Social Relations I

Social Computing

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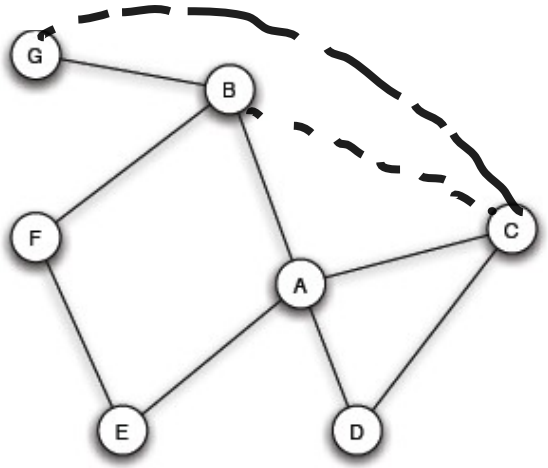
Announcements

- AST1
- Project Proposals

Lecture Topics

- Triadic Closure
- Clustering Coefficient
- Bridges & Local Bridges

Triadic Closure



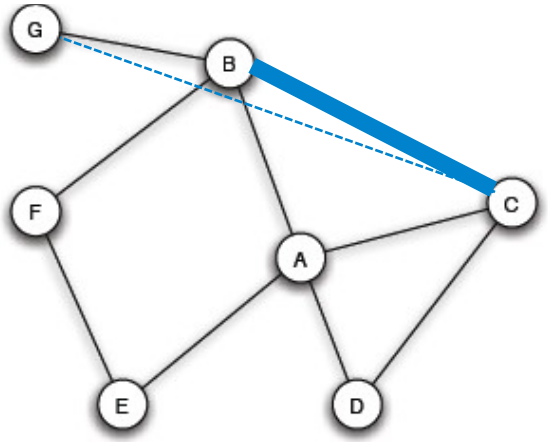
In this friendship net, C-B is more likely to form or C-G?

Triadic Closure

nodes neighbor

- If two people in a network have a friend in common, then there is an increased likelihood they will become friends themselves.

connected

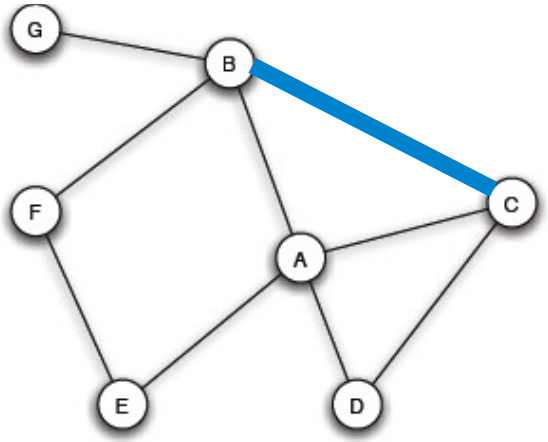


Georg Simmel, 1900s

In this friendship net, C-B is more likely to form or C-G?

Triadic Closure- Cnt.

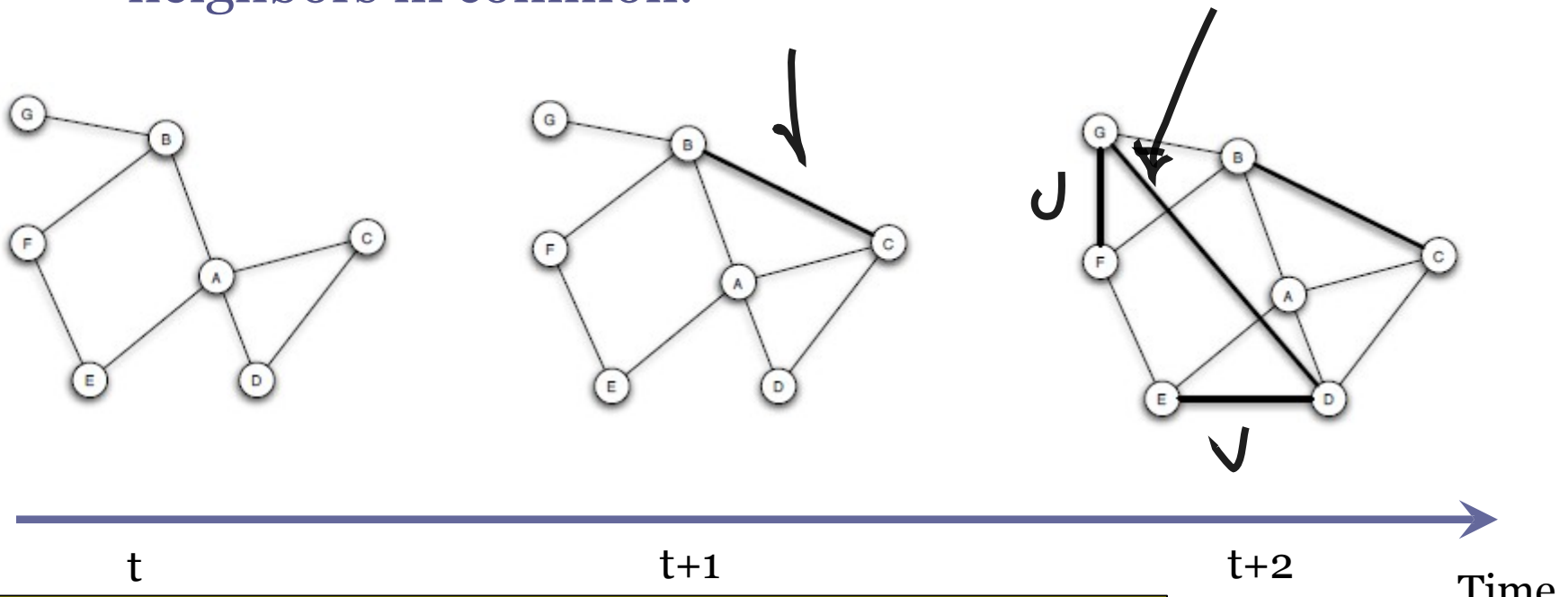
- The term “triadic closure” comes from the fact that the B-C edge has the effect of “closing” the third side of this triangle.



In this friendship net, C-B is more likely to form or C-G?

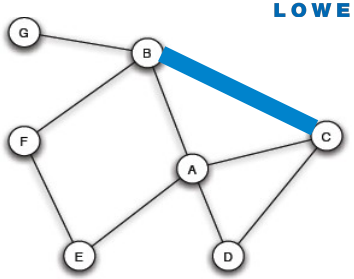
Triadic Closure- Cnt.

- Watching a network for a longer period of time:
  - Multiple edges form!
    - Some form through triadic closure while others (such as D-G) form even though the two endpoints have no neighbors in common.



For other network dynamics see: The Law Prof Twittersphere 2019. https://t.co/fIxPOudwWL

Triadic Closure- Cnt.



- Reasons for Triadic Closure:
  - Opportunity:
    - B and C have a common friend A -> there is an increased chance they will end up knowing each other.
  - Trust:
    - B and C are friends with A -> gives them a basis for trusting each other that an arbitrary pair of unconnected people might lack.
  - Incentives:
    - A may have to bring B and C together (social psychology).

Clustering Coefficient

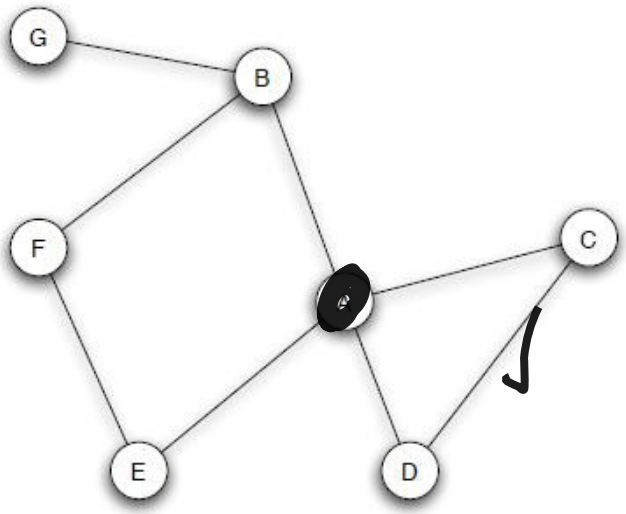
- A measure to capture the **prevalence of Triadic Closure**

- Clustering Coefficient (CF)
  - CF of a node is defined as the probability that two randomly selected friends of the node are friends with each other.
  - CF of node *A* is the fraction of A's friends that are friends with each other.

Clustering Coefficient- Cnt.

- CF of a node *A* is defined as the probability that two randomly selected friends of A are friends with each other.

$$CF(A) = \frac{\textit{Number of connections btw A's friends}}{\textit{Possible Number of connections btw A's friends}}$$



Clustering Coefficient- Cnt.

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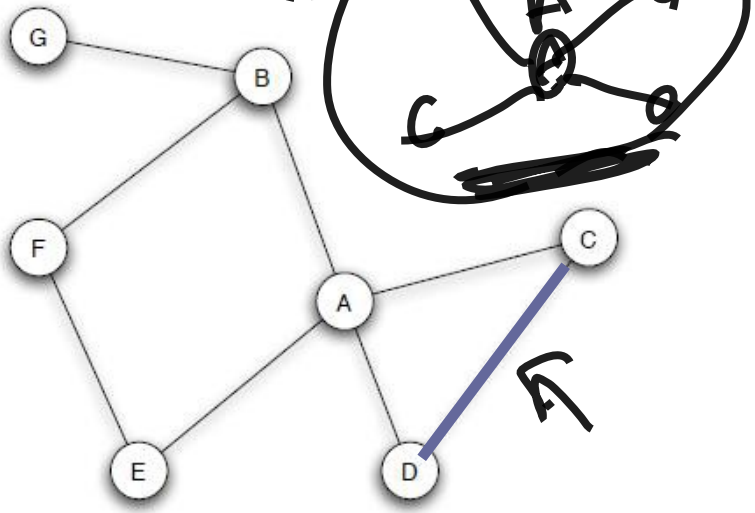
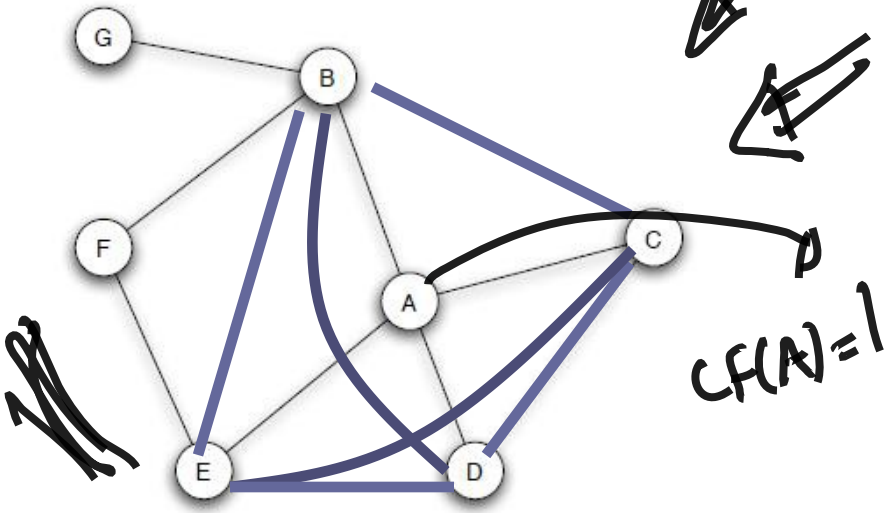
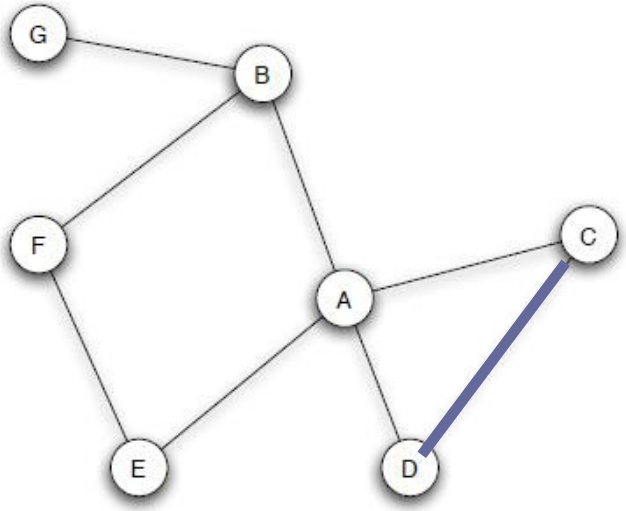


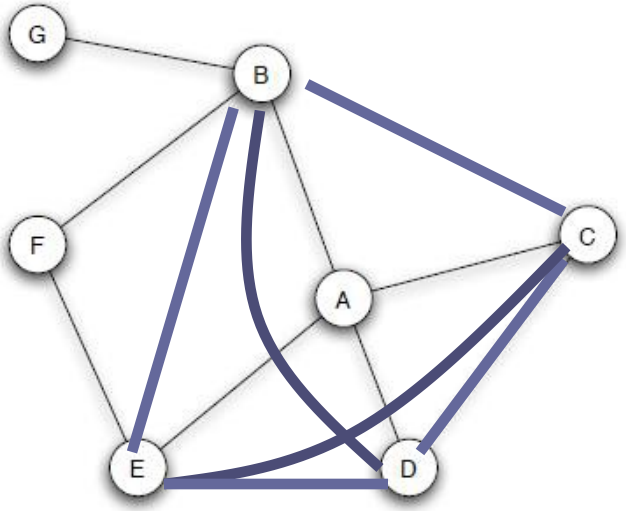


Clustering Coefficient- Cnt.

- Range btw?
  - [0-1]

$$CF(A) = \frac{\textit{Number of connections btw A's friends}}{\textit{Possible Number of connections btw A's friends}}$$

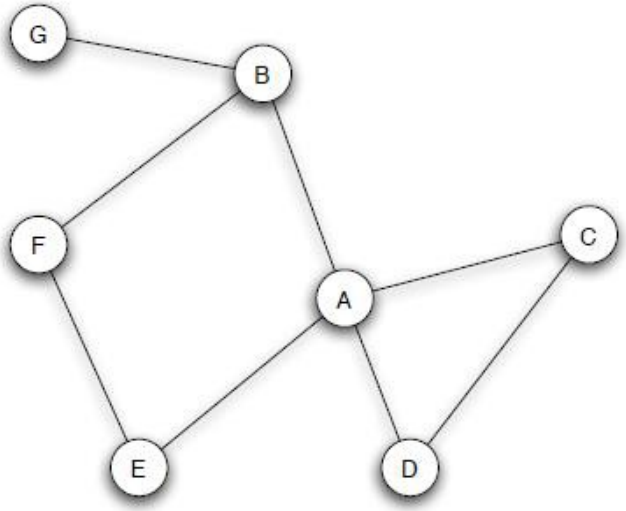


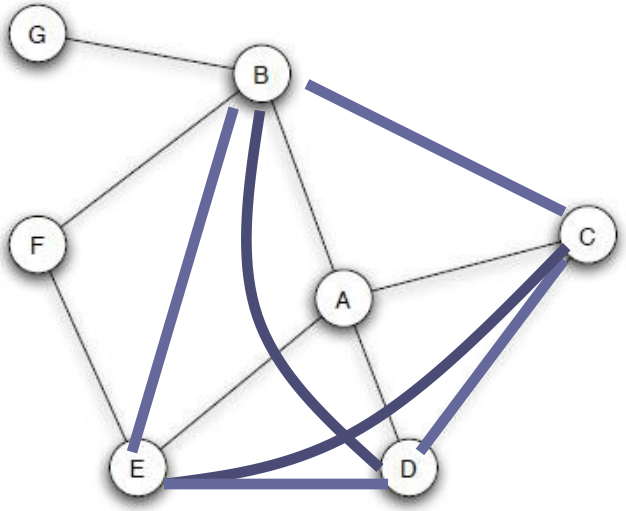


Clustering Coefficient- Cnt.

- Relation btw *triadic closure* & *clustering coefficient*?

$$CF(A) = \frac{\textit{Number of connections btw A's friends}}{\textit{Possible Number of connections btw A's friends}}$$



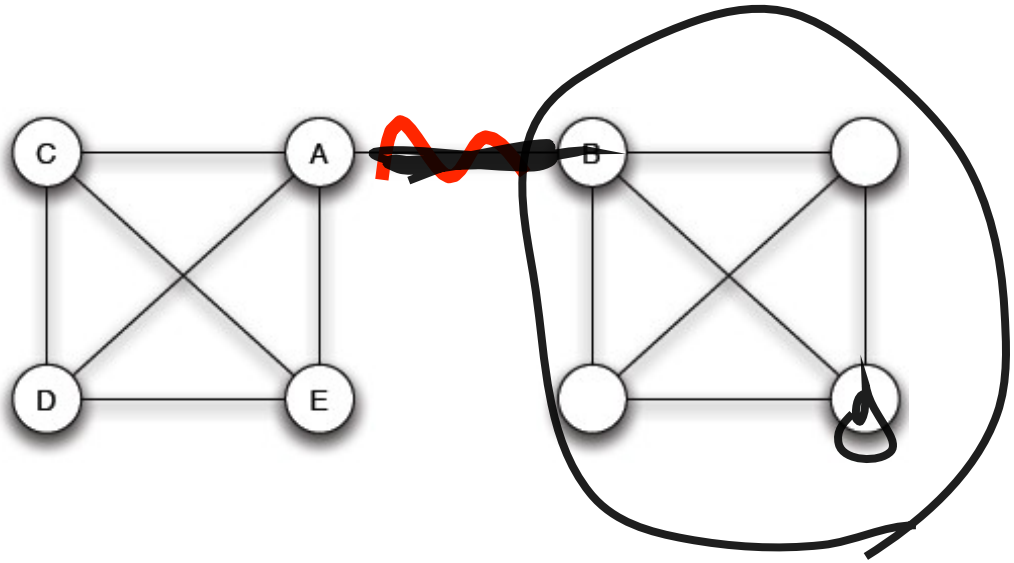


Clustering Coefficient- Cnt.

- Empirical study by Bearman and Moody (2004):
  - Teenage girls who have a low clustering coefficient in their network of friends are significantly more likely to contemplate suicide than those whose clustering coefficient is high!

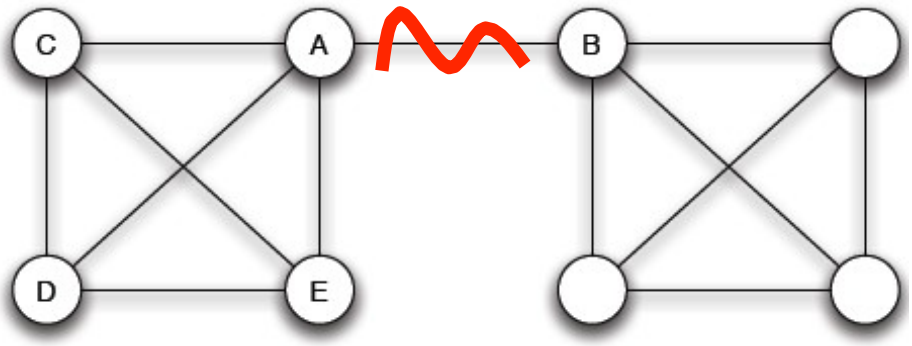
Bridges

- Structural Notion!
- The edge (A,B) is a bridge if **deleting** it put A and B into **two different connected components**.



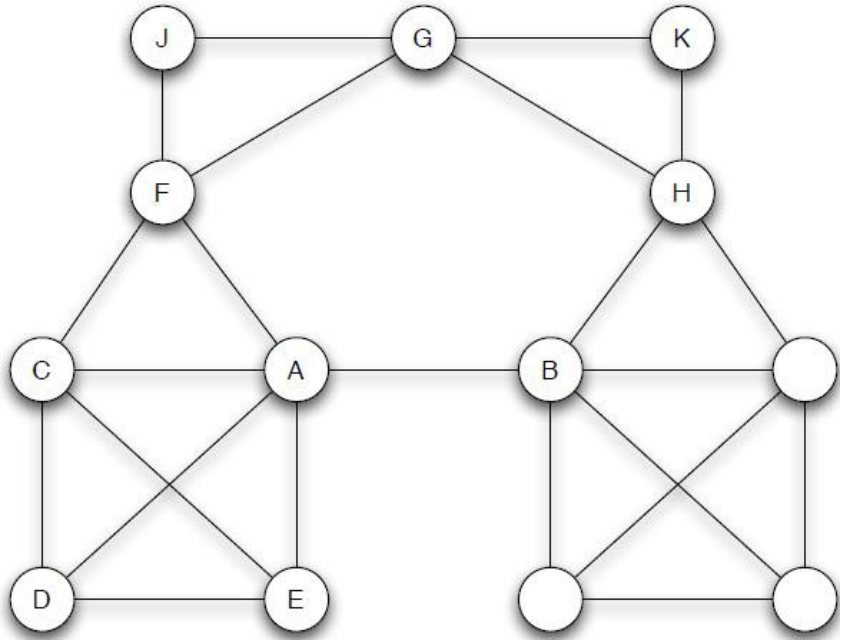
Bridges- Cnt.

- Important points about Bridges:
  - A Bridge is the only route btw its endpoints!
  - Bridges provide access to parts of the network that are unreachable by other means!



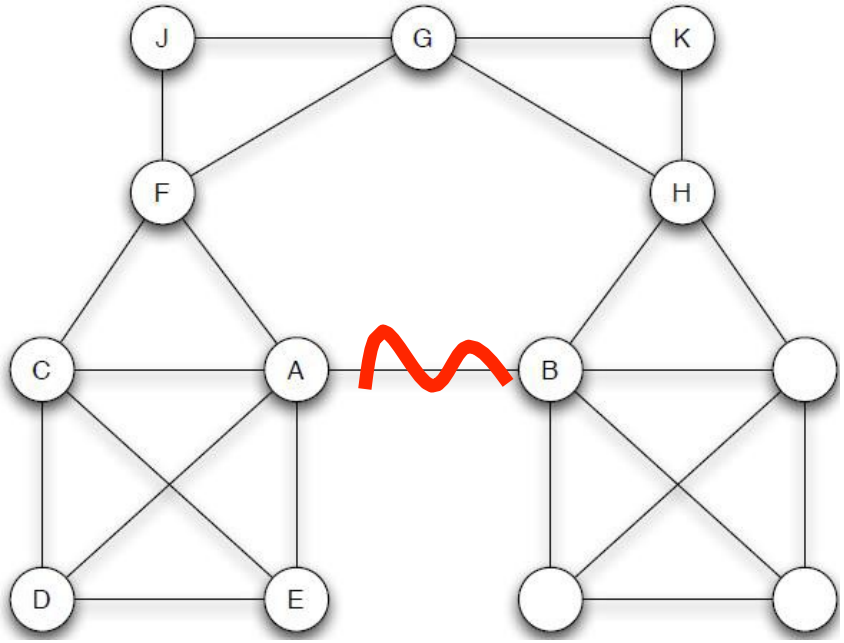
Bridges- Cnt.

- Are bridges rare in real-world networks?
  - Consider the availability of a giant component in real-world nets!



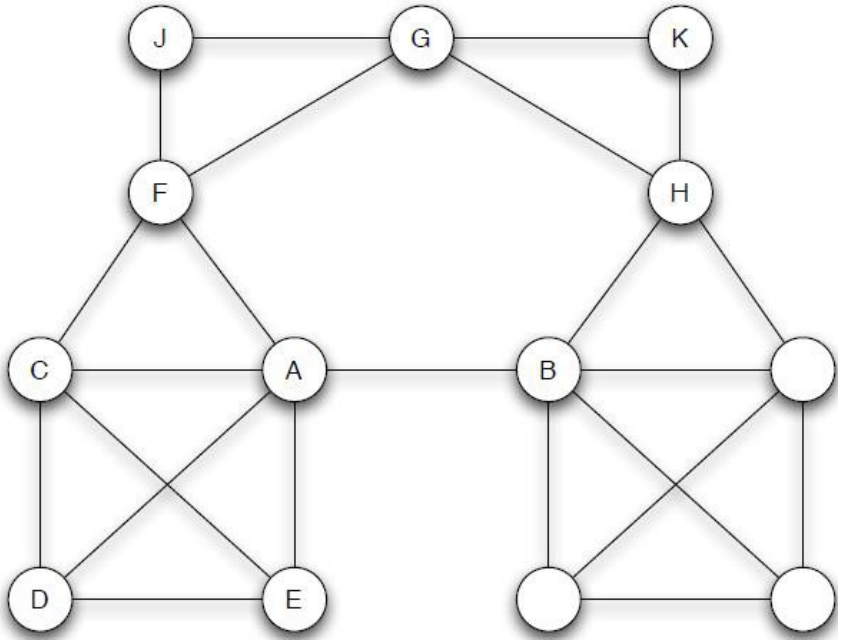
Local Bridges

- Local Bridges:
  - The edge (A,B) is a local bridge if A and B have **no friends in common**!
    - In other words, if deleting the edge would increase the distance btw A and B to a value strictly more than 2.



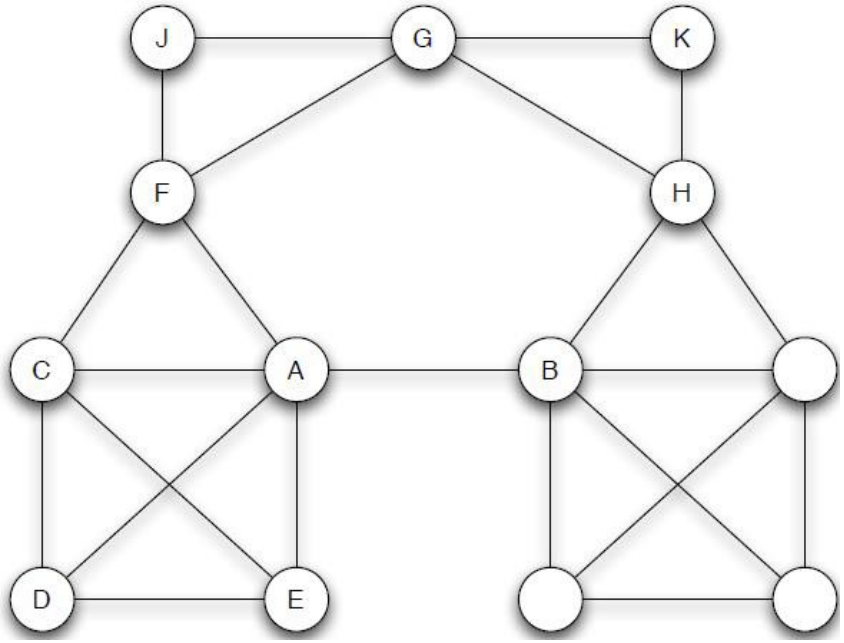
Local Bridges- Cnt.

- Beside (A,B), is there any other local bridge in this net?



Local Bridges- Cnt.

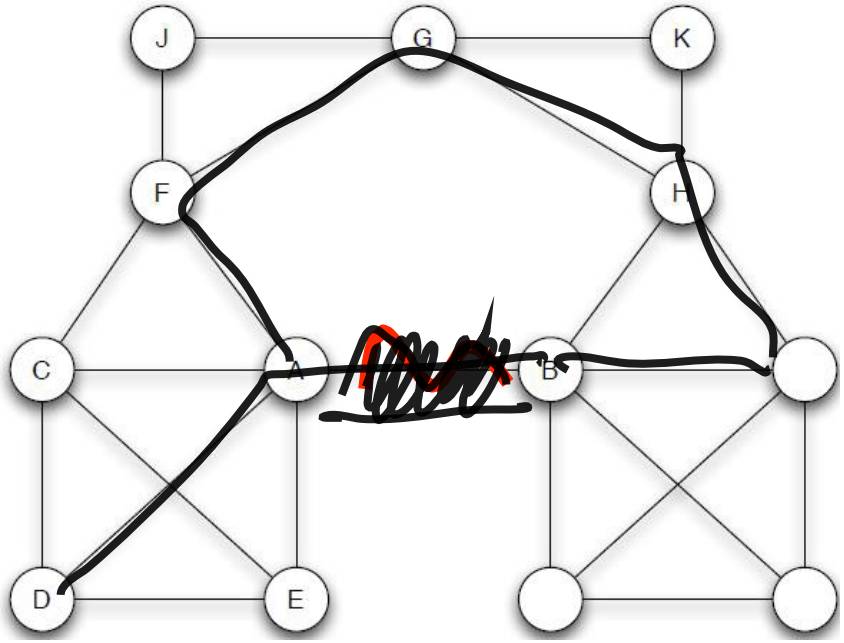
- Beside (A,B), is there any other local bridge in this net?
  - Local bridges never form the side of any triangle in the net!
  - Local Bridge→ **edge not in a triangle**!



Local Bridges- Cnt.

- Span of a Local Bridge:
  - Span of a local bridge is the distance btw its endpoints if the edge were deleted.
  - Span(A-B)=4

Length of the shortest path btw two nodes



Local bridges with large span play roughly the same role as bridges:

Provide their endpoints with access to parts of the net that they would otherwise be far away from.

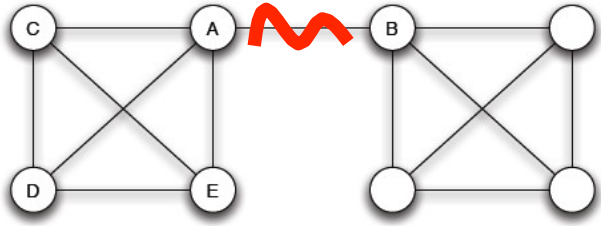
Local Bridges- Cnt.

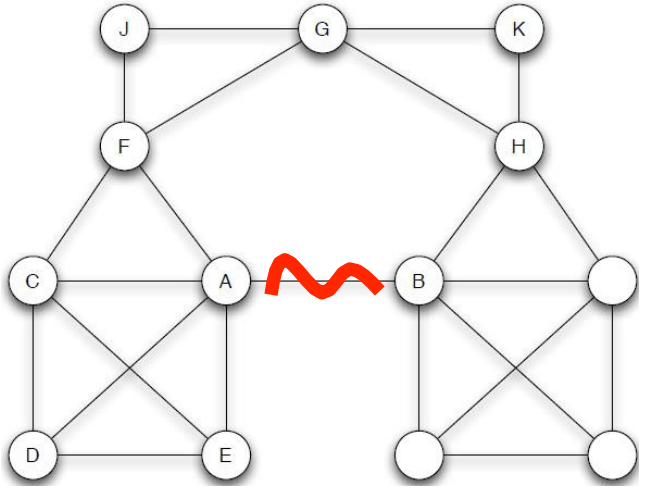
- Granovetter's Experiment
  - 1960s
  - Question: "How people find out about new jobs?"
    - People find the info through personal contacts
    - But: contacts were often *acquaintances* (weak ties) rather than *close friends* (strong ties)!
  - This is surprising as one would expect close friends to help you more than acquaintances!
  - Why are acquaintances most helpful?

Source: Changing jobs : channels of mobility information in a suburban population, Mark S Granovetter. PhD Thesis. 1970

Local Bridges- Cnt.

- Why Acquaintances are more important (in Granovetter's Experiment)?
  - A, C, D, and E will all tend to be exposed to similar sources of info, while A's link to B offers access to info A otherwise wouldn't necessarily hear about.





Strength of Local Bridges (Weak Ties)

- The dual role of local bridges (weak ties) - as weak connections but also valuable links - is the surprising strength of weak ties.
  - Local bridges as weak ties connect us to new sources of information, and their conceptual "span" in the social network (the local bridge property) is directly related to their weakness as social ties.

Reading

- Ch.03 Strong and Weak Ties [NCM]