Clustering Coefficient

Introduction to Network Science
Carlos Castillo
Topic 06

upf. Universitat Pompeu Fabra Barcelona

Contents

- Local clustering coefficient
- Global clustering coefficient

Sources

- Albert László Barabási: Network Science. Cambridge University Press, 2016.
  - Follows almost section-by-section chapter 02
- URLs cited in the footer of specific slides

How many links, maximum?

- Remember, the maximum number of links between k nodes is

$$\frac{k(k-1)}{2}$$

Local clustering coefficient

- The **local clustering coefficient** C_i is a property of a node i
- Let L_i represent the number of links among neighbors of node i

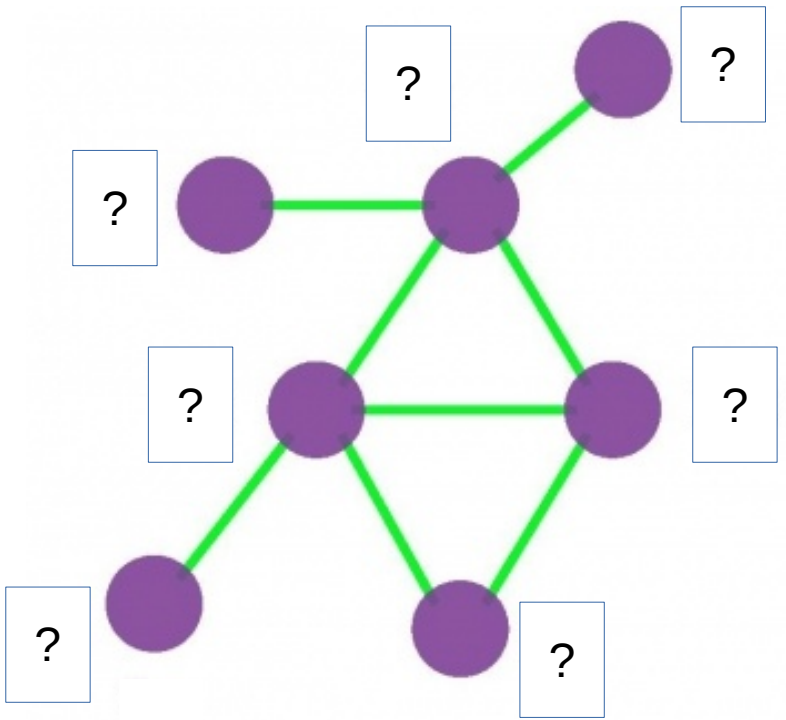
$$C_i = \frac{L_i}{\frac{k_i(k_i-1)}{2}} = \frac{2L_i}{k_i(k_i-1)} \qquad C_i \triangleq 0 \text{ if } k_i \leq 1$$

Tendency to form triangles

- Many natural processes of link formation encourage the closing of “V”s into triangles
- Example 1: you’re more likely to meet new friends through common friends
- Example 2: you’re more likely to follow an account u because you see content posted by u and re-posted by an account v that you already follow

Exercise

What is the local clustering coefficient of each node?



$$C_i = \frac{2L_i}{k_i(k_i - 1)}$$

$$C_i \triangleq 0 \text{ if } k_i \leq 1$$

Draw in Nearpod Draw-It
https://nearpod.com/student/
Code to be given during class

Average clustering coefficient

- The **average clustering coefficient** is a property of the entire graph

$$\langle C \rangle = \frac{1}{N} \sum_{i=1}^{N} C_i$$

Sometimes this is called the *curvature* of a graph

Summary

Things to remember

- Local and global clustering coefficient

Practice on your own

- Calculate local clustering coefficient of each node in this graph