Indian Institute of Technology Kanpur

National Programme on Technology Enhanced Learning (NPTEL)

Deep Learning – Part II

Module 16.8 – Independencies encoded by a Bayesian network
(Case 3: Node and its descendants)

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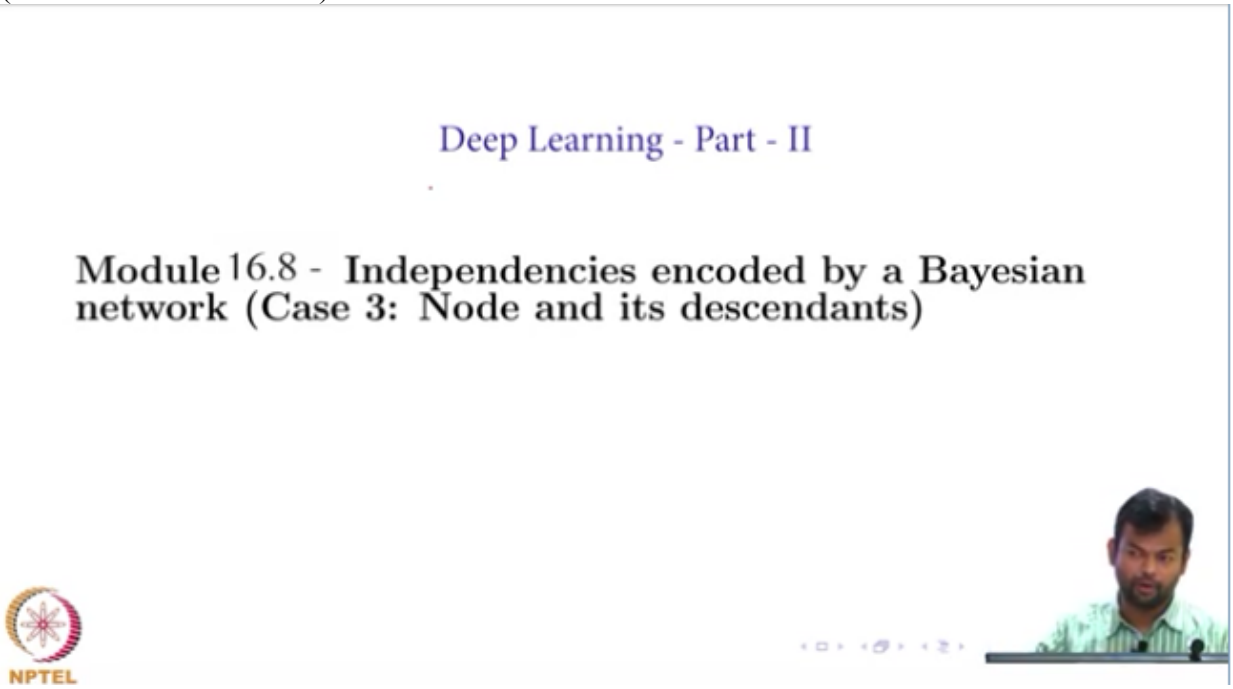

Discussion that we were seeing about so far was node and its non-parents, and what was the rule that we came up with? A node is dash of its, dash given its dash, independent of any node given its space, that's the rule that we came up with there, okay, so we have come up with two rules so far.

Now look at the third case, so we looked at node and it's parents, we looked at node and its non-parents, now we are going to look at node and it's descendants, okay,

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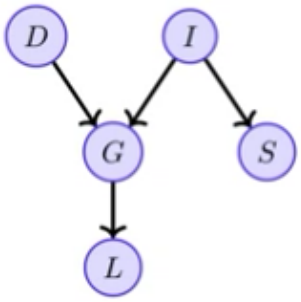

- $(G \not\perp D)\ (G \not\perp I)\ (S \not\perp I)\ (L \not\perp G)$
  A node is not independent of its parents

so this is the first rule that we had, a node is not independent of its parents.
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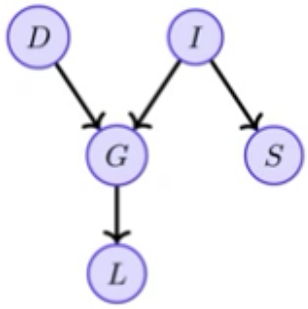

- $(G \not\perp D)\ (G \not\perp I)\ (S \not\perp I)\ (L \not\perp G)$
  A node is not independent of its parents
- $(G \not\perp D, I) | S, L$
  $(S \not\perp I) | D, G, L$
  $(L \not\perp G) | D, I, S$
  A node is not independent of its parents even when other variables are given

The second rule that we had is a node is not independent of its parents even when other variables are given.
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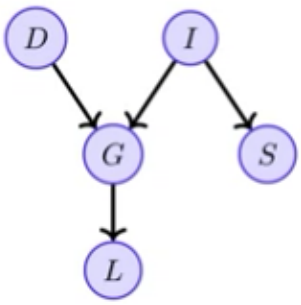

- $(G \not\perp D)$ $(G \not\perp I)$ $(S \not\perp I)$ $(L \not\perp G)$
  A node is not independent of its parents
- $(G \not\perp D, I)|S, L$
  $(S \not\perp I)|D, G, L$
  $(L \not\perp G)|D, I, S$
  A node is not independent of its parents even when other variables are given
- $(S \perp G)|I$?
  $(L \perp D, I, S)|G$?
  $(G \perp L)|D, I$?
  A node **seems to be** independent of other variables given its parents

The third rule that we have is a node seems to be independent of other variables given it's parents, this is the giveaway, okay and that's what we need to fix.

Based on whatever discussion we saw in the previous module, this is the rule that we'll come up with it, the node seems to be independent of the other variables, as long as I know it's parents value, it's independent of everything else in the network, is that fine? That's what we saw in that, is that fine? Everyone loudly, someone got the trick, okay.

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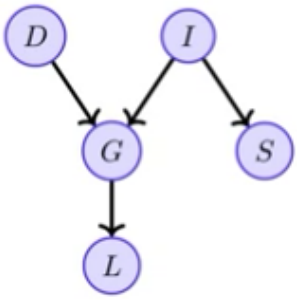
- Let us inspect this last rule
- Is $(G \perp L)|D, I$?



So let us inspect this last rule, right, so let me ask you this, is G independent of L given D,I, you know that the course was difficult, you know that the student was intelligent or not, which have these, now is the grade independent of the letter?
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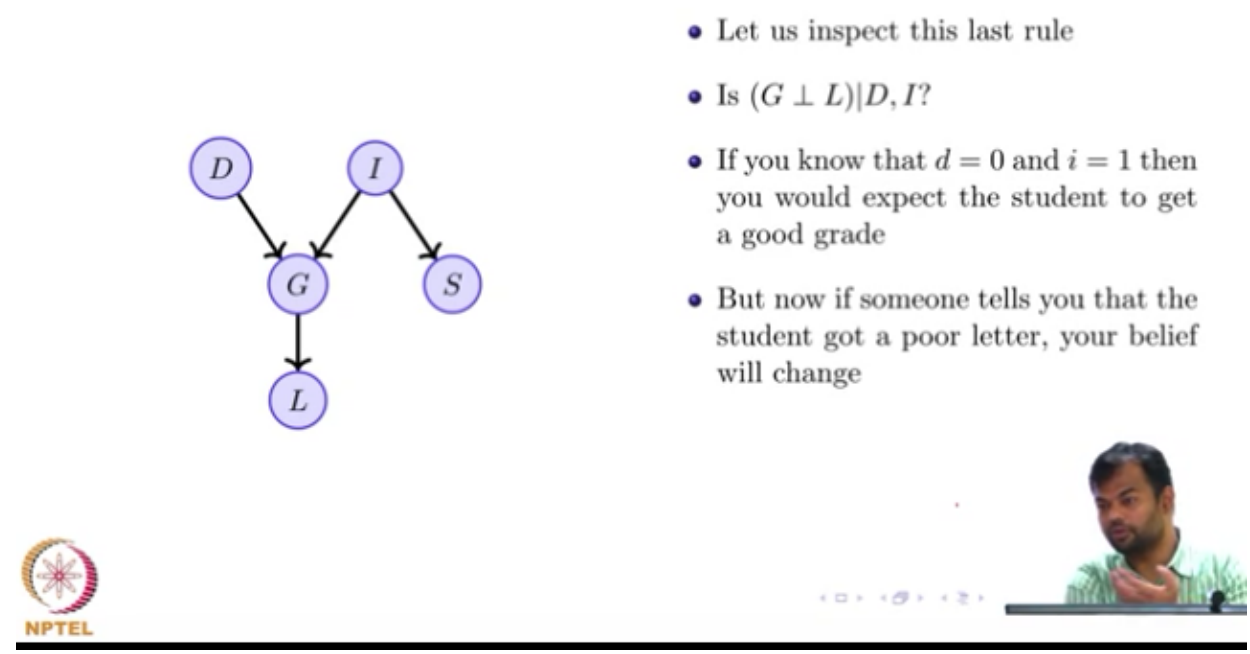

So if you know that the first two conditions were true right, that the course was easy and the student was intelligent, you would expect the student to get a good recommendation letter, right, but now if someone, you would expect the student to get a good grade, sorry, but now if someone tells you that the student got a bad recommendation letter, will this believe change or not?

Given the assumption that you have made about the way the world works, of course if the instructor was in a bad mood and all that those what if questions are not there, the student ended up getting a bad recommendation letter, is that going to change or belief about the grade or not? It is right, that influence does not flow just one way right, you know that the letter was bad, that means something would have got wrong, would have been wrong with the grade, right.

So what is the rule that was coming up here? So let's correct our rule,
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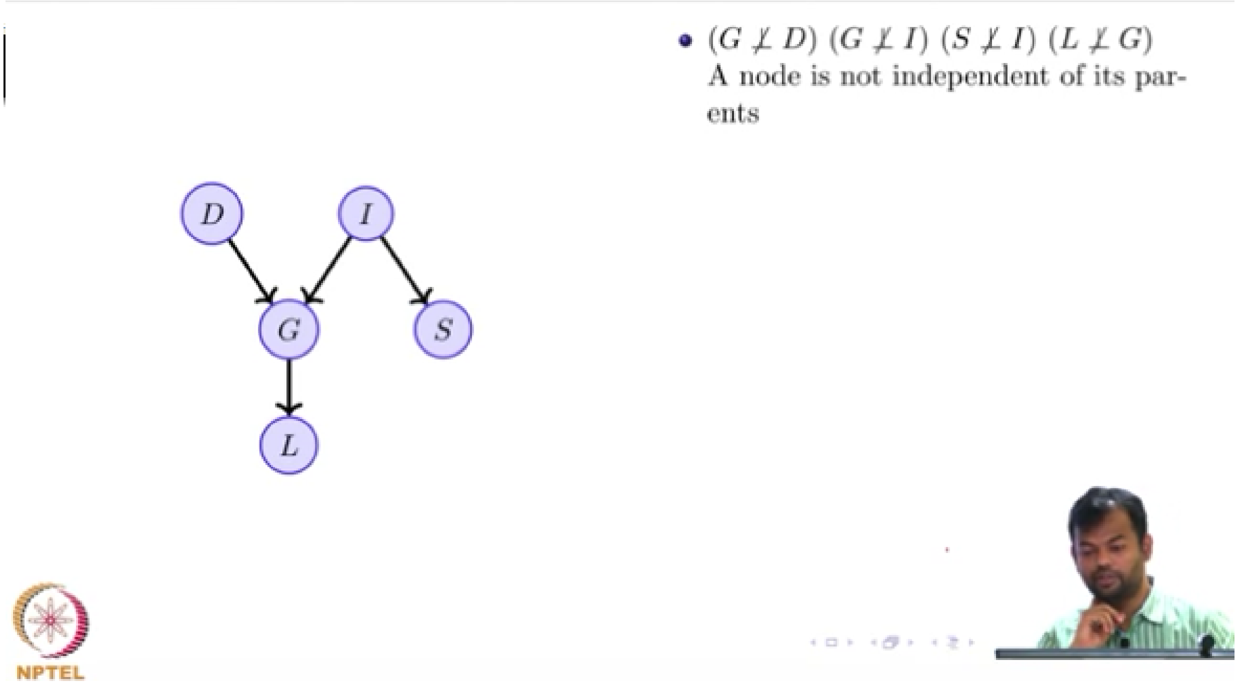

the first rule is fine, no one is not independent of its parents, even when other variables are given. What's the last rule? A node is independent of other variables given its parents, I wanted you to replace that other variables by something a node is independent of its non-descendants given its parents, does that make sense?

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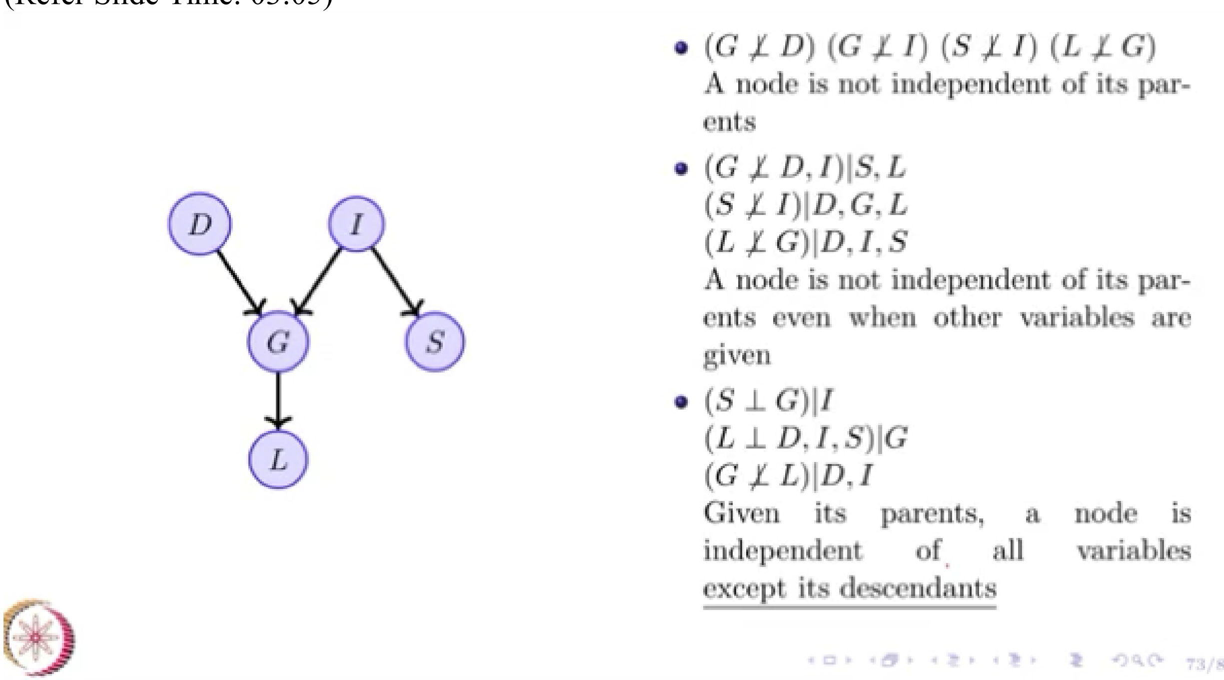

So given its parents a node is independent of all variables except its non-descendants, okay.

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