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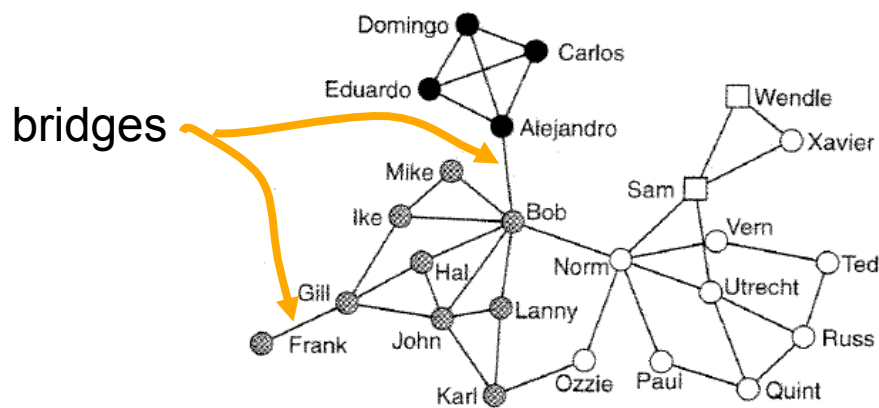
School of Information
University of Michigan

SI 508

Brokers and bridges

Bridges

- Bridge – an edge, that when removed, splits off a community
- Bridges can act as bottlenecks for information flow



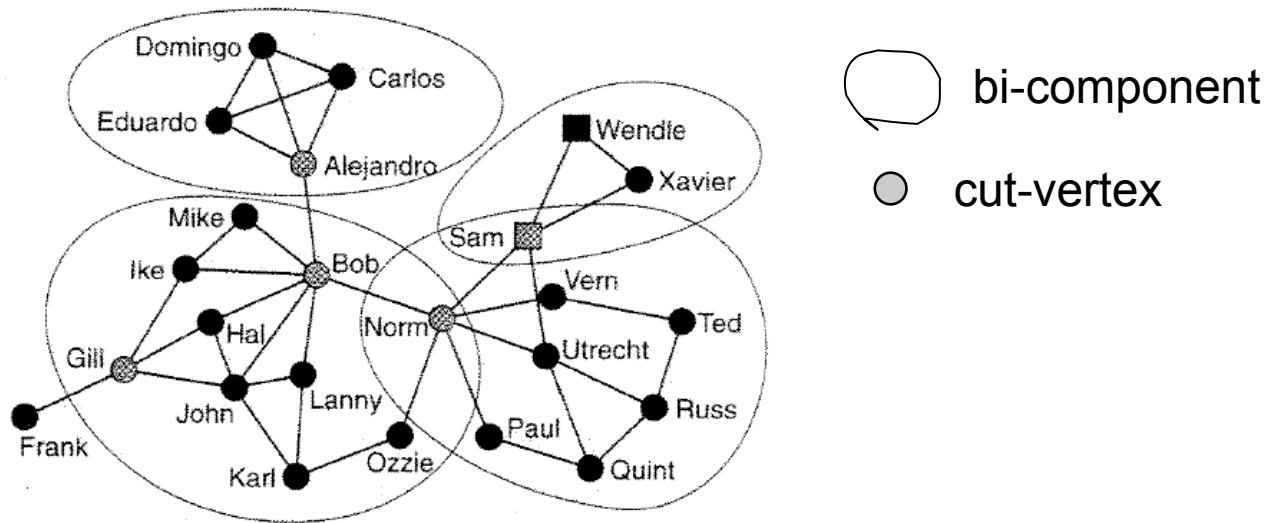
- younger & Spanish speaking
- younger & English speaking
- older & English speaking

□ union negotiators

network of striking employees

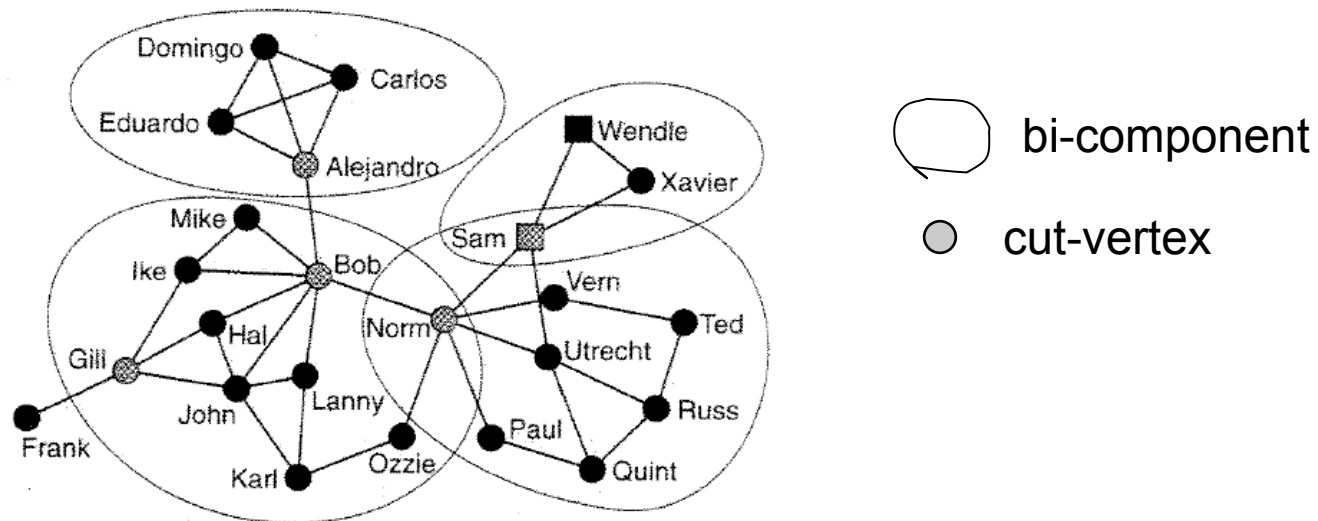
Cut-vertices and bi-components

- Removing a cut-vertex creates a separate component
- bi-component: component of minimum size 3 that doesn't contain a cut-vertex (vertex that would split the component)



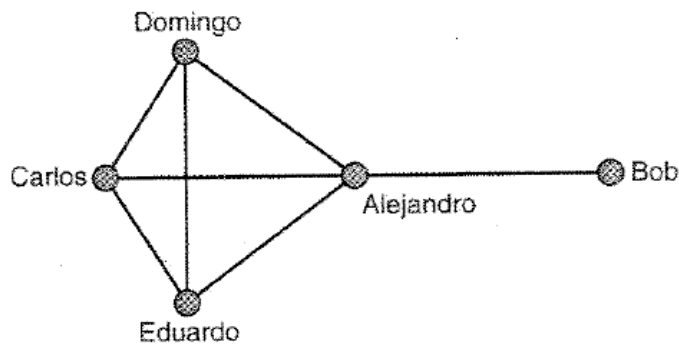
Cut-vertices and bi-components

- Pajek: Net>Components>Bi-Components (treats the network as undirected) *see chapter 7*
 - identifies vertices belonging to exactly one component and isolates
 - identifies # of bridges or bi-components to which a vertex belongs
 - identifies bridges (components of size 2)



Ego-networks and constraint

- ego-network: a vertex, all its neighbors, and connections among the neighbors



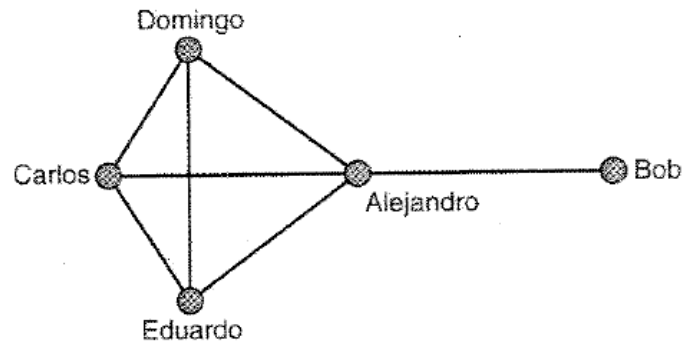
Alejandro's ego-centered network
Alejandro is a **broker** between
contacts who are not directly
connected

Ego-networks and constraint

Constraint: # of complete triads involving two people

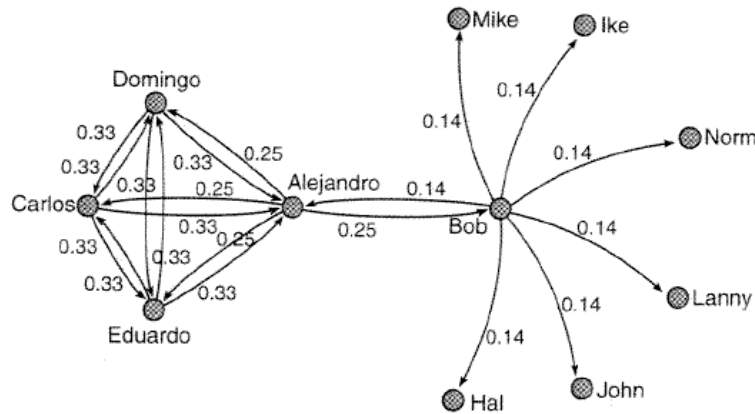
Low-constraint – many structural holes that may be exploited

High-constraint – removing a tie to any one of the vertices means that others will act as brokers for that contact

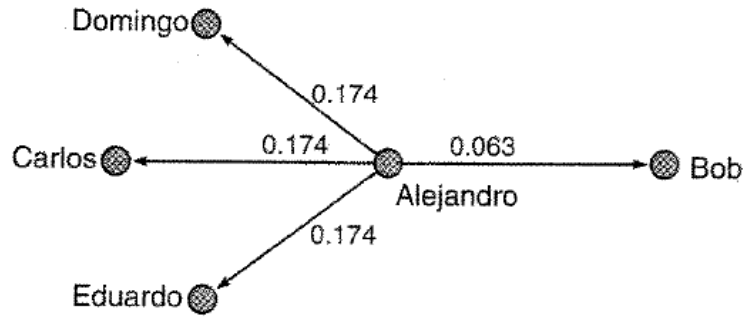


Proportional strength of ties

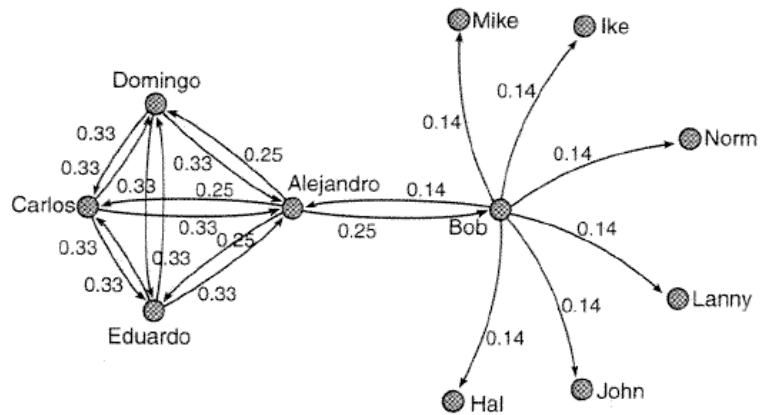
- Strength of tie $\sim 1/(\# \text{ connections for the person})$
- asymmetrical



Dyadic constraint

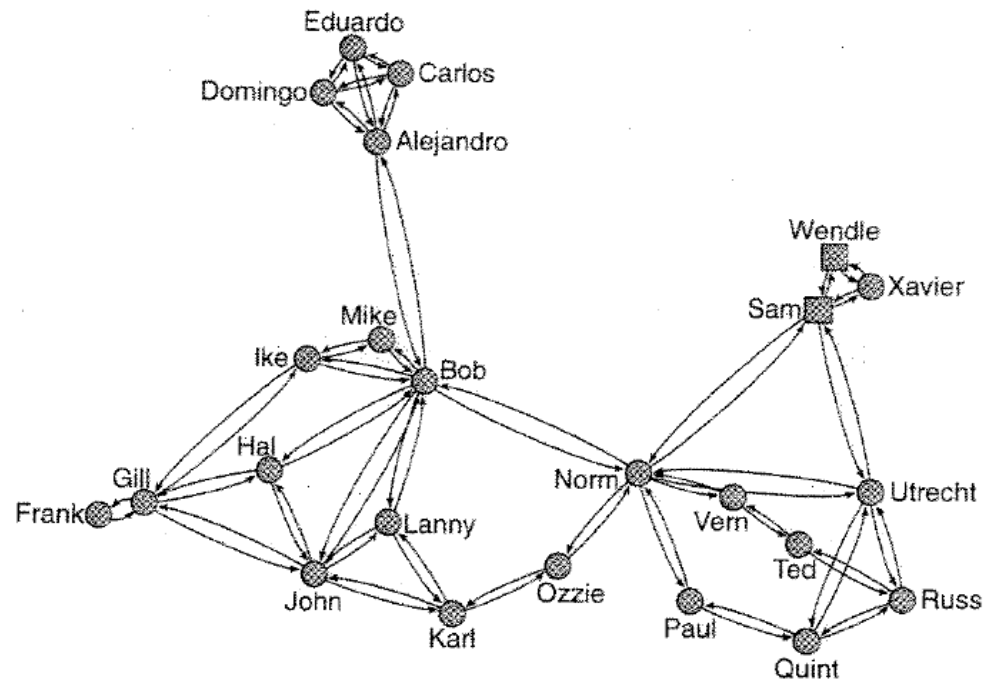


dyadic constraint: measure of strength of direct and indirect ties to a person

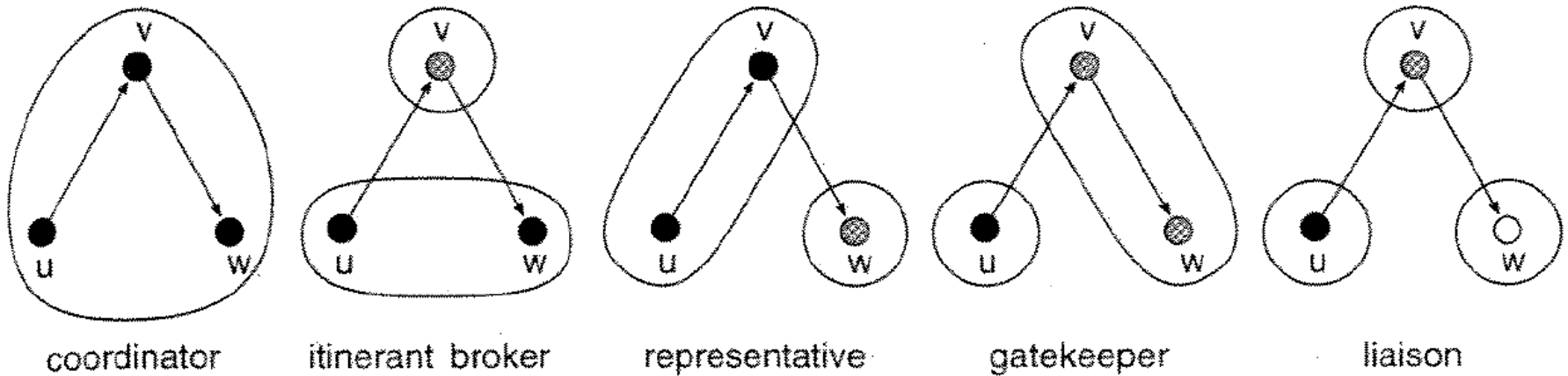


Structural holes with Pajek

- Net>Vector>Structural Holes computes the dyadic constraint for all edges and for the network in aggregate
- To visualize
 - Options>Values of Lines>Similarities (in the Draw screen)
 - Use an energy layout – high dyadic constraint vertices will be closer together



Brokerage roles in and between groups



source: de Nooy et al., Exploratory Social Network Analysis with Pajek, Chapter 7, Cambridge U. Press, 2005.

summary

- brokers *bridge* different communities in networks
- we'll see them again and study their role when we talk about information diffusion in networks