “ranked clusters” (Davis and Leinhardt 1972)

Meaningful, but incomplete

- ∴ Does not describe specific relations, individual positions, etc.
- ∴ Strictly limited triads almost never occur in empirical networks