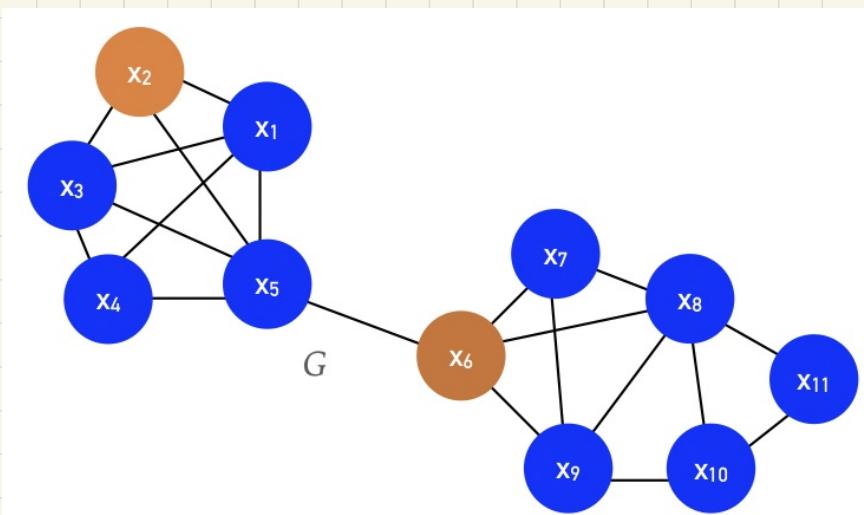


Clustering  
Coefficient

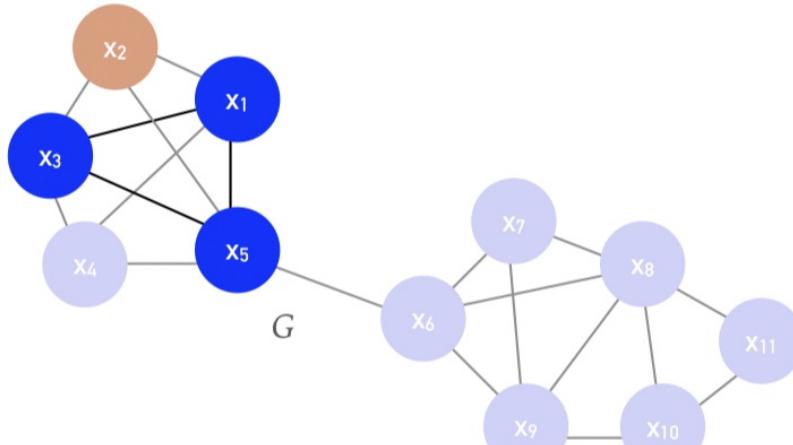
# Informal Def

Clustering coeff measures cohesiveness  
of node's neighbor hood

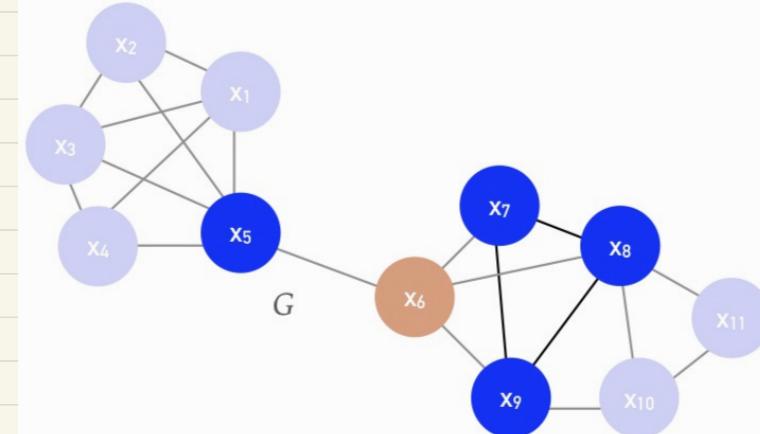
Example



$x_2$  has 3 neighbors  
all neighbors connected



$x_6$  has 4 neighbors  
in 2 components



# Formal Def

Let  $G_i = (U_i, E_i)$  be the subgraph induced by the neighbors of node  $x_i$ .

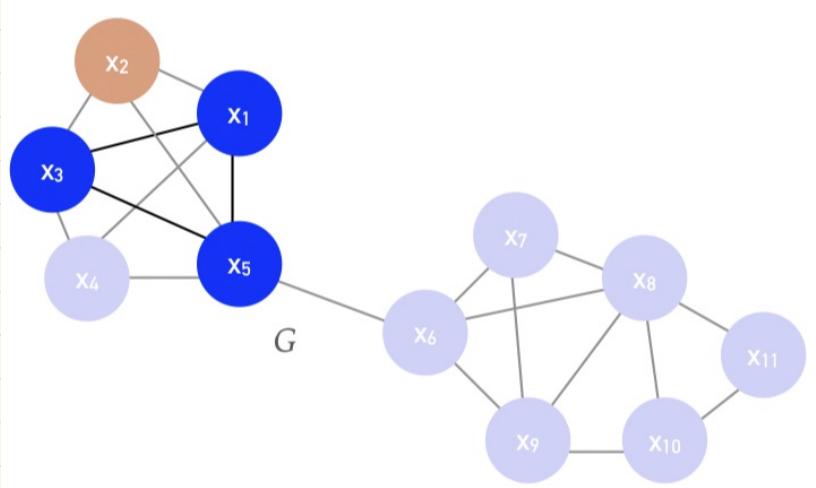
$$\text{Let } n_i = |U_i| \quad m_i = |E_i|$$

The clustering coeff of  $x_i$  is

$$\frac{m_i}{\binom{n_i}{2}} = \frac{\# \text{ of edges among neighbors of } x_i}{\# \text{ of possible edges among neighbors of } x_i}$$

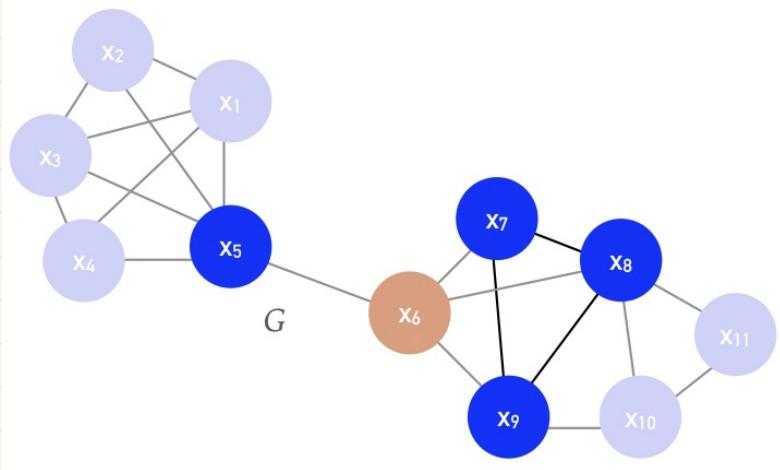
example: Clust coeff of  $x_2$

$\frac{\text{\# of edges among neighbors of } x_i}{\text{\# of possible edges among neighbors of } x_i}$



$$\frac{\text{\# of edges ... } x_2}{\text{\# of possible edges... } x_2} = \frac{3}{3} = 1$$

example: Clustering coeff of  $x_6$



$$\frac{\text{\# of edges ... } x_6}{\text{\# of possible edges... } x_6} = \frac{3}{6} = \frac{1}{2}$$

# Formal Def (after example)

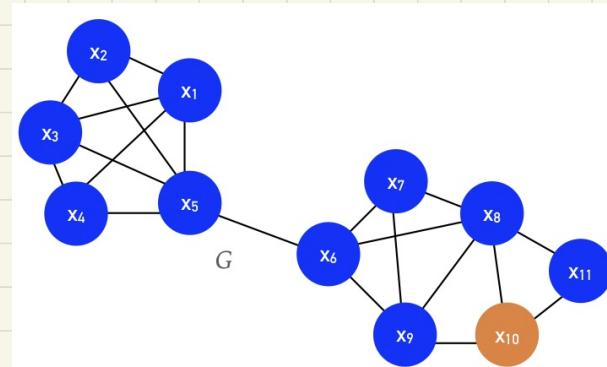
Let  $G_i = (U_i, E_i)$  be the subgraph induced by the neighbors of node  $x_i$ .

$$\text{Let } n_i = |U_i| \quad m_i = |E_i|$$

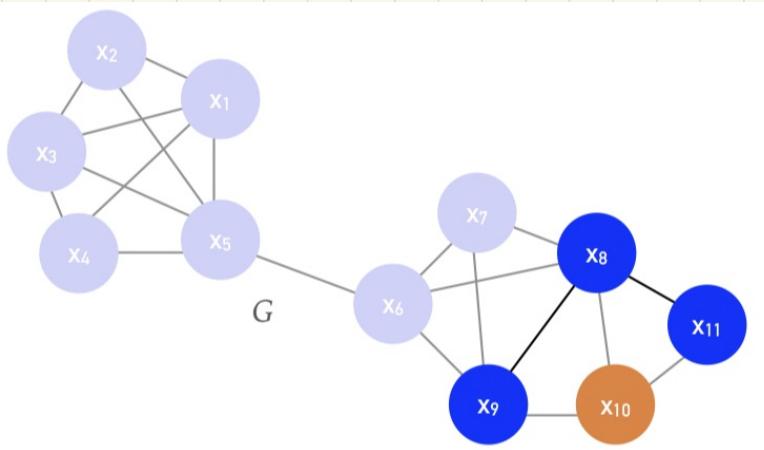
The clustering coeff of  $x_i$  is

$$\frac{m_i}{\binom{n_i}{2}} = \frac{\# \text{ of edges among neighbors of } x_i}{\# \text{ of possible edges among neighbors of } x_i}$$

$\nwarrow n * (n-1) / 2$

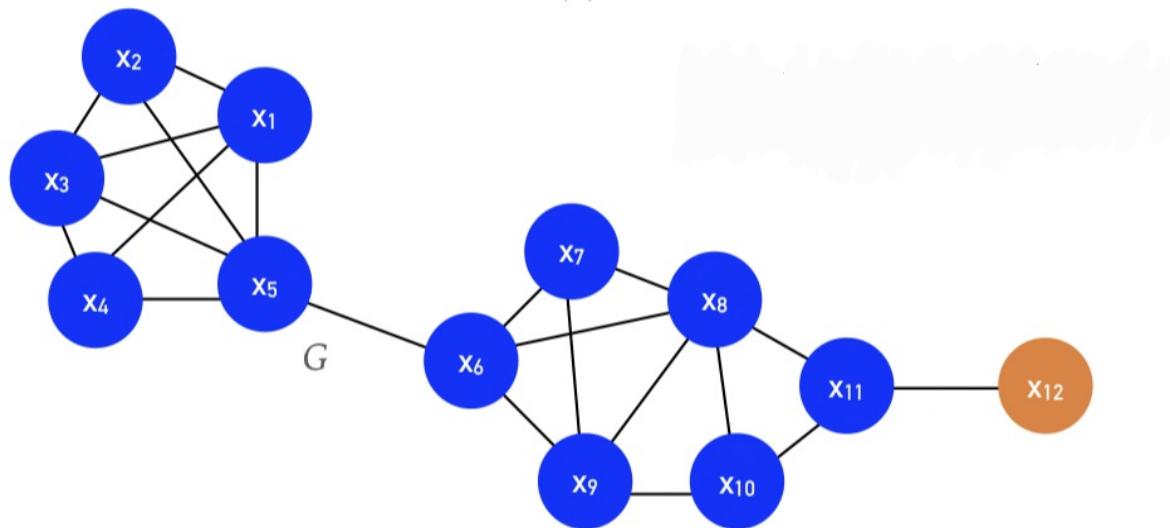


example: Clustering coeff of  $x_{10}$



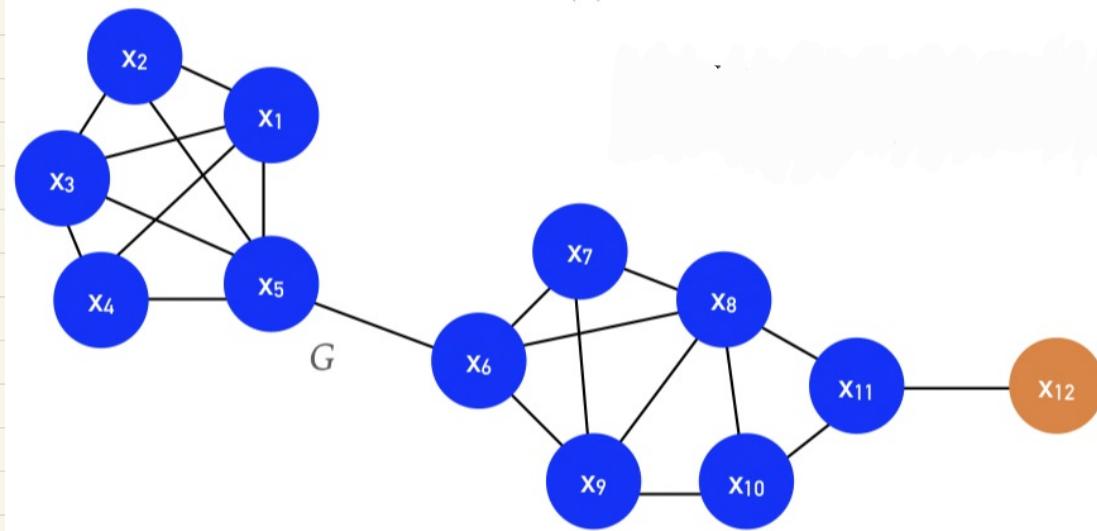
$$\frac{\text{\# of edges ... } x_{10}}{\text{\# of possible edges ... } x_{10}}$$
$$= \frac{2}{3}$$

What if node has deg less than 2?



$$\frac{\text{\# of edges ... } x_{12}}{\text{\# of possible edges ... } x_{12}} = \cancel{0}$$

What if node has deg less than 2?

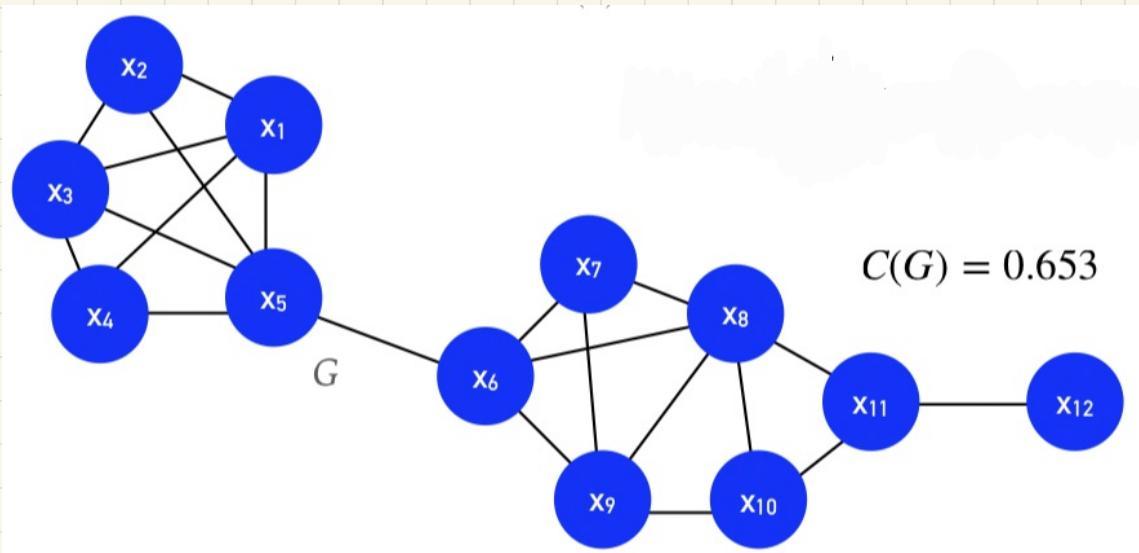


$$\frac{\text{\# of edges ... } x_{12}}{\text{\# of possible edges ... } x_{12}} = \cancel{0}$$

Define clust  
Coeff as 0  
for nodes w/  
degree less  
than two

Given graph  $G$  clust coeff of  $G$ :

$$C(G) = \frac{1}{n} \sum_{i=1}^n \text{clust coeff } x_i$$



Coding using  
networkX !!