

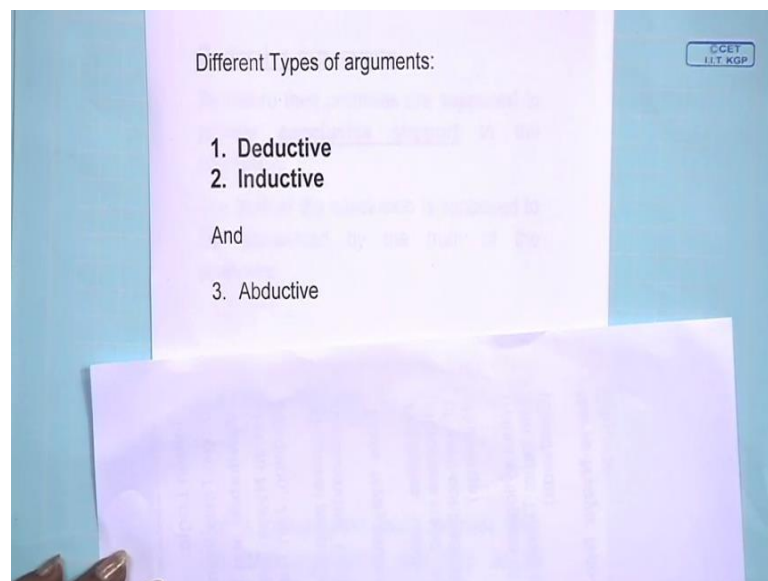
Symbolic Logic
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Lecture – 04
Types of Arguments, Types of Logic
Deductive and Inductive
Different Logic and Norms to assess Different Types of Arguments

Hello to Module 4 of the NOC course Symbolic Logic. We have done 3 modules already together. So this is Module 4, where we will be looking at: What are the different kinds of arguments, depending upon their type; different types of logic that we require. Mainly we will be looking into the difference between the Deductive and the Inductive. I am sure you have heard these names earlier : Deductive and Inductive. So, we will like to learn what is deductive argument, what is inductive argument, exactly where do they differ. By contrasts, sometimes, the identification becomes easier. And then we will talk about what are the different criteria that we require in order to address this difference that exists in the arguments. So this is our plan for Module 4.

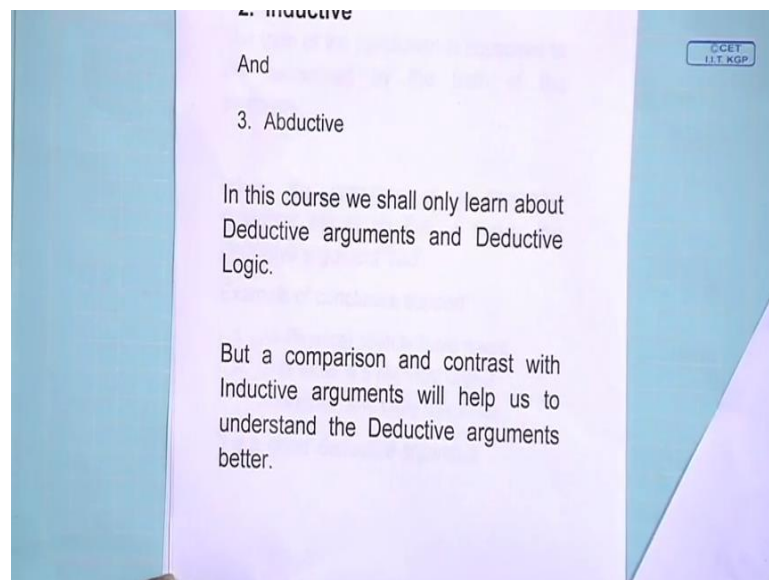
Different types of arguments. See, we have talked about what arguments are: That they are set of claims of certain types.

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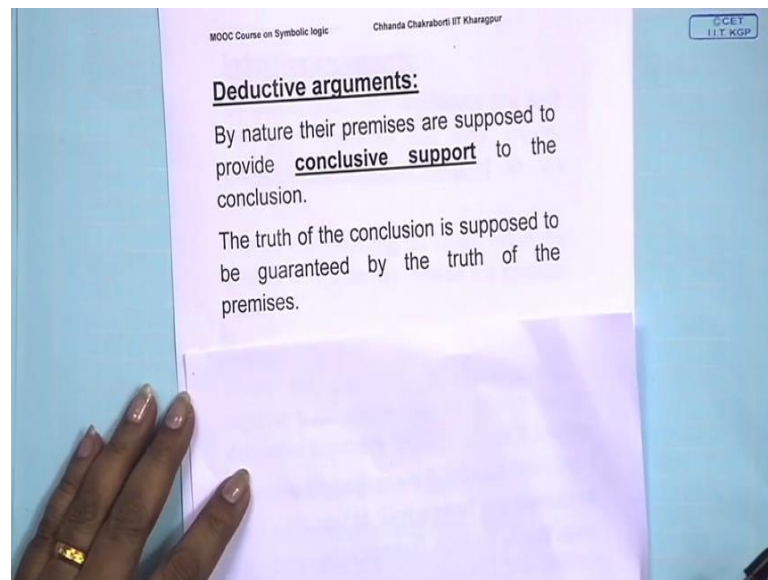
Then, there can be special characteristics of those arguments which make them very different from each other. And basic types are more than one. So, we have the Deductive kind of argument, we have the Inductive kind of argument, we also have the Abductive kind of argument.

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But, we are not going to look into all these variety with equal time, or at all. In fact, our course is going to be completely focused on Deductive argument, because Symbolic Logic is a deductive logic. So, we will be looking into deductive arguments very very thoroughly, just to have a comparison and a contrast done. We are now going to look into inductive arguments also, because sometimes the comparison and contrast sort of helps. So, that's our plan. For the next few minutes we will be talking about what deductive arguments are, what inductive arguments are, and exactly where do they differ, how do we approach them and why do we need to approach them differently. That is what we are going to learn in this module.

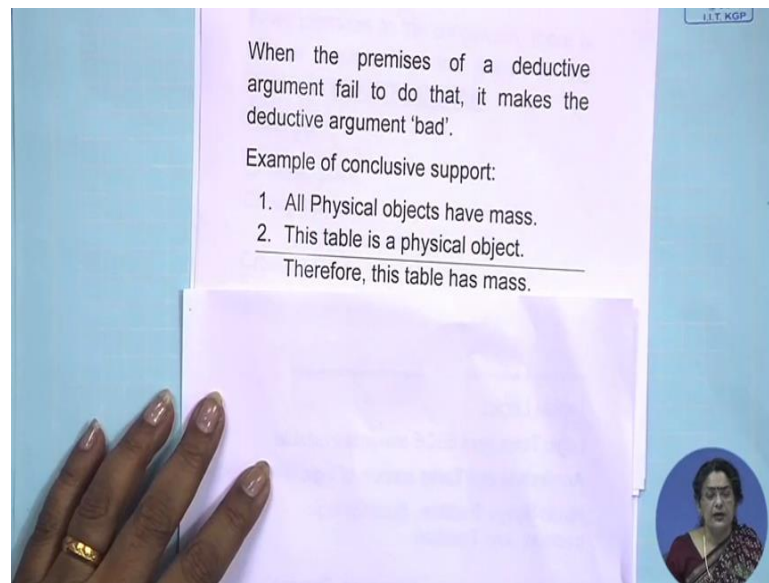
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So deductive arguments. What are they? How do we define them? And so on. See, main thing to remember is that from deductive arguments our expectation is completely different. What is our expectation? That their premises will provide *conclusive support* for their conclusion. See, every premise supposed to provide support to the conclusion. You know that. That is what their role is in an argument. But when you dealing with deductive argument, what make an argument deductive is the very claim that our premises are going to provide *conclusive support* to the conclusion.

Conclusive means what? Conclusive means certain, absolute; so that there is no room for doubt. The premises are such that they will necessitate the truth of the conclusion. That is the kind of expectation from deductive argument. This is the reason why it is said that, you know, that the truth of the conclusion in a deductive argument is supposed to be *guaranteed* by the truth of the premises. If you come to know that the premises are true in a deductive argument, you can be assured that from that the truth of the conclusion will follow. When that does not happen, when, that is, the premises of a deductive argument fail to provide this kind of conclusive support, that is when we call deductive argument *bad*. So, the default expectation from deductive argument is that the premises are going to provide conclusive support for the conclusion. When they cannot, or when they do not, that is when we call those deductive arguments *bad*. Because it is a failure of what the premises were supposed to do. And that is the nature of the deductive argument.

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Let me show you some examples as we go along. We have seen this argument earlier in another context, but let us do this again.

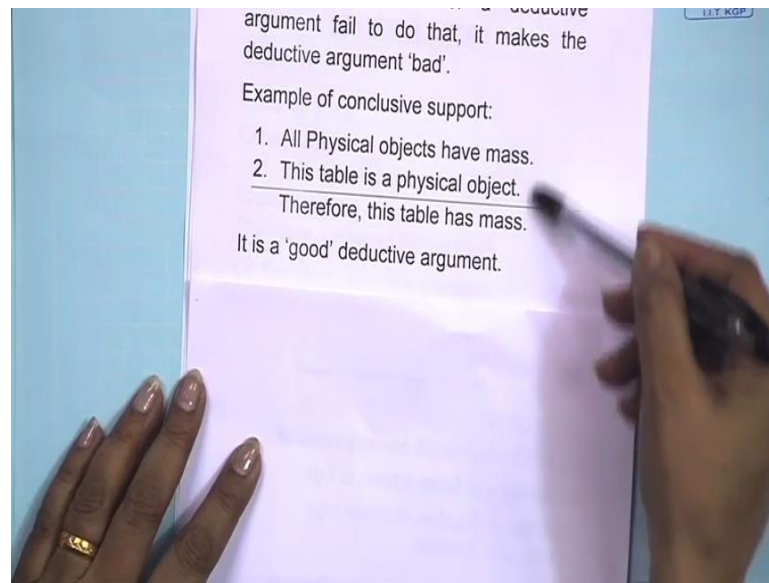
All physical objects have mass.

Second premise is 'this table is a physical object'.

The truth of this together *conclusively* makes this conclusion true: 'this table is a physical object'. And if it is true 'all physical objects have mass, it has to follow that 'this table too has mass'.

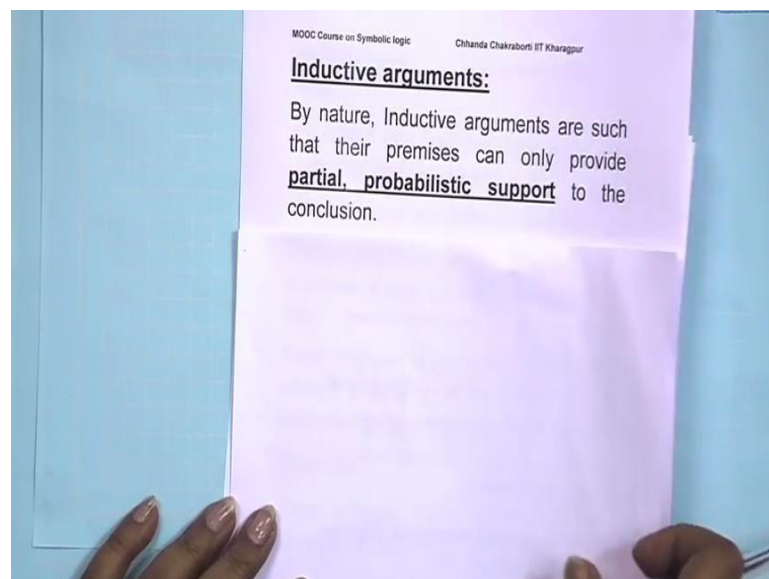
You see the force in, with which the premises support the conclusion. You see the way the premises sort of conclusively push the conclusion ahead. If the premises are true there is no way the conclusion can be false. That is also part of that. And that is the mark of deductive argument.

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And that is the mark of a *good* deductive argument. The goodness comes from the fact that the premises have done their job. The job was to provide certainty for the conclusion. Alright ? This is one example of a deductive argument, this is an example of a good deductive argument where the premises have done their duty. If you understood that, then let me walk you to the inductive argument little bit.

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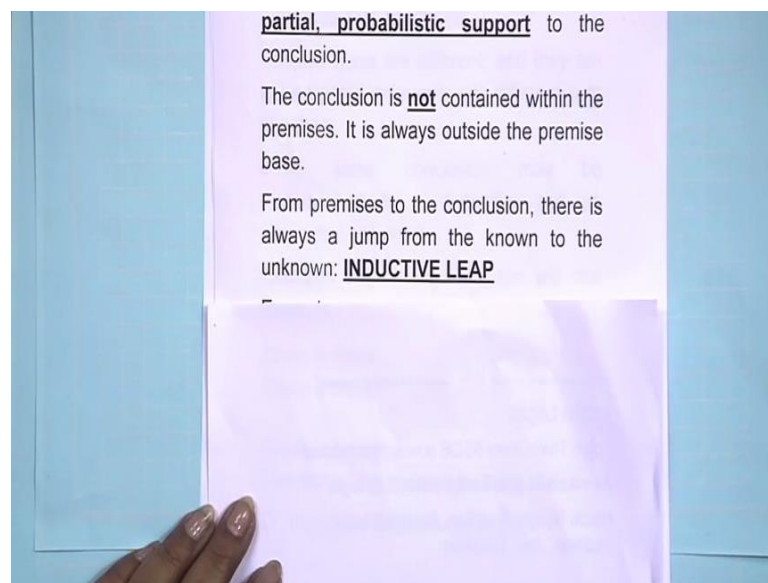


The inductive arguments are of a different nature altogether. By nature they are such; by nature, the inductive arguments are such that their premises can only provide partial, that

is, only part-support, and probabilistic support for the conclusion. So, this is where here is a complete departure from the expectations that we have towards deductive argument. The inductive argument, even the best of the best of the inductive argument, will also provide partial and probabilistic support. That is their nature. That is how, when you will see the example you will understand better perhaps that, that is the very nature of inductive argument that even when they are at the best form, they will only provide probabilistic support.

So, you can't have the same expectation that you had from deductive argument, and say why can't they provide conclusive support? Because that is not what they are. They are inductive arguments and their job is like this. So, this is our expectation from inductive arguments premises that they will provide partial and probabilistic support. Alright? So, that is the first thing to remember.

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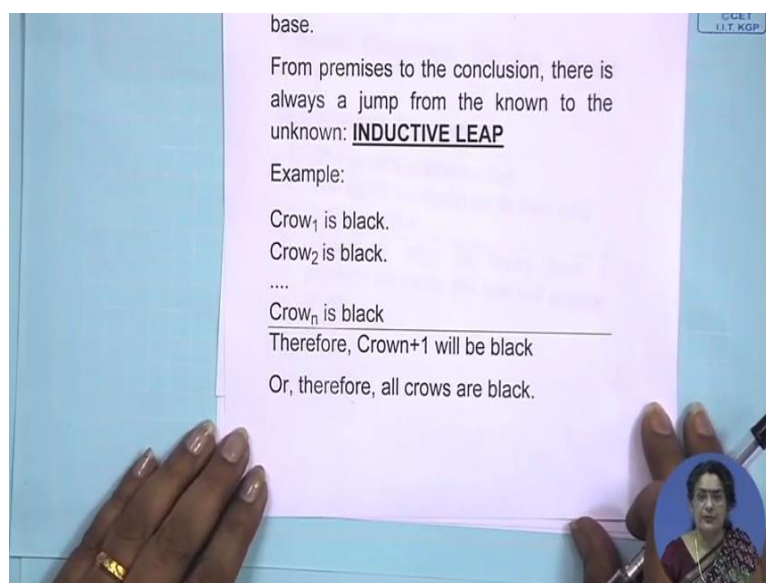
Then you also should know that in case of inductive argument, the conclusion is never contained within the premises. Whereas in the deductive argument, the conclusion is supposed to be *in a way* contained within the premises. Let me remind you if you are, if you still read Sherlock Holmes, for example. You know Sherlock Holmes series, Arthur Conan Doyle (Refer Time: 08:35) So, Sherlock Holmes is supposed to be a master of deductions. Watson always praises Sherlock Holmes saying "excellent deduction". And what deductions we see? Somebody coming and Watson sees the same person, Sherlock

Holmes sees the same person, but then Sherlock Holmes starts making these conclusions about this person that Watson is amazed about: How do you know this ? And Sherlock Holmes tells it is nothing but deduction; it was already given, it was already there. So, in a way, he is saying that the conclusion was already *contained* within the premises. Whatever fact I am telling you about the person, whether he was from Afghanistan, whether he was in the army (Refer Time: 09:17), etcetera, etcetera. All these are just given facts; I am just eliciting them, I am just deducing them. And that is a nature of the deduction.

Now note, that induction does not work like that. In inductive argument, the conclusion is never contained within the premises; it is always outside the premise base. So, there is a jump and we'll talk about that in the minute. But notice that the premises take you up to a point, and then the conclusion is not there to be found within the premise base. No matter how much analysis you do, the conclusion is outside the premise base. And that is what is being induced from the premises.

So, there is a jump, as I was trying to say. In inductive arguments from the premises to the conclusion, there is always a jump. From what is known to what is not known, or unknown. So that is known as the *inductive leap*. Leap means jump; that inductive leap. And that is the marker of inductive arguments; that by characteristically there has to be an inductive leap for the inductive argument to work. Let us now look into an example and maybe we can plug this in what we are talking better with the example being shown.

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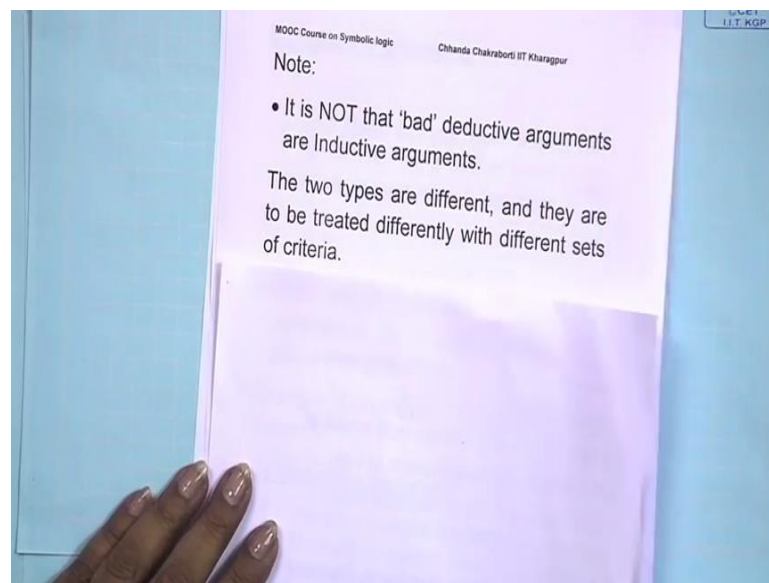
Suppose you have come to our campus and the first day, I do not know why, but you noticed the crows. You saw that the crow number 1, the first crow that you saw, is black. Next day you also see another crow that too is black. Suppose you are staying in our campus for slightly longer time, so you are collecting evidence and everyday you see a crow that is black. Maybe it is the same crow, maybe it is not the same crow, but you are watching these crows. So, when you see the n^{th} crow and it is still black, you can now conclude. You might say, that the next crow that I will see, which is the crow $n^{\text{th}} + 1$, that too will be black. Or, if you are slightly casual, then you might say that all crows are black. Right? And this is what we would call an *inductive argument*.

You have just seen an example of inductive argument. Let us watch this. See, these are your premises which you have collected over days, or maybe years, I do not know, but that's your premise.

Please note, that this conclusion is not contained anywhere in the premise base; it is something else; something outside the premise. Moreover, please note that even if each of this is true, their truth does not provide *guaranteed support* to the conclusion. Why not? Because the next crow that you will see may not be black, you know, there are, there may be an Albino, (Refer Time: 12:26), a white crow. Do you know for sure that the next crow will be black? There is a small gap, there is a small uncertainty. Right?

So, that is what makes the inductive leap. You know this much, you don't know completely, and for sure with certainty, that the next crow will be black, or that all crows are black. Right? That's a generalization. But nonetheless, it is a good argument. In fact, the more crows that you observe, if your observation base is very large, then the more support you will get. But do you understand that there is a big difference in nature between these two arguments? You can't expect from this conclusive support and the probabilistic support will not work in the case of deductive argument. So, these are two different types of arguments.

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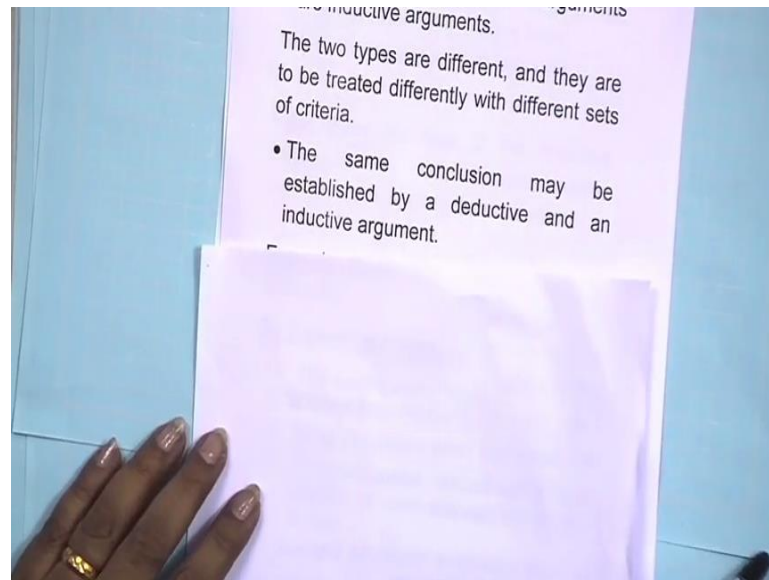


So, let us summarize. I hope you understood the differences, but still let's talk about. Now what I did *not* say. I did *not* say that the bad deductive arguments are inductive arguments. Whenever the deductive arguments fail to provide conclusive support, they become inductive argument: No. The nature, the process in which, or the way the arguments is developed, are completely different. These are apples and oranges. So let's not mix them up. What our expectations are from deductive argument is quite different, what our expectations are from inductive arguments are also very very different. So, let's not mix them up.

Now, because there are two different kinds, so they have to be treated differently. Meaning: that if you are going to assess them, if you are going to say that this is a good argument and that is a bad argument, you cannot use the same criteria to judge these two

types. So we are going to learn that for deductive arguments we have separate criteria, and we will talk about it in module number 5 in a bit. And if you are dealing with inductive arguments then you are dealing with a completely different set of things and you need a separate set of criteria to sort of approach those.

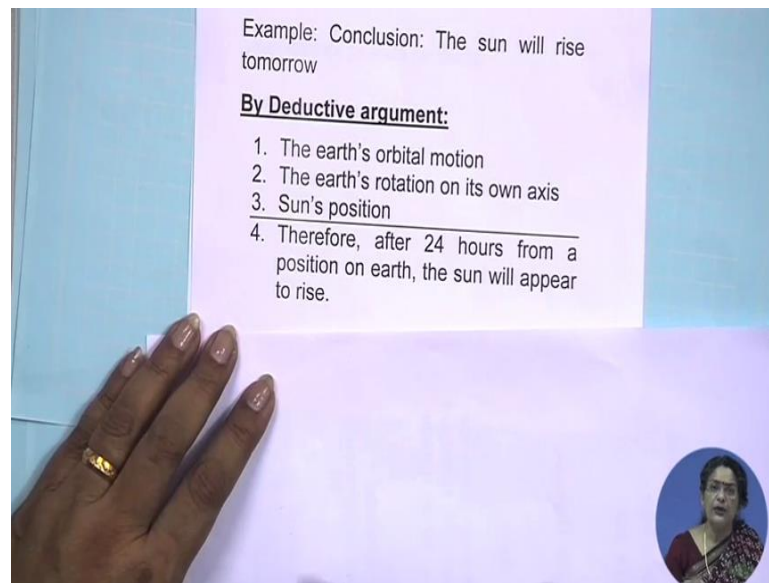
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Second, I think it needs to be said that they are different. Deductive arguments and inductive arguments are completely different; we said that. But, at the same time, they are not separate in the sense that their domains do not overlap. In fact, it can be that you may have the same conclusion, but you are arriving at that conclusion in two different ways; by deduction and by induction. Alright?

So, let me give one example of that, so that you know that the difference is there, and difference is to be appreciated, but that doesn't mean that they are mutually exclusive completely. In fact, sometimes we use both, sometimes there are arguments that are sort of follow up on another, sometimes there is this conclusion, as I am trying to say, but it can be reached from two approaches: Deductively as well as inductively. Let me show you one example of that.

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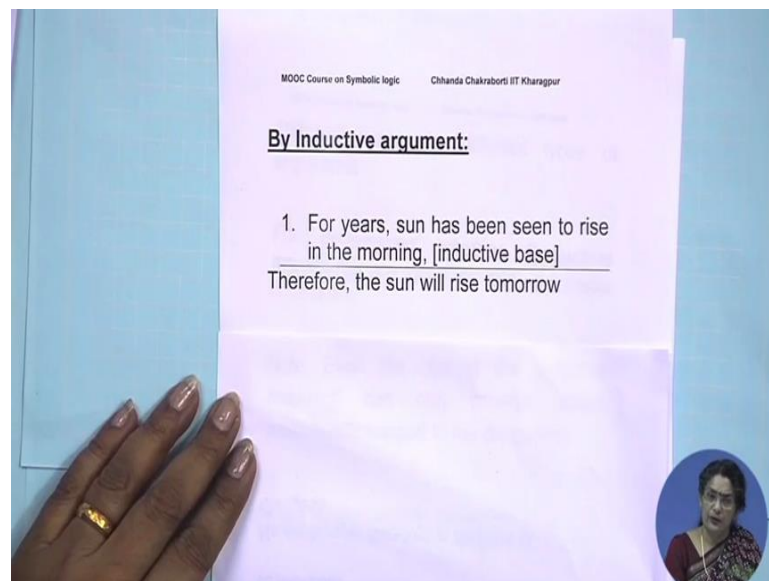


See, a great example of inductive argument often is given in this way. 'The sun will rise tomorrow'. 'The sun will rise tomorrow'. Do you know that 'the sun will rise?' If asked, how you know that? You are probably going to say by induction. Because so many years I have seen the sun to rise everyday. A new day starts with the rise of the sun. Fine? And the premise base is so strong that the probability is close to one that tomorrow also sun will rise. If you say this, what are you saying? That this is a clear conclusion of an inductive argument. So many years from day one I have seen, before me my father has seen, or mother has seen, and before them our grandparents have seen that the sun has risen. So now sun will rise. Is it completely guaranteed that the sun will rise tomorrow? The answer is no. It could be the day when the sun explodes; you know it is a star after all. So the small gap of uncertainty is there. You know. But the probability is strong enough to be close to one. If you go that way, then you are using inductive argument.

But let me show you that you can arrive at the same conclusion also deductively. How? Well, you can probably go like this: that let's look into earth's orbital motion. Earth has an orbit and certain motion and that earth rotates around on its own axis. All this is true, given that, given that, and given sun's position what will happen in 24 hours or next, which is our morning time on earth, we will see that the sun will appear to rise from east.

So, in a way you have shown that the sun will rise tomorrow, but look at the way you have proceeded. You did not come from an observation base, you took some well-known principles and you derived that the sun will rise tomorrow because of this. That is the nature of deduction. The conclusion is already contained in this: If these are true, this will happen. Alright? And what was your argument, inductive argument? Well, that was based on your observation and that sort of worked like this. Look at the way this inductive argument is placed.

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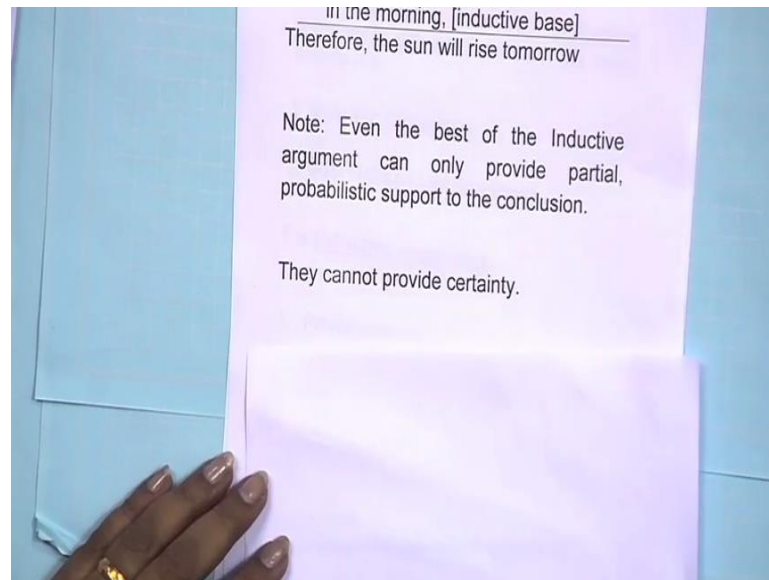


So, now if you are proceeding towards same conclusion inductively, what you will say is that you have collected evidence. That you have seen the sun to rise everyday, every year, and so on and so forth, and that is the inductive premise base: Observation base. “Tomorrow’s sun”, is that part of your inductive premise base? No. So, this is your known from which you are jumping to the unknown. And that is a leap, the inductive leap, that is what we talking about ,and there is this uncertainty also. And, look the nature of the argument. It is completely different from the way the deductive argument has gone. Nonetheless, the conclusion is same.

So, my point remains there that first of all learn to appreciate the difference between these two types of argument, and then also appreciate the fact that they are of different kinds and they both are good at gaining knowledge. Inductive arguments are not bad arguments. In fact, there is a lot of knowledge that you gain by doing inductive

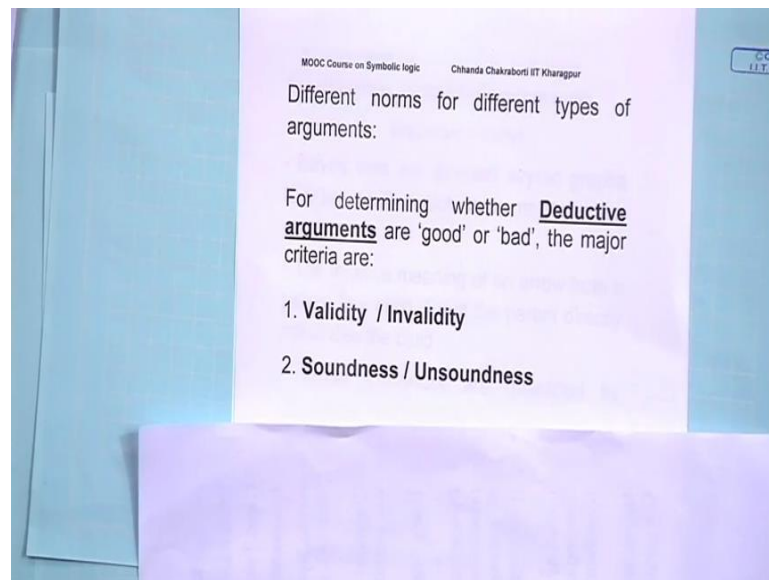
arguments. Similarly, deductive arguments also has its place and they also provide us knowledge. These are not to be mixed, but they are not mutually exclusive either, which is what I said little bit and I hope you have understood that.

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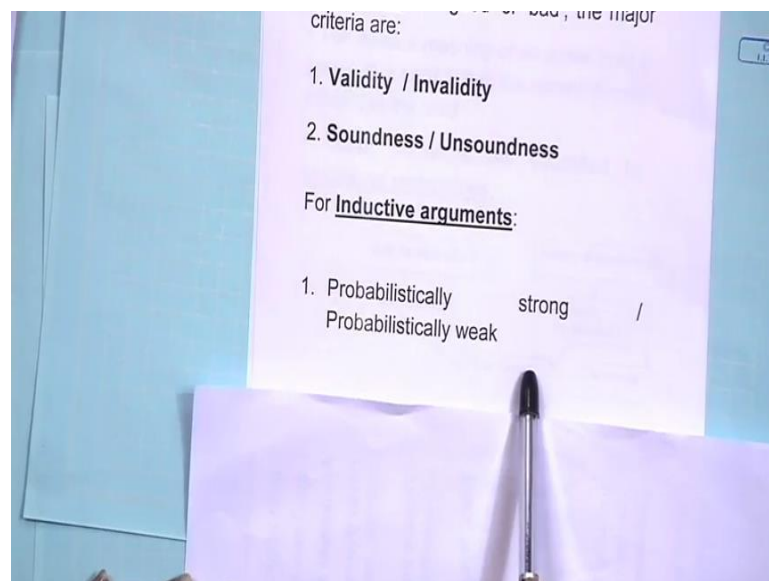
So, before we leave the topic, let me remind you once more that the inductive argument are as such that even the best amongst them will not be able to provide you absolute guarantee about the truth of the conclusion, they cannot. That is their very nature. So, that is unfair to expect the inductive arguments to do the job of a deductive argument, just as it is unfair to expect the deductive argument to give you new knowledge, something that is not contained within the premise base. OK? So, these have to be kept separately. One of them will provide certainty; namely, deductive; another will give you new information, that is, inductive argument. Both are useful and both are to be used. But we will keep them separate because we are going to go towards the deductive logic and deductive arguments.

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Now, I said that because they are so different, therefore there is going to be different norms, different criteria, to assess them. So, for deductive arguments, when you are trying to decide whether they are good or bad, the major criteria that are going to be used are these, *validity* or *invalidity*. These are the criteria. If it is a good deductive argument, it will be valid; if it is a bad deductive argument, it is going to be invalid. There is also *soundness*. So if it is a good deductive argument, it will be *sound*. If it is a bad deductive argument, it will be *unsound*.

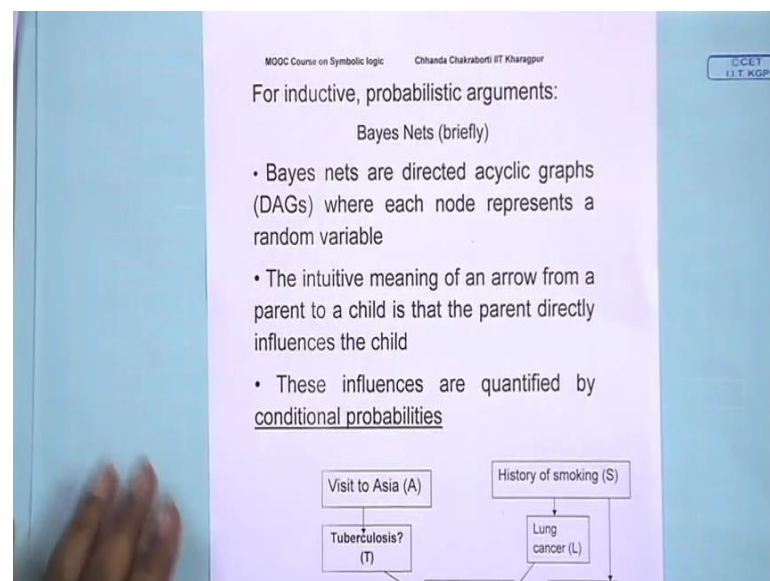
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In comparison, in inductive arguments, we do not even apply the soundness and validity. What do we apply? We talk about their *strength*; whether the inductive argument is *probabilistically strong* or *probabilistically weak*. The better inductive arguments are strong. So, the higher the probability is, or the higher the probabilistic support is, from the premise base, the inductive base, the better the inductive argument is. And the weaker it is, the worse it is in the run. Look at the criteria: Very very different. Right? So, once we are going to look at validity, invalidity and soundness; here we are only talking about strength and weakness. And this validity and soundness criteria we are going to take it up in the next module and we will talk at length, as I said over this.

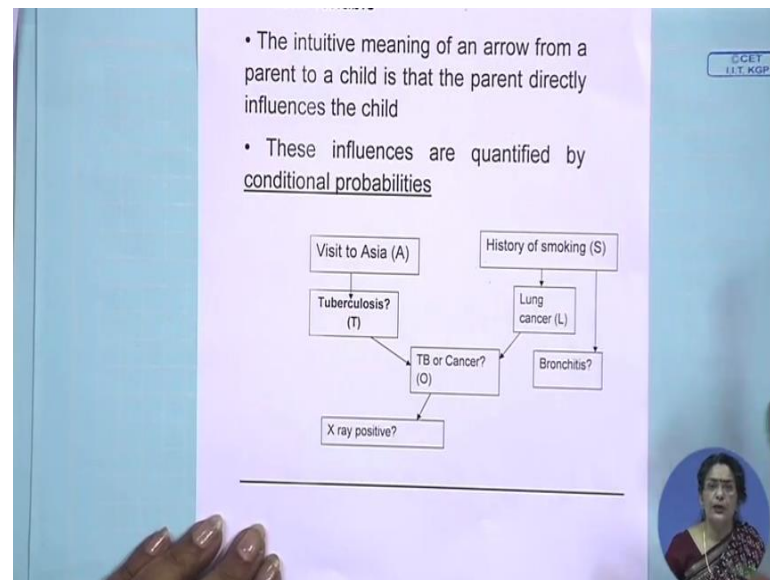
But let me just show you the inductive argument, because we are not going to talk anymore about inductive arguments. So, this is our last chance to sort of tell you that what we are going to need for inductive argument is the probabilistic logic

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where conditional probabilities are used, Bayesian nets are sometimes used. Bayesian theory is applied here to calculate the probability; the conditional probability and so on.

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So, those of you who can follow the conditional probability, you understand, then how to assess an inductive argument. Let me just in a very colloquial sort of a way, in a more ordinary, everyday sort of a way, let me explain. Suppose that a doctor is seeing a patient who is complaining of some lung trouble. Now, if the doctor and the patient are in a different continent, right? And they are trying to understand what could have happened to this person, what is the problem with his lung? Suppose that you get to know, the doctor gets to know, that there was a recent visit to Asia. Remember? They are from a different continent. So, there has been a recent visit to Asia. The moment it is said, because certain diseases lung diseases is endemic in Asian continent. For example, tuberculosis. So, they might ask, given that, there has been a recent visit; that's conditional probability, how probable is it that the person has tuberculosis? It may be so that the patient also has a history of smoking, right? So, there a certain flag (Refer Time: 24:23) goes up in the mind of the doctor: Is it lung cancer? Because there is a known causal connection between history of smoking, long history of smoking, and lung cancer. And then could it be bronchitis? What are we looking at, look at arrows, what they are doing is saying that *given* the history of smoking, how probable is it that the person has lung cancer? *Given* the history of smoking, how probable is it that the person has bronchitis? This is conditional probability. We are not talking about guarantee, but only probability; how high the probability is. And then between these we are asking: Is it TB or cancer? Which one is it? One way to find out the probably would be X ray and other

things. So, you see this is the conditional probability network and this is how inductive arguments are often approached. Alright?

So, today's module was about this different kinds of argument and we learned about the deductive arguments and inductive arguments, so that we can make the compare and the contrast. And we understood that they are very different kinds, not mutually exclusive , but they are different kinds and that we need different criteria to approach them. The remaining part we'll take it upon in other module.

Thank you very much.