14/12/22

Paper-III

* Social Network Analysis (SNA)

⟹ SNA- ① The study of social network co... by using graph theory.

→ Difference between Conventional data & social network data.

Conventional data	Social network data
Tabular - 2-D array	Relationship
employeee	graph & adjacency - matrix

eid	e-name	Address	Cont
1	A	—	-
2	-	-	-

Symmetric mutual
Twoway
node
Priya
relation
Rohan
edges
Alan

Asymmetric ~~array~~

A
Akshij
Sohel B
Madan D
Abx C

	Priya	Rohan	Alan
Priya	-	1	0
Rohan	1	-	1
Alan	0	1	-

	A	B	C	D
A	0	0	1	1
B	1	0	1	0
C	1	0	0	0
D	0	0	0	0

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* SNA practicals

2- practicals for 20 marks total 40 marks

⇒ Tools → install igraph.

Practical-1

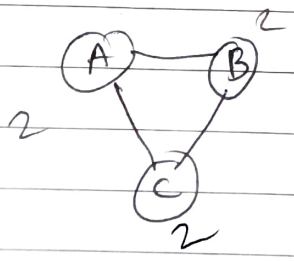
Code :-

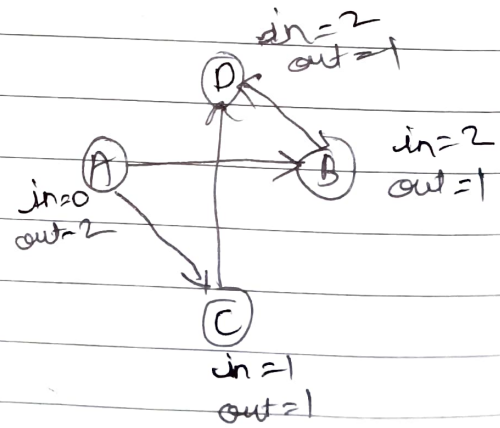
```
library (igraph)
g1 = graph.formula (A-B, A-C, A-D, B-C, B-D,
                    C-D)

g2 = graph.formula (A++B, A+-C, A-+D, D-+A,
                    B++D)

ecount(g1)        <- no. of edges
ecount(g2)
vcount(g1)        <- no. of vertices
vcount(g2)
get.adjacency(g1)
```

for degree






```
plot(g1), plot(g2)
degree(g1)
degree(g2, mode="in")
degree(g2, mode="out")
```

* SNA *

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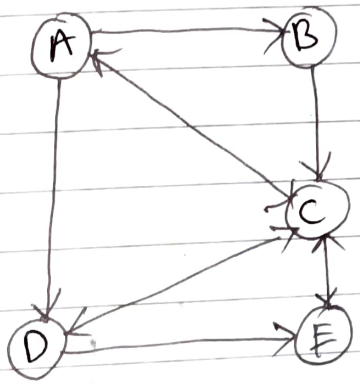
* SNA *

* Connectedness :-

① for the given network connectedness show the average connectivity for individual node

② It differ from density of network as density of network shows average connectivity of entire network while connectedness check one particular node at a time and then calculate submission of each and every nodes connectivity.

directed graph (Asymmetric)



$$\sum_{i=1}^{n} \frac{\text{no. of connected nodes to } n_i}{n-1}$$

where n = no. of nodes.

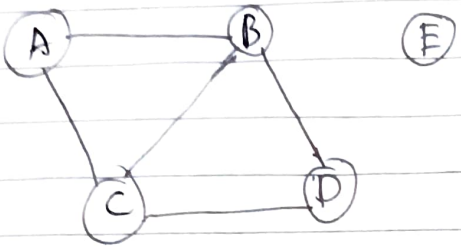
⇒ Two nodes are said to be connected if there exist path between these two nodes

Soln:- $\frac{4}{4} + \frac{4}{4} + \frac{4}{4} + \frac{4}{4} + \frac{4}{4} = 5$

n-1 = 5 - 1 = 4

isolated node

Eg ②



$$= \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{0}{4}$$

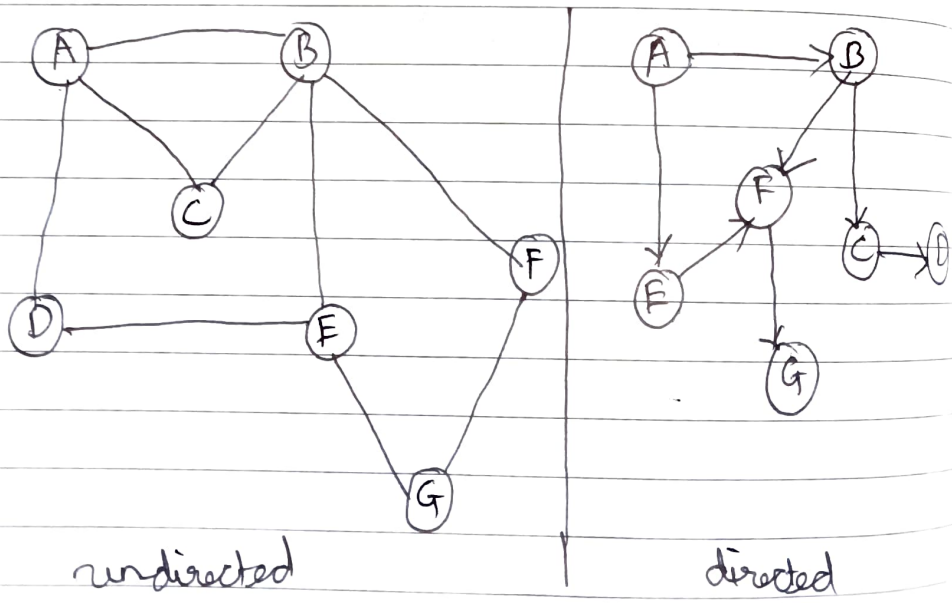
$$= \frac{12}{4} = 3$$

Exam Q

Q For a given symmetric and asymmetric network calculate the following

① Degree of Network.
② Reciprocity rate of a network.
③ Density
④ Connectedness

Eg ①



undirected

directed

(In exam write formula & solve)

	undirected	directed
degree	A = 3	A = 0+2 = 2
	B = 4	B = 1+2 = 3
	C = 2	C = 1+1 = 2
	D = 2	D = 1+0 = 1
	E = 3	E = 1+1 = 2
	F = 2	F = 2+1 = 3
	G = 2	G = 1+0 = 1

~~reciprocity~~ density = $\frac{9}{\frac{n \times (n-1)}{2}}$ (undirected)

$= \frac{9}{\frac{7 \times (7-1)}{2}}$

$= \frac{9}{7 \times 3}$

$= \frac{9}{21} = \frac{3}{7}$

$= 0.428$

density = $\frac{7}{7 \times 7-1}$ (directed) (no. of nodes)

$= \frac{7}{7 \times 6}$

$= \frac{1}{6}$

$= 0.1667$

Reciprocity (directed graph (Asymmetric))

Reciprocity rate = $\frac{\text{Total no. of existing } \sout{\text{reciprocity}} \text{ reciprocity relation}}{\text{Total no. of possible reciprocity relation (no. of edge)}}$

$= \frac{0}{7} = 0$

Connectedness (undirected)

$$= \frac{6}{6} + \frac{6}{6} + \frac{6}{6} + \frac{6}{6} + \frac{6}{6} + \frac{6}{6} + \frac{6}{6}$$

$$= 7$$

(directed)

$$= \frac{6}{6} + \frac{4}{6} + \frac{1}{6} + \frac{0}{6} + \frac{1}{6} + \frac{0}{6}$$

$$= \frac{6}{6} + \frac{4}{6} + \frac{1}{6} + \frac{2}{6}$$

$$= \frac{14}{6} \quad 2.33$$

$$= 2.33$$

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SNA

Practical - 02

Aim:- Converting a data into one or more nodes

Code :- R Software not R studio

first run the

=> library (igraph)

=> then code