Social Networking

الشبكات الاجتماعية

ITMC 413

إعداد

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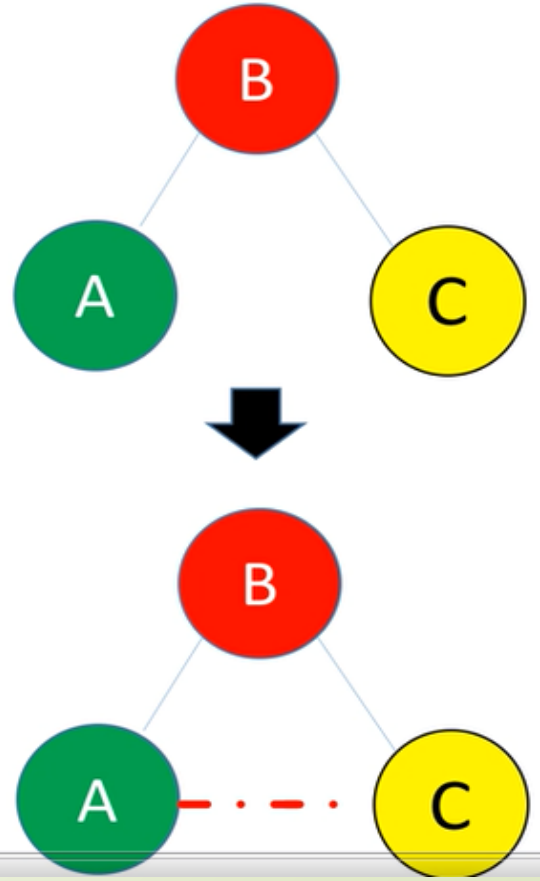
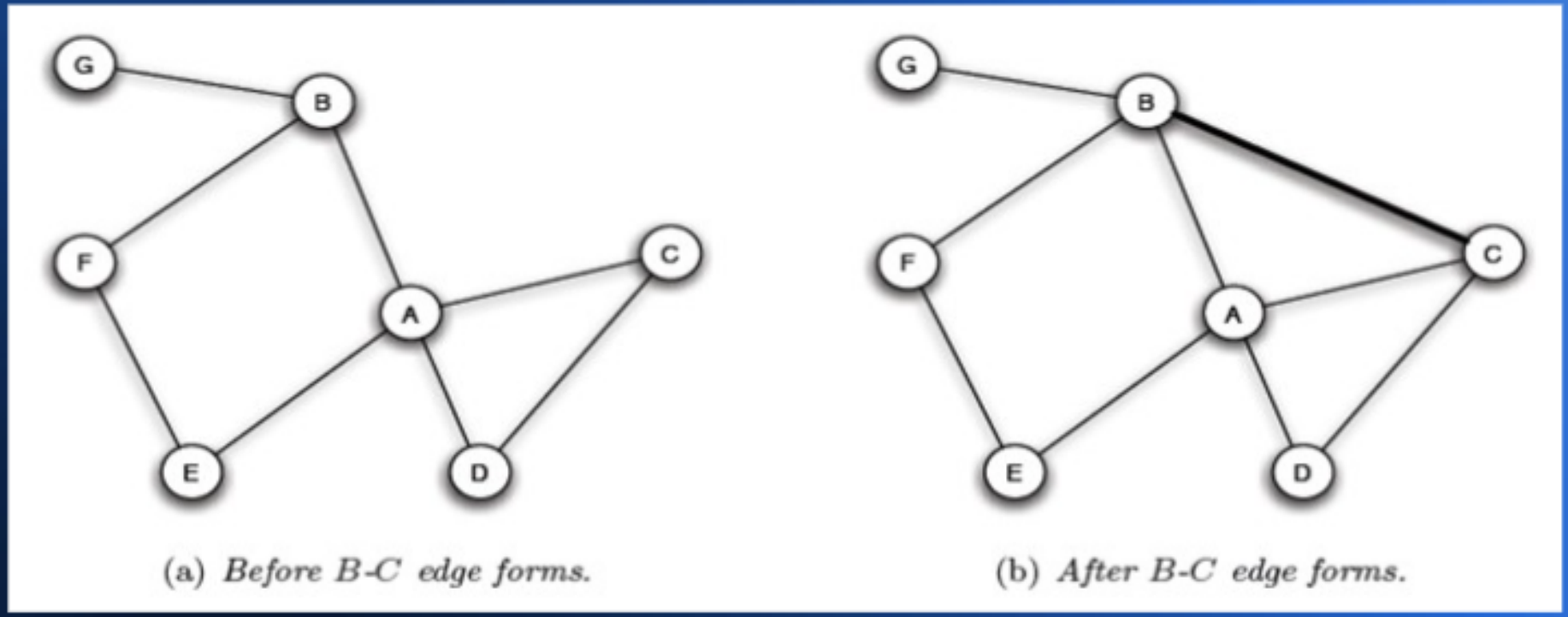
Triadic Closure

Principle

- If two people in a social network have a friend in common, then there is an increased probability that they will become friends at some point in the future.



Triadic Closure cont.



(a) *Before B-C edge forms.* (b) *After B-C edge forms.*

The formation of the edge between B and C illustrates the effects of triadic closure, since they have a common neighbor A.

Triadic Closure cont.

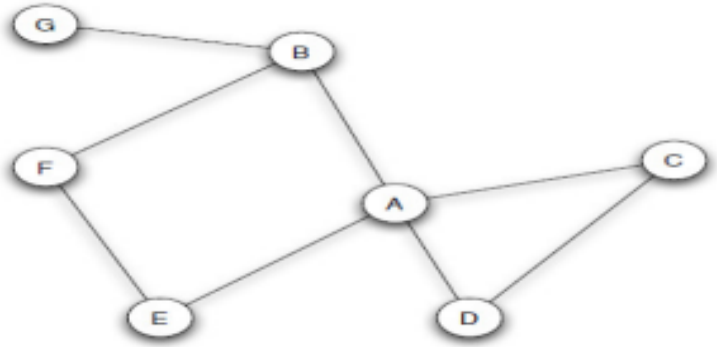
We refer to this principle as ***triadic closure***, and it is illustrated in the figure above: if nodes B and C have a friend A in common, then the formation of an edge between B and C produces a situation in which all three nodes A, B, and C have edges connecting each other – a structure we refer to as a ***triangle*** in the network. The term "triadic closure" comes from the fact that the B-C edge has the effect of "closing" the third side of this triangle.

Triadic Closure

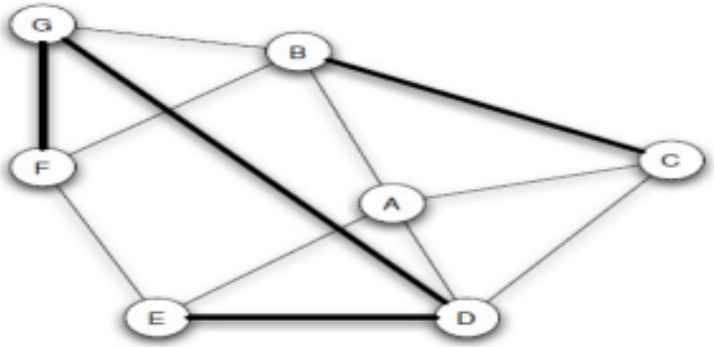
If we observe snapshots of a social network at two distinct points in time, then in the later

snapshot, we generally find a significant number of new edges that have formed through this triangle-closing operation.

Snapshot. In the same Figure, for example, shows the new edges we might see from watching the network in above Figure over a longer time span.



(a) *Before new edges form.*



(b) *After new edges form.*

Reasons for Triadic Closure

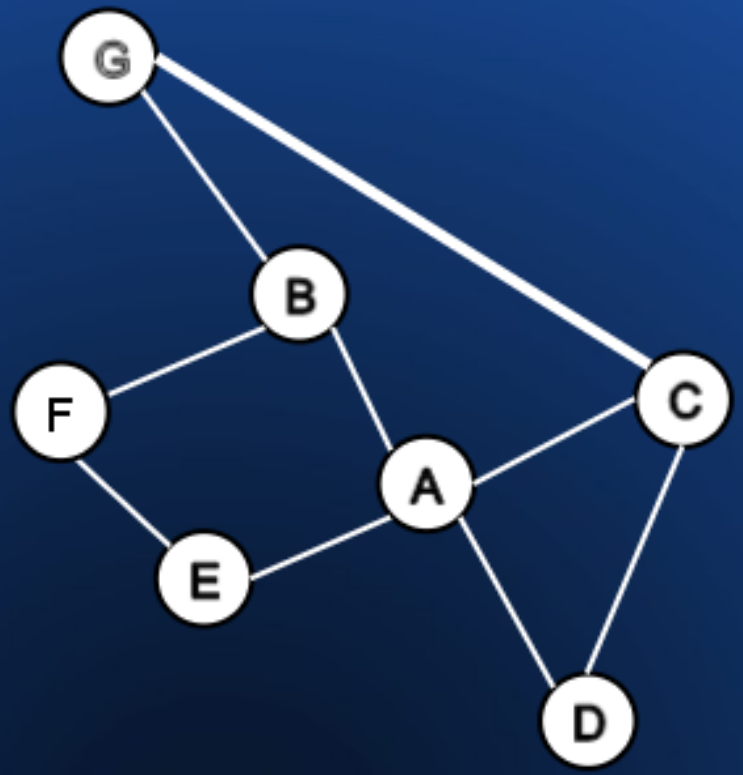
- Triadic closure is intuitively very natural.
- In the process of forming a friendship, the fact that each of B and C is friends with A (provided they are mutually aware of this) gives them a basis for ***trusting*** each other that an arbitrary pair of unconnected people might lack.
- The incentive A may have to bring B and C together: if A is friends with B and C, then it becomes a source of latent stress in these relationships if B and C are not friends with each other.

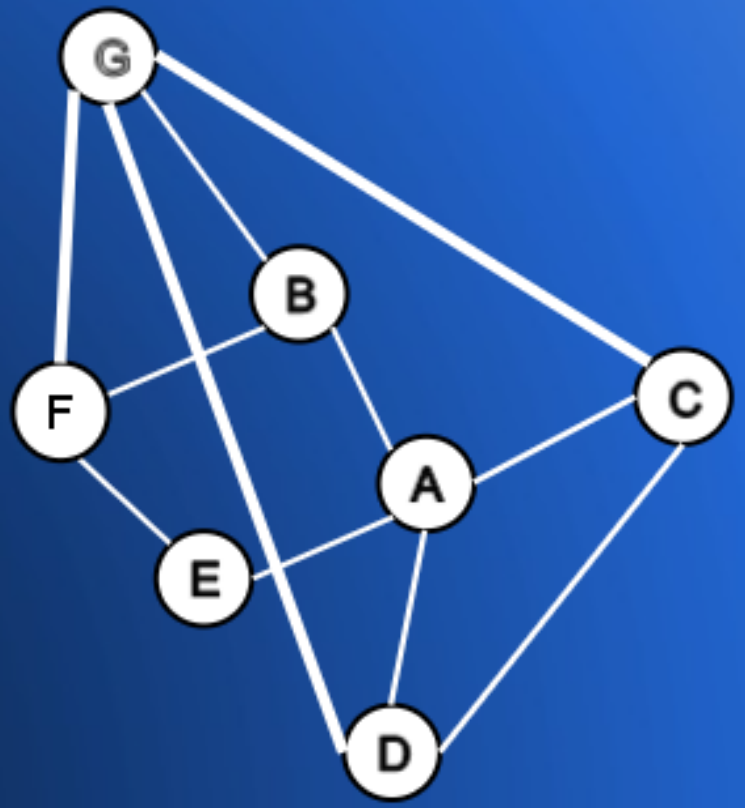
The Clustering Coefficient

The basic role of triadic closure in social networks has motivated the formulation of simple social network measures to capture its prevalence.

The clustering coefficient of a node A is defined as the probability that two randomly selected friends of A are friends with each other. In other words, it is the fraction of pairs of A's friends that are connected to each other by edges.

Clustering Example





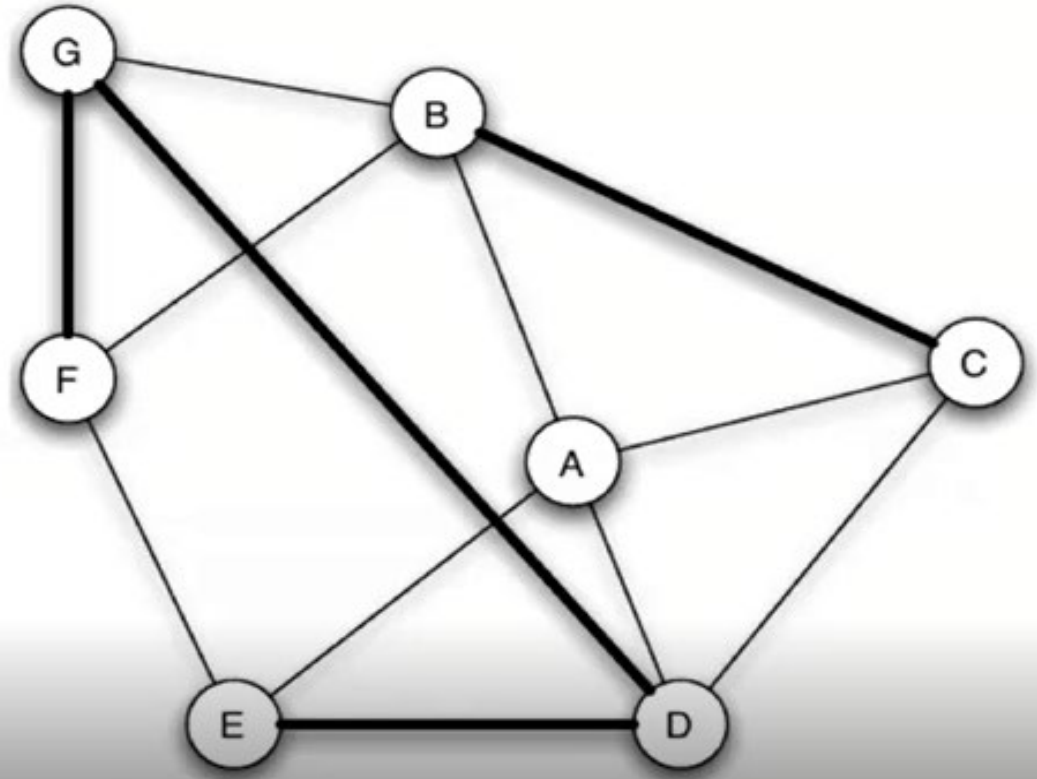
The Clustering Coefficient cont.

The clustering coefficient of node A in the figure above is 1/6 (because there is only the single C-D edge among the six pairs of friends B-C, B-D, B-E, C-D, C-E, and D-E), and it has increased to 1/2 in the second snapshot of the network in the Figure above (because there are now the three edges B-C, C-D, and D-E among the same six pairs). In general, the clustering coefficient of a node ranges from 0 (when none of the node's friends are friends with each other) to 1 (when all of the node's friends are friends with each other), and the more strongly triadic closure is operating in the neighborhood of the node, the higher the clustering coefficient will tend to be.

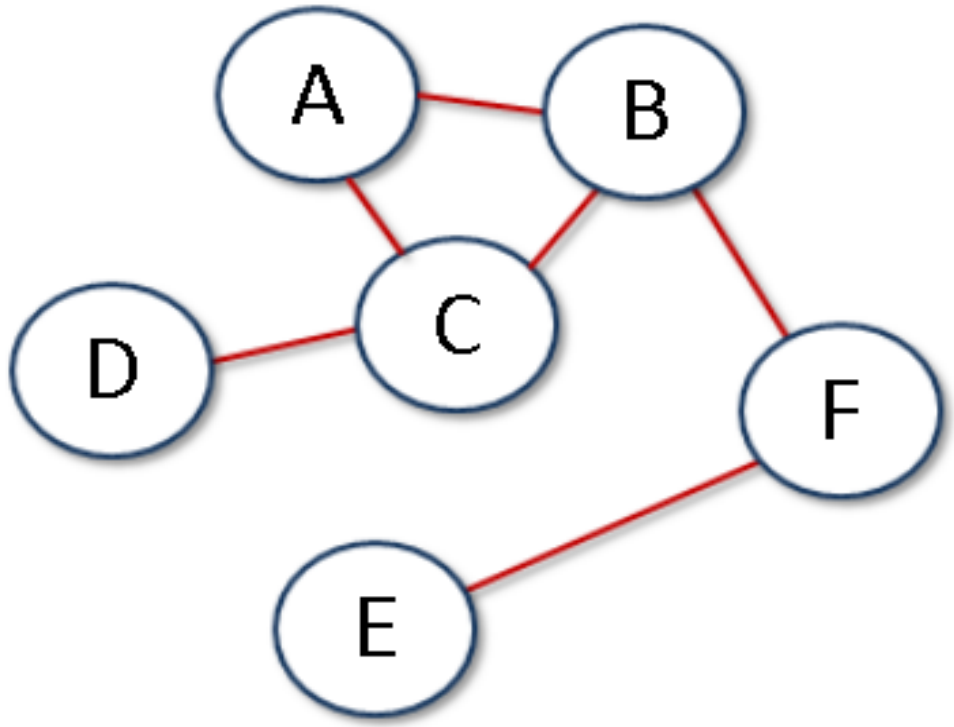
Clustering Coefficient

- Definition of triadic closure is very strict
- Clustering coefficient calculates the connectedness of the neighbors of a node
- Ratio of actual edges between neighbors of a node and maximum possible

CC(A)=3/6 =0.5



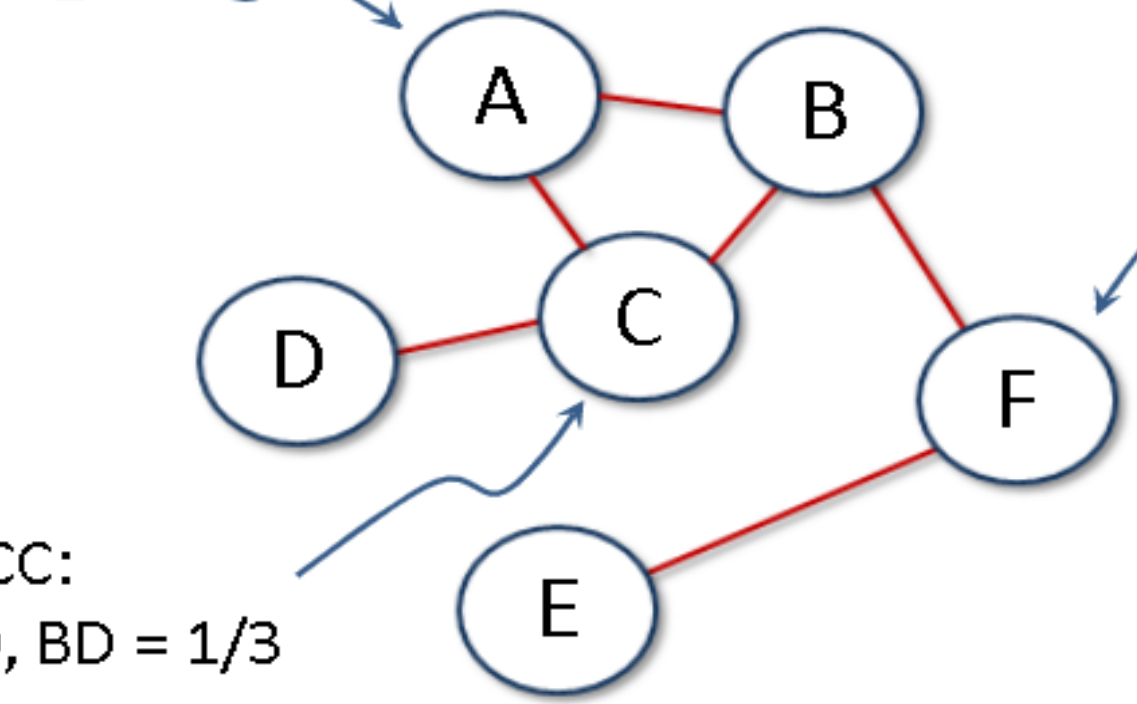
Clustering Coefficient



CC for a node = # of friend pairs / # of possible friend pairs

Clustering Coefficient

A's CC:
BC / BC = 1



F's CC:
- / BE = 0

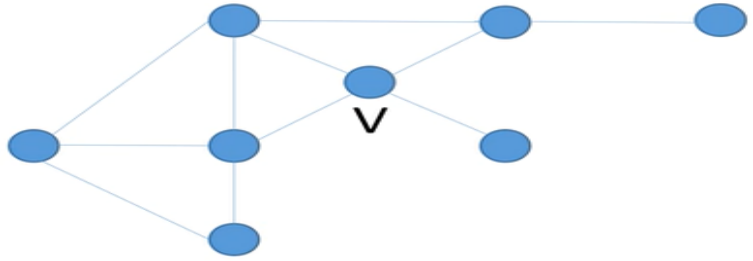
C's CC:
AB / AB, AD, BD = 1/3

CC for a node = # of friend pairs / # of possible friend pairs

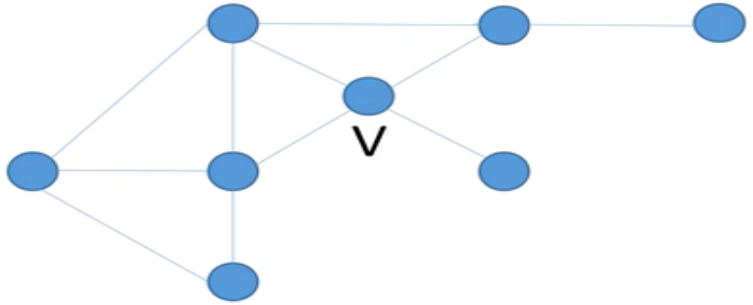
Clustering Coefficient

- In graph theory, a clustering coefficient is a measure of the degree to which nodes in a graph tend to cluster together.
- Given that V = Node, Kv = degree, Nv = number of links between neighbors of V
- $CC(V) = \frac{2N_V}{K_V(K_V-1)}$

Find the Clustering Coefficient of node V.



Clustering Coefficient

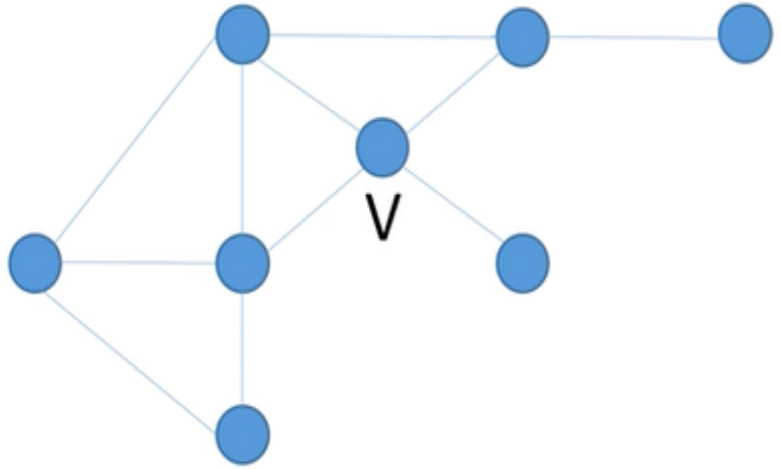


$$CC(V) = \frac{2N_V}{K_V(K_V - 1)}$$

Nv= 2

Kv = 4

$$CC(V) = \frac{2N_V}{K_V(K_V - 1)} = \frac{2(2)}{4(4-1)} = \frac{4}{12} = \frac{1}{3}$$



Global Clustering Coefficient

- Global clustering coefficient

  3 x number of triangles in the graph

  number of connected triples of vertices

$$C = \frac{3 \text{ x number of triangles in the graph}}{\text{number of connected triples}}$$

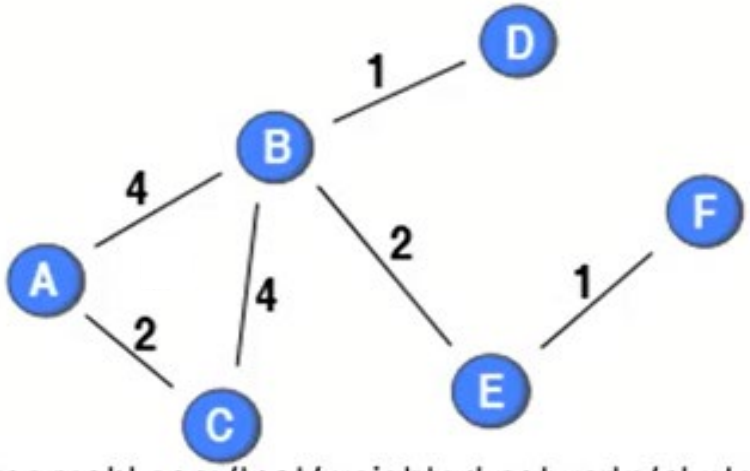
Global Clustering Coefficient

Global Clustering Coefficient

Closed triplets : BAC , ABC, ACB

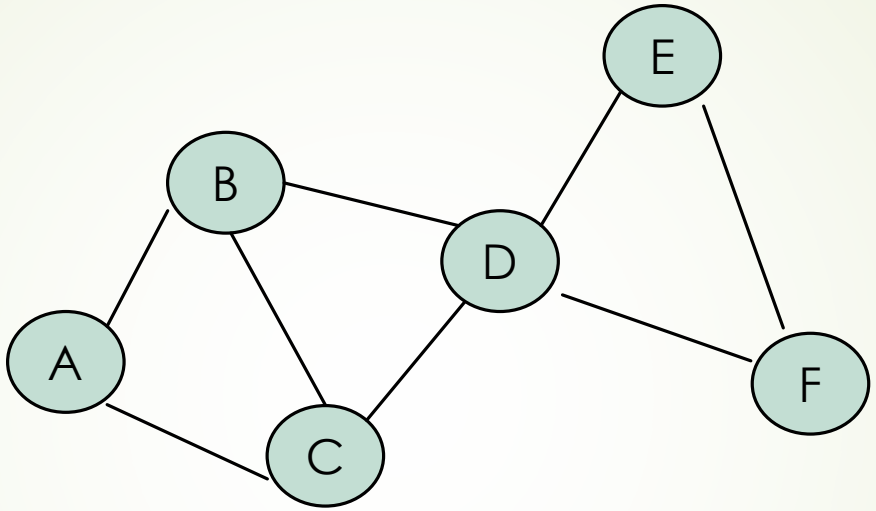
Open triplets : ABD, ABE , CBD,CBE , DBE , BEF.

$$C = \frac{3 \times 1}{9} = \frac{1}{3}$$



http://toreopsahl.com/tnet/weighted-networks/clustering/

Find The Global Clustering Coefficient

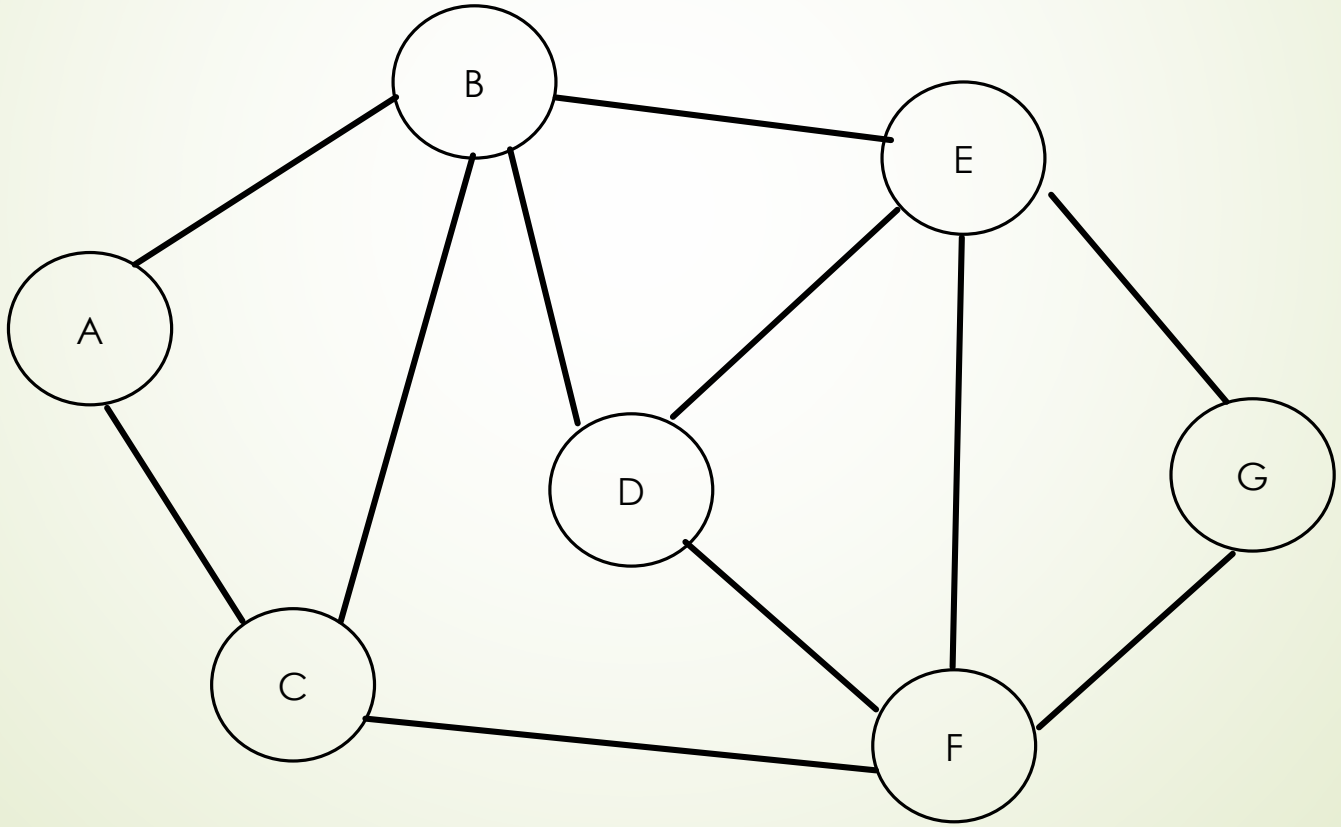


Closed triplets : BAC , ABC, ACB,CBD,BCD,CDB,DEF,EFD,FDE

Open triplets : ABD, ACD , BDE, BDF , CDF , CDE.

$$C = \frac{3 \times 3}{15} = \frac{3}{5}$$

H.W /
- Find The Global Clustering Coefficient
- Find The Cluster Coefficient for ALL nodes



HOME WORK :

- كتابة بحث لدراسة أي ظاهرة (إيجابية أو سلبية)ونستطيع من خلال هذه الدراسة استنتاج قوة ال **Triadic Closure** ومدى تأثيرها على الشبكات الاجتماعية .
- كتابة برنامج لحساب Global Clustering Coefficient& Clustering Coefficient For ALL nodes.

في ال GRAPH الذي تم رسمه في المحاضرات السابقة واستنتاج أهمية Global Clustering Coefficient في الشبكة.

شكـرًا للاستماع

لايمكن تحقيق النجاح إلا إذا
أُحببت ماتقوم به