

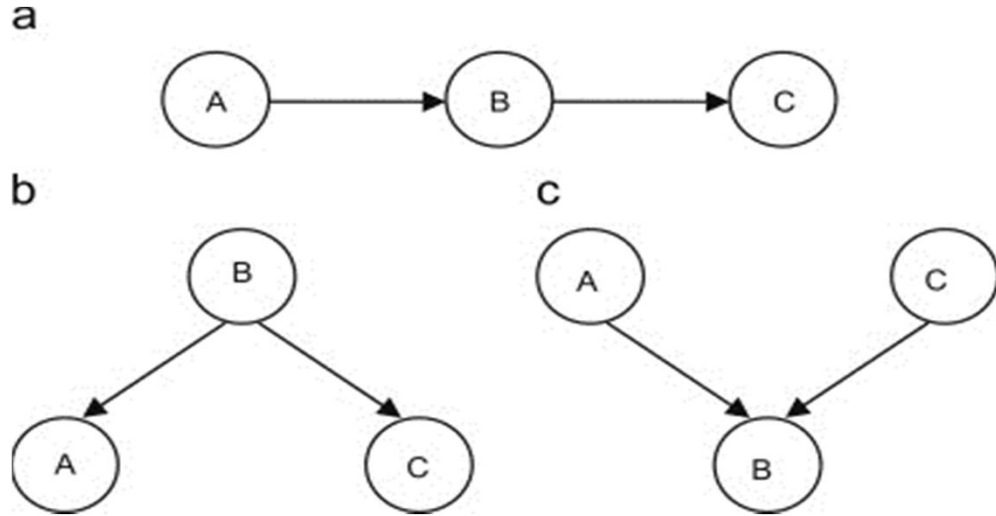
# Model structure theory

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# Connections between the variables

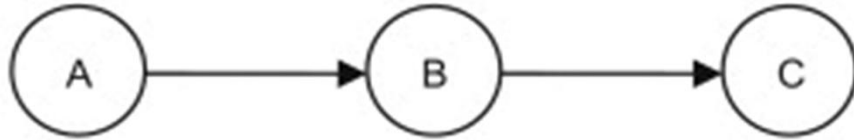
three variables can be linked in three ways:

- A) serial
- B) diverging
- C) converging connection



# Connection type affects the information flow

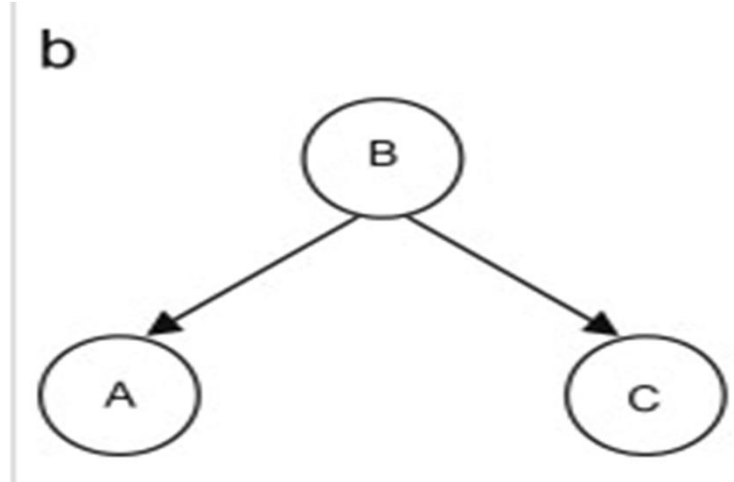
a



- Information about A updates our knowledge about B, which again updates our knowledge about C
- Also works the other way
- What if we know B for certain? Does additional information about A change our knowledge about C?
- *”A and C are d-separated given B”*

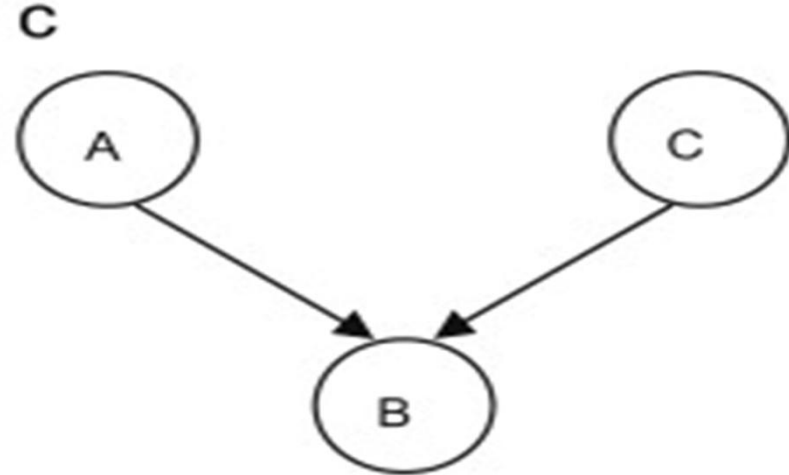
# Diverging connection

- Info about A updates our knowledge about B, which again updates our knowledge about C
- If B is known, info about A does not affect C
- *"A and C are d-separated given B"*

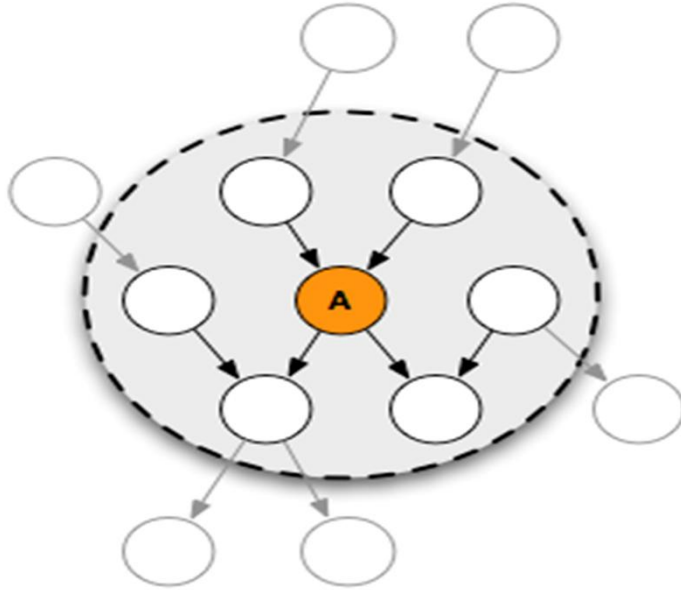


# Converging connection

- If there is no info about B, A and C do not inform about each other (*the presence/absence of one cause does not tell us anything about the presence of another cause*)
- If we know anything about B (*soft evidence*), A and C start to affect each others' probabilities
- “Explaining away”



# Markov Blanket



- The Markov blanket of variable  $A$  consists of its parents, its children, and the parents of its children
- If the values of all variables in  $A$ 's Markov blanket are known, no other information will affect  $A$  ( $A$  is *d-separated* from the rest of the model)

# So what?

- These properties form the basis of the computations in BNs; the probabilities are updated assuming that these properties hold
- Look at your model structure from this perspective: Do the implied assumptions make sense? If not, how could the model structure be changed?
- If the model is built to reflect causal connections, these assumptions tend to hold
- Ask: Which variables affect this one? Which variables does this one affect?