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19CSE337 Social Networking and Security

Lecture 20

Topics to Discuss

- Learning based methods

Feature based classification

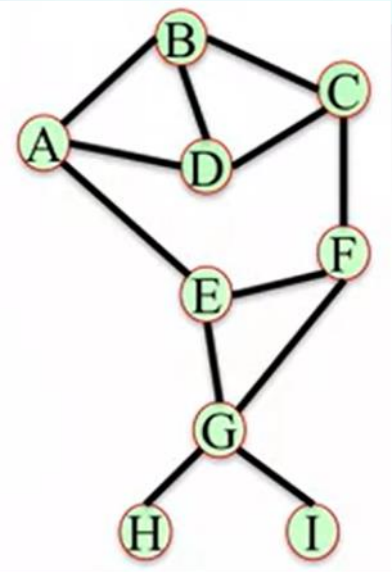
- Classification is a supervised learning approach.
- It uses class labels.
- Let $(x,y) \in E$ in $G(V,E)$ and $l(x,y)$ be the label of node pair.
- Each non-connected pair of nodes corresponds to an instance of a class label.
- The pair of nodes can be either positive or negative. (Binary classification).
- $l(x,y)=+1$ if $(x,y) \in E$ else -1

Feature based classification

- To build an efficient classifier, it is must to extract required features from the network.
- Classification learning models will use similarity index based features also.

Step-1 Compute Similarity Scores (Data Set for Learning)

Node Pair/Link	CN	JC	PA
(A,C)	3	0.5	9
(A,G)	1	0.167	12
(A,H)	0	0	12
(D,E)	1	0.2	9
(D,F)	1	0.2	9
(H,I)	1	0.5	1



Fix the minimum values of each metrics as follows to be considered. CN=1,JC=0.5, PA=9

Step-2 Compute Frequency Table (Two class labels Yes/No)

Node Pair	Yes	No
A,C	3	0
A,G	2	1
A,H	1	2
D,E	2	1
D,F	2	1
H,I	2	1

Yes/No is counted based on satisfying min. scores in earlier table.

Step-3 Compute Likelihood Table

Node Pair	Yes	No	
A,C	3	0	3/18=0.167
A,G	2	1	3/18=0.167
A,H	1	2	3/18=0.167
D,E	2	1	3/18=0.167
D,F	2	1	3/18=0.167
H,I	2	1	3/18=0.167
	12/18=0.67	6/18=0.33	

Step-4 Applying Bayes' Theorem

P(Class/Data)=[P(Data/Class)*P(Class)]/P(Data).

P(Yes/AC)=[P(AC/Yes)*P(Yes)]/P(AC)

P(AC/Yes)=3/12=0.25

P(Yes)=12/18=0.67

P(AC)=3/18=0.167

P(Yes/AC)=[0.25*0.67]/0.167=1

Step-4 Applying Bayes' Theorem

P(Class/Data)=[P(Data/Class)*P(Class)]/P(Data).

P(No/AC)=[P(AC/No)*P(No)]/P(AC)

P(AC/No)=0/6=0

P(No)=6/18=0.33

P(AC)=3/18=0.167

P(No/AC)=[0*0.33]/0.167=0

P(Yes/AC)>P(No/AC), therefore link AC will form.

Step-4 Applying Bayes' Theorem

P(Class/Data)=[P(Data/Class)*P(Class)]/P(Data).

P(Yes/HI)=[P(HI/Yes)*P(Yes)]/P(HI)

P(HI/Yes)=2/12=0.167

P(Yes)=12/18=0.67

P(HI)=3/18=0.167

P(Yes/AC)=[0.167*0.67]/0.167=0.67 [>0.5, The link HI will form]

Step-4 Applying Bayes' Theorem

P(Class/Data)=[P(Data/Class)*P(Class)]/P(Data).

P(Yes/AH)=[P(AH/Yes)*P(Yes)]/P(AH)

P(AH/Yes)=1/12=0.083

P(Yes)=12/18=0.67

P(AH)=3/18=0.167

P(Yes/AH)=[0.083*0.67]/0.167=0.332 [<0.5, The link AH will not form]

Thanks……