CS 412 Office Hour

April 19, 2019

Bayesian Networks Structure

- Three basic types of *junctions* (a three-node sub-network with two links):
  - A → B → C: *Cascade*
  - A ← B → C: *Common parent*
  - A → B ← C: *Common child*

A → B → C (Cascade)

- B transmits the effect of A to C
- B “screens off” information about A from C and vice versa
- A and C are dependent, but (conditionally) independent if the value of B is given
- Example: Study hard → Do well in the final exam → Get an A

A ← B → C (Common Parent)

- B makes A and C statistically correlated even though there is no direct link between them
- A and C are dependent, but (conditionally) independent if the value of B is given
- Example: Shoe size ← Age of child → Reading ability

A → B ← C (Common Child)

- A and C are by themselves independent, but conditioning on B will make A and C dependent
- Example: Hollywood actors
  - Talent → Celebrity ← Beauty
  - If we only look at famous actors (i.e. Celebrity = 1), then we will see a negative correlation between talent and beauty: finding out that a celebrity is unattractive increases our belief that he or she is talented
- This negative correlation is sometimes called the "*explain-away*" effect

Review: Junctions

- Complete the following table

	Name of structure	Are A and C independent?	If we know B, are A and C independent?
$A \rightarrow B \rightarrow C$			
$A \leftarrow B \rightarrow C$			
$A \rightarrow B \leftarrow C$			

Review: Junctions

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A ← B → C	common parent	no	yes
A → B ← C	common child	yes	no