**Artificial Intelligence**
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**Lecture-57**
**Bayesian Networks: Inference Using Variable Elimination Part-4**

so I want to do One last thing which I am very fond of injustice 2 show you that there's nets Encompasses satisfiability 3sat actually think about you can come up with production. But in the spirit of making it quick. I show you the result if you are not VW and not you are not w a y letter se. I want to create a base which stores the set top. What is the SAT problem to figure out the formula satisfiable or not?

Can we create a business and do inference of a base net so that the answer to the base net solution give me the answer to the satisfiability problem. So, how do you do it? You take each law and make a random variable out of it. So U V W and why they all random variables and you give them a prior probability of. V to be true and. 52 be false. OK then You take each clause and create a URL not here. So one or not be you or not via w1 or not would be not you or not w a y this also needs a conditional probability

table for your condition property will be zero if us false V is true and false and one otherwise it basically saying you are presenting the all function in the conditional probability table. And then you have an and function here, which basically says that this is an and functions. If all of them are one I am one if any of them zero then I am so now what have you done? We have been given a condition popular table for each node

in my business and I have also given the probabilities for each of the initial random variables. Now, I do basic network in foreign what the inference I do. I say what is the probability of and Nothing about what doesn't give you tell me. When was probability of A and B 0? If the formulas and satisfied there is no way to make ability and Note 1. If probability of and is 1

what does the tell me? all configuration make and true that is not going to happen. But in in in usually it may be a number between 0 and 1. So what does the number represent and this is very interesting because all the origin variable and dependent you will have all possible configuration captured in this and if there is only one solution to the whole problem probability of the and will come out to be one by two. Exactly two solutions Probability and come out to be 2 hour to the end

and 64. So what is very interesting is not only is bassnett telling you that formulas. That is not it can do something bigger. It can count the number of solutions of the set formula. if you can do bayesian network inference, not only can we do sat we can Also figure out how many solutions at particular cell formula has and that particular problem is by the record model counting

that is NP complete problem. But if you are looking at the model problem, that's what is called the sharpie complete Shafi means counting the number of solutions of the NP complete problem. So bassnett unless all the Hira ki collapses. Itna more advanced complexity class then NP complete problems then NP Irshad pic the business has always has more information than that.

ok so that is the first thing exact incident has to be in Bihar this weekend Getaway from exponential second we like in CSP if it was a tree, we could do it in polynomial time there something called a political structure where if the quality of a tree structured bayesian network, then you can do inference and like you have cycle cutsets in CSP is you have probabilistic that sets in Asianet You have tricks of looking at the structure

and doing things with that we have equal and tricks years. We have variable elimination here. We have bucket elimination there. You can do your full in a deep analysis of comparing CSP is in basement and you will find the so many similarities that it's not even find its there just two sides of the same coin different classes in the next thing to do after 2 today's lecture. Next lecture is it will talk about is approximate inference algorithm,

which is better than its source of constant time in some time because if you spend more time you get a better approximation. Ok so that is what you will do in the next class. It uses the general principle of sampling and