Introduction to Data Science: Homework 3

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1.

(a) An acyclic (or approximately acyclic) directed network

(1) Epidemiological

(2) 設計問卷蒐集病人的生活習慣或活動範圍

(3) 進而觀察疾病的發生原因，不良生活習慣或地區性傳染?

(b) A cyclic directed network

(1) 師生關係

(2) 蒐集受訪者曾經受過誰的指導或是指導過誰

(3) 可以看出哪領域的知識快要失傳了

(c) A tree (or approximate tree)

(1) 企業的職位關係

(2) 蒐集受訪者的主管是誰

(3) 觀察公司的管理有沒有出問題，如：有沒有人沒人管?或有沒有主管一次帶太多人?

(d) A planar (or approximately planar) network

(1) Florence families

(2) inter-family marriages

(3) which family is most central?

(e) A bipartite network

(1) 男生女生聯誼配對

(2) 調查每個人對哪個異性有興趣

(3) 找出人氣王，也可以直接將 1 對 1 的配對成功

(f) A temporal network (or sequence of edges)

(1) private messages sent on an online social network

(2) edge (u, v, t) means that user u sent a private message to user v at time t

(3) Users could search the network for others and then initiate conversation based on profile information.

2.

(a)

A	1	2	3	4	5
1	0	0	0	0	1
2	1	0	1	1	0
3	0	0	0	0	0
4	0	1	1	0	1
5	0	0	0	1	0

(b)

1 --> {5}
2 --> {1,3,4}
3 --> {}
4 --> {2,3,5}
5 --> {4}

(c)

上排

B	1	2	3	4	5
1	1	1	1	0	0
2	0	1	0	0	0
3	0	0	1	1	0
4	0	0	1	0	0
5	0	0	0	1	1
6	0	0	0	1	1

下排

(d)

$$\sigma_{ij} = \frac{W^i \cdot W^j}{\|W^i\|\|W^j\|} = \frac{\sum_k w_{ik} w_{jk}}{\sqrt{\left(\sum_k w_{ik}^2\right)\left(\sum_k w_{jk}^2\right)}}$$

$$\sigma_{ab} = \frac{1*1+1*1}{\sqrt{2^2+2^2+1^1}\sqrt{2^2+2^2+1^1}} = \frac{2}{9}$$

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