Affective Computing
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Lecture - 01
Emotion Psychology

Hi friends, welcome to this week's class. So, in this week we are going to talk about the theory of emotion and here is our agenda for this week's class.

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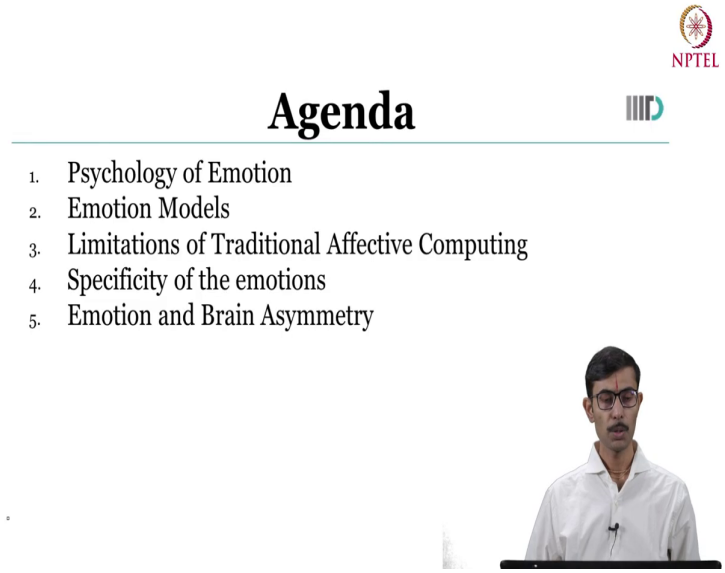

So, we will be covering first the psychology of emotion. Emotion models and we will try to understand the limitations of the traditional affective computing approach and then we will further move on to understand the specificity of the emotions followed by the emotion and the brain asymmetry.

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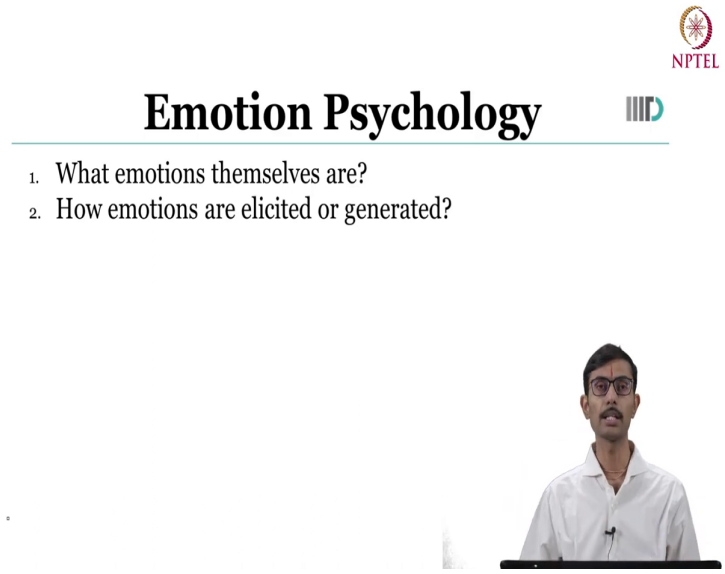

So, let us start with the psychology of the emotion. So, when it comes to the psychology of the emotions there are n number of different questions then we do that we need to answer. But we will start with two most prominent questions that are there with respect to the affective computing primarily.

So, first question that we are very much concerned about is the what emotion themselves are? So, we really want to understand before even trying to understand about the emotional intelligence and all that; first we want to understand that what emotion exactly are and the second thing that we want to understand how emotions are generated or elicited.

Because this will enable us to understand the emotions in a better way. So, that the monitoring can be done in a better way and accordingly the agent adaptiveness can be done in a significant manner perfect.

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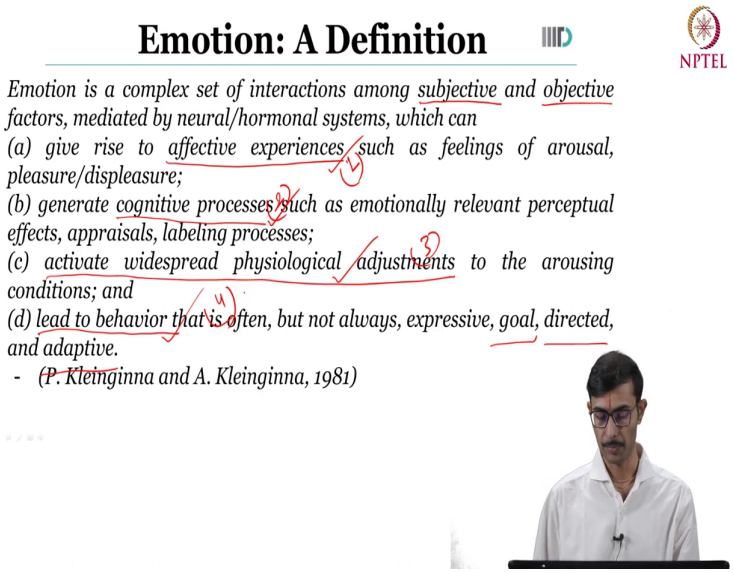

So, let us start with the trying to understand the emotions. So, what exactly are the emotions? So, emotion as such has been a very very difficult topic for the psychologists to define and they have been struggling since. So, many decades while there are different variations and the versions on the understanding of the emotions one common and popular definition that is used has the following components.

Emotion is understood as a complex set of instructions among two important things. One is the subjective and the another is the objective factors. So, and it is mediated by the neural and

the hormonal systems which can number one this is very important to understand give rise to affective experiences such as failings of arousal, pleasure or displeasure.

What it means that the very first component with respect to the emotion that we want to understand that it is a mix of it arises with a mix set of interactions between the subjective and the objective factors which can be many. And the very first thing that the individual experiences is an affective experiences such as a feeling of the emotion itself.

Second thing that we have is the it the emotion also generates cognitive processes such as emotionally relevant perceptual effects. So, how exactly we are perceiving those emotions and appraisals basically how exactly are we evaluating those emotions those experiences that have arisen and then we try to label them with a particular in a particular fashion.

So, there are these two important things. The very first thing is that there is an affective experience involved and then along with the affective experience we have a cognitive process and the third thing that we have is very important again it activates a widespread physiological adjustments to the arousing conditions.

What it means? That once we have felt a particular emotion then there are certain physiological adjustments that happen in the body with respect to the emotion that we are feeling and this kind of activation it is followed by the feeling of the emotions. So, the third thing is the activation of the widespread physiological adjustments.

And last, but not the least that once we have felt an emotion, once we have evaluated what the emotion is all about, once we have our body has done some physiological adjustments such as for example, change in the heart rate even and so on so forth.

Then the last, but not the least which is a very important step that it leads to an action it leads to a behavior that is followed that is dependent or that is in accordance with the emotion that we have felt and this behavior or this action can be expressive, but may not be expressive always, but nevertheless it has it could be very very much goal oriented and adaptive.

So, what it means that once we have felt a particular emotion, we may want to act in a way that is going to help us in countering or in responding to that particular emotion. So, now, let us take a very very simple example. Suppose, that we encountered an animal in the forest right. The moment we encountered an animal in the forest; now there are lots of different things that are happening right.

So, there are lots of subjective and objective factors that are here. Of course, there is this objective fact that you are there in the forest. There is an animal and subjectivity could be subjective factors could be that you may know already that what type of animal that is imagine that is a lion and its an dangerous animals. So, you already know all these kind of factors. So, there are the subjective and the objective factors that are there.

Now, the moment you see a lion, now there is a particular experience that you will have and that particular experience could be let say for example, feeling scared right. So, you may feel scared by seeing the lion. So, that is what is the first check that we have? So, we have a feeling of the affective experience which is in this case getting scared by seeing the lion.

Number thing number two could be now generation of the cognitive processes. Now, what could be the generation of the cognitive processes in this case? So, once you have seen a lion what can be done what will happen? That your brain is going to evaluate the situation right.

So, basically it is going to evaluate the situation of course, the perceptual effects are that you have seen the lion through your eyes and now it is going to evaluate the situation that ok where how much at what distance the lion is whether the lion is in a cage or well if it is in a forest, it could be not in a cage, it could be free and whether you are in a safe position, do you have an options to run and then so on and so forth. And so, you will start evaluating your options.

So, that is basically the these are the cognitive processes, cognitive calculations that are going to happening. So, number two is also checked. Now, the third thing could be once you have encountered this feeling of being scared by seeing the lion and you have already evaluated

your options. So, imagine that your options could be that you find yourself in a position that you are very very near to the lion and you cannot run and if you decide to run then maybe the lion can see you or it can even catch you right.

So, then there are certain physiological adjustments that are going to happen to all this scenario. So, for example, what is going to happen that maybe your body will suddenly realize that ok you really need to run fast in this situation and in order to run fast for example, you may need a lot more supply of the oxygen or the blood towards your limbs for example, right because you need to take some actions now.

So, for example, your heart rate may will increase because now your heart will start pumping at a faster rate. So, that it can start producing the supply that your body demands now. So, this is and these are and at the same time you may start experiencing some kind of sweating you know and so on so forth. So, basically this is the third that is the physiological adjustments that are happening with respect to the emotion that you have just felt right perfect.

Now, the third thing would be of course, it should lead to the behavior a particular behavior that is in this case should be expressive or may not be expressive if for example, you decided to do nothing may not be expressive, but usually if you have seen the lion if you have evaluated your options and you have already understood that ok the only option for you is to run as fast as you can.

Then maybe what you want to do it is definitely going to be expressive because you will run. It is going to be you will have a goal of running towards a safer zone putting yourself in a safer place. And then it will be directed towards that goal and then of course, it is going to be adaptive because you are taking this action of running, you are doing this action of running only because you have you felt scared.

And you have evaluated your options and accordingly your body has brain and body together they have decided ok this is our only option that we need to run and accordingly we are going to make these adjustments right. So, this is in this case the fourth box is also checked.

So, I hope that now you understand that while the motion is a very very difficult topic to design and there are lots of different components here, but in general as per this popular definition given by Kleinginna and in 1981 what we have? We have four very very important components. One we have there is an affective experience. This is you can say it as the number one.

We have some cognitive processes involved with that particular emotion. We have certain physiological adjustments in the body and then there is certain action motivated by or adopted that is going to be in adaptation to the particular emotion right perfect. So, this is what in brief we try to understand what exactly a motion is right.

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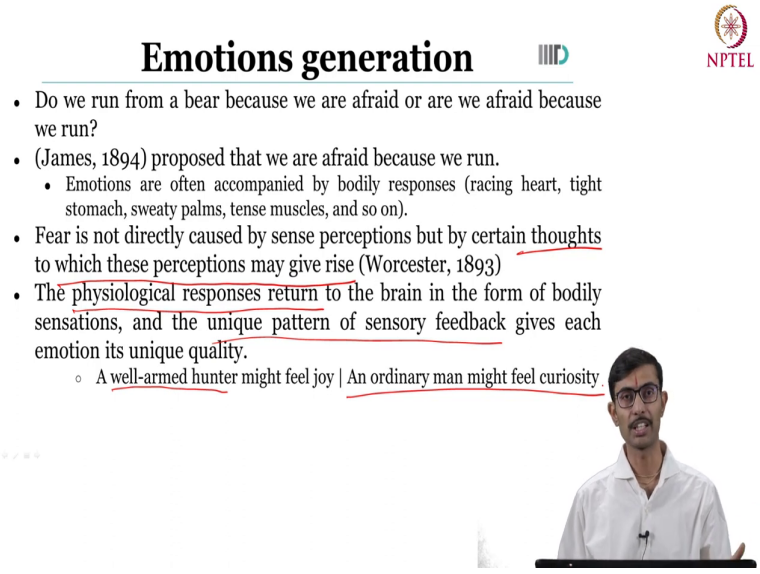

Now, let us try to understand the different second question that we raised in the beginning which is how exactly the emotions are generated? Now, this is a very interesting topic and

before even able to answer this question let us take another question which is derived from the similar example that we just saw that.

For example, imagine we encountered an animal, which could be a lion, which could be a bear or anything imagine that if we encountered a bear, do we run from a bear because we are afraid or are we afraid and hence we run. So, it is a very very interesting question that was raised by the psychologists in 19 in 1800's. In fact, and there are different opinions, there are different ways in which the psychologist and the emotion theorist they have tried to answer it.

For example, James he came up with the very very simple proposition which is also known as a common sense theory here, which he says that we are afraid because we run. So, what James said in his very famous proposition in 1894 that we are afraid because we run and that is how it means our emotions that have been generated they have been generated because of the bodily responses.

So, for example, we our heart is started our heart is started racing, we started feeling tight stomach, we had the sweaty palms, our muscles got very very tense and so on so forth and because we started experiencing these bodily responses what happened? That we started feeling get we started experiencing the feeling of this scaredness or the fear right. So, this is the theory that was populated by James in in 1894.

Nevertheless there are lots of criticism about this particular theory and one of the very common criticism for example, one of the common criticism that was given by more or less around the same time by Worcester was that the fear for example, in this case is not directly caused by the sense perceptions which was the argument of the James, but by certain thoughts please pay attention to this thing by certain thoughts to which these perceptions may give rise.

So, basically what Worcester is trying to say that in the same situation we are feeling scared, we are feeling fear not because our body is experiencing some responses. It is because that there are certain thought process, there are certain cognitive processes that happens first and

because of that cognitive process what happens? That certain evaluations or perceptions can be understood and hence this feeling of the fear or the scaredness is arising now.

And to certain senses actually this is very very true, but at the same time we need to understand this. That the physiological responses that our body is experiencing, it is of course, sent back to the brain in order to make the brain understand that ok what exactly the body is demanding or what exactly is the body needing right and this unique pattern of the sensory feedback that is the feedback that you just gave to your brain, it gives each emotion its unique quality right.

So, now in this case its really hard to say that ok whether exactly we first felt the bodily reactions and according to that only the emotions were generated or first we felt certain perceptions because there was certain thought process in our brain and that give rise to that give rise to the emotions that we are experiencing.

So, for example, let us take this example of the in the same situation, when we encountered a bear and someone is feeling scared right, but in the same situation imagine that there is a well-armed hunter and if the well-armed hunter is going to encounter a bear. It is going to feel rather than feeling scared it is going to feel happy.

Why it is going to feel happy? Because of course, it had a thought process behind first, it had a thought process that ok; today, I am going to go to the forest and maybe I am going to make a kill of a big animal maybe a bear right. So, rather than saying that ok you saw the bear first and then certainly and bodily reactions happened and then give that that give rise to the emotions what is happening here?

That for example, you had certain thought process and once you encountered a stimuli, a situation combined with that thought process certain perceptions arise and because of those certain perceptions, now you felt a particular emotion right. Similarly, we can take the example another example where an ordinary man for example, who may not have seen bear before may feel curiosity by seeing a bear in the lion.

A bear or the lion in the forest and so he may not he or she may not feel scared or he or she may not feel very very happy as well. So, they may feel curious. So, now you have to understand. So, ultimately now we let us discuss again our the question the question was whether we feel our emotions because of the bodily reactions or the bodily reactions happens because of the emotions.

Of course, we already saw that there are two very popular theories, one is given by the James, one given by the Worcester and they both have their own set of arguments. But primarily what happens that it may not be entirely true that we feel emotions because of the bodily reactions, certainly we saw some examples here and at the same time it may also not be entirely true that we have certain thought process and we have there are certain cognitive processes that happens first and then only the bodily reactions follow.

So, basically it has to be that a mix of both and certain things are happening at the same time simultaneously, but the answer to this particular question is really not that simple. Nevertheless, this is what the psychology says. So, far that it could be one of these or most of the time the psychologists they tend to lean towards the second approach second method where they tend to see that ok, there is certain thoughts to which the perceptions may give rise to right perfect.

So, we already now so I hope that now we have already understood that what exactly are the emotions? What are the four components of the emotions? And we also try to understand that how exactly the emotions are generated right. So, basically first some because of the certain thought processes some certain perceptions are arising and because of that then followed they are followed by the bodily reactions.

And those bodily reactions again go back to the your send some signal back to the brain to which the brain again responds or adapts right. So, basically this is how the emotions are generated in general perfect.

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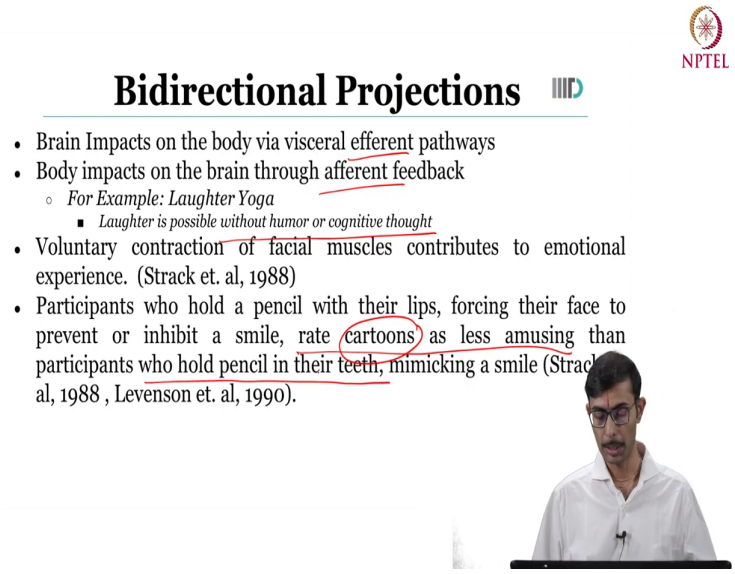

So, having understood that how the emotions are generated and what the what exactly the emotions are? Now, there is another very interesting thing that we must look here while we are discussing the generation of the motion is the bidirectional projections. So, basically what happens that now we have already understood that not only our brain impacts the body because when brain feels something where a brain encounters a particular type of thought process then certain bodily reactions follow.

In the same way body also impacts the brain right and then there are different pathways neurons actually. So, there are for example, afferent neurons and then there are there are efferent neurons. So, basically what they do they create different types of paths through which these signals. So, for example, through the with the help of the afferent neurons what happens?

That the all the bodily reactions they are communicated back to the central nervous system which includes your brain, which includes your spinal cord for example. And similarly, with the help of the efferent neurons the all the signals from the brain, from the central nervous system from the spinal cord are communicated to the body right.

So, there are these two different types of communication that happens with the help of different pathways with the help of different types of neurons that are there in the body. Now, one very beautiful example of how body impacts the brain is of the laughter yoga right. So, basically in the case of the laughter yoga you may know already about the laughter yoga.

So, in the case of the laughter yoga what happens, that a group of people they come together they try to laugh about they try to laugh together and maybe without having even a context without having a joke right. So, basically they try to laugh consciously without even having a let say very joyful situation there right.

So, basically in this case in the case of the laughter yoga what happens, that when you start doing this practice of the laughter yoga then what happens that you may not be able to feel joy, you not you may not be able to even laugh with the group right and it could be embarrassing as well in the beginning.

But then what happens that as the time progresses and as you start getting accustomed to this yogic meditation methods and ways then what happens that slowly you also make you can start laughing and by start laughing what happens that your body starts feeling joy and in in turn that laughter becomes very very natural right.

So, basically that is what happens in the case of the laughter yoga that laughter you experience laughter, you experience joy without the humor or the cognitive thought of the same and that is one beautiful example of how the body impacts the brain. And in this context there has been several experiments that the researchers have done in the past trying to understand that what exactly are the implications of this and how exactly the body is impacting the brain?

So, for example, one of the very first and very interesting experiment was done by Strack et al and his team in 1988 in which what they tried to understand that how the voluntary contraction of facial muscles contribute to the emotional experience. So, what they did? They did a very interesting experiment they ask the participants to hold a pencil either with their lips or with their mouth right.

So, basically when you put the pencil in your mouth like this then you are inhibiting their smile right you are not allowing the participants to smile and in the same way when you are putting when you are putting the pencil in your mouth inside then sort of you are like doing like this and then you are mimicking a kind of a smile or laughing smiling behaviour.

So, basically what they found Strack team Strack and the colleagues and then the similar experiment was also followed by the Levenson was carried by the Levenson as well in 1990. So, what together they found? That the participants who had the pencil who had who hold the pencil with their lips they rated the cartoons as less amusing.

So, please note here that they had the pencil in their lips, what it means? That they were trying to prevent or inhibit the smiles and then while doing so, they were asked to rate the cartoons. So, they rated the cartoons as less assuming as amusing then in comparison to the participants who hold the pencil in their teeth.

So, basically the participants who were holding the pencil in their teeth. They were mimicking a smile and then at the same time what they found at the end that they rated the cartoons as more amusing. So, what exactly this interesting experiment tells us? This interesting experiment tells us that by applying certain bodily reactions this bodily reactions are also impacting the brain right.

So, for example, when you are going to inhibit the smile, it means you are preventing yourself from doing this smile and at the same time maybe the signal that your brain body is trying to give your brain that ok the situation is not very amusing the situation is not very humorous and for the same reason maybe the cartoons they got a less amusing ratings.

On the other hand then you have the participants who hold the pencil in their teeth and by doing so maybe the signal that you are trying to that your body is trying to give to the brain that it is a very amusing scenario, it is a very amusing situation and even without in first looking at the cartoons even without encountering any humor or the cognitive thought right.

So, basically by putting yourself in this particular situation you are giving a signal to the brain that the situation is quite amusing and it could be because of the same reason that they rated the these participants who hold the pencil in their teeth, they rated the cartoons as more amusing right.

So, this is quite this is how the bidirectional projections also work. So, we this is very important to understand that how the body impacts the brain and how the brain impacts the body and while of course, it is very common to understand that brain can easily impact the body, but at the same time there are n number of cases where we can see that how the body can impact the brain also when it comes to the experience of an emotion right perfect.

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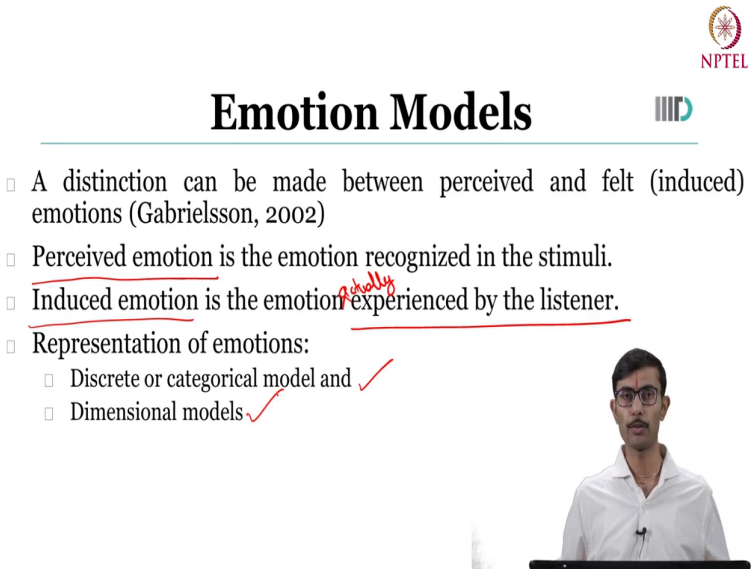

So, now having understood what emotions are? And how emotions are generated? What are the bidirectional positions of the emotions? Let us try to understand that what are the different models of the emotion? Or how the emotions are perceived? What are how the emotions are perceived right?

So, basically when we talk about the perception of the emotion then Gabrielsson made a distinction and he proposed a distinction between the perceived and the felt emotions right. So, basically what Gabrielsson proposed that perceived emotion is the emotion that is recognized in the stimuli.

What it means? It simply means that for example, you are experiencing a particular music. And that the music may have its own set of emotion right that it wants you to perceive that can be perceived. So, for example, there could be happy music, there could be sad music,

there could be dancing music, there could be funny music, there could be all different types of music. So, that is what is the perceived emotion?

So, basically this is very very important. So, basically perceived emotion is the emotion that is already recognized or embedded in the stimuli right. Now, on the other hand we also have the induced emotion. Now, what is induced emotion? Induced emotion on the contrary of the perceived emotion is the emotion experienced actually experienced by the listener. So, basically this is what this is the emotion that is the emotion that is actually perceived by the listener.

So, please pay attention to these two things now the induced emotion could be similar to the perceived emotion as well. So, basically what happened? That maybe you wanted you have a music which is a happy music in general right and the person who listened to the music also felt happiness right. So, in this case what may happen?

That the perceived emotion and the induced emotion they both become similar and that is what as a designer your thought process should be, your aim should be, your objective should be right. So, whatever emotion you want to induce the same emotion whatever emotion that you want the user to perceive. The same is being induced among the your listeners or among the users.

But what happens for example, even though there is a happy music, but then a particular kind of incident has been associated with that particular happy music and while listening to that music rather than experiencing happiness, rather than experiencing joy you may experience sadness right. So, and in this case these two set of different things can be very very different.

So, this and that is why the Gabrielsson he made this nice distinction between the perceived emotions and the induced emotion right. So, as an affective computing researcher or as a student practitioner of the affective computing theory you also need to take this into account. That, when you are talking about the emotions what exactly is the type of the emotion that

you are talking about are you talking about the perceived emotion? Or are you talking about the induced emotion?

Nevertheless, most of the time what happens? That this induced emotion is very very dependent on the individuals own thought process desires, beliefs and intentions right. So, there is a lot of individual variability when it comes to the induced emotion and hence most of the time we discussed when we discussed the emotions, we discussed the perceived emotion of a stimuli or the perceived emotion of a system right.

And then there are different ways in this perceived emotion or along the same lines the induced emotion as well can be modelled or can be represented. And among different models that exist these two models one the discrete or the categorical model and the dimensional models they are very very popular models and are most commonly used by the affective computing community right.

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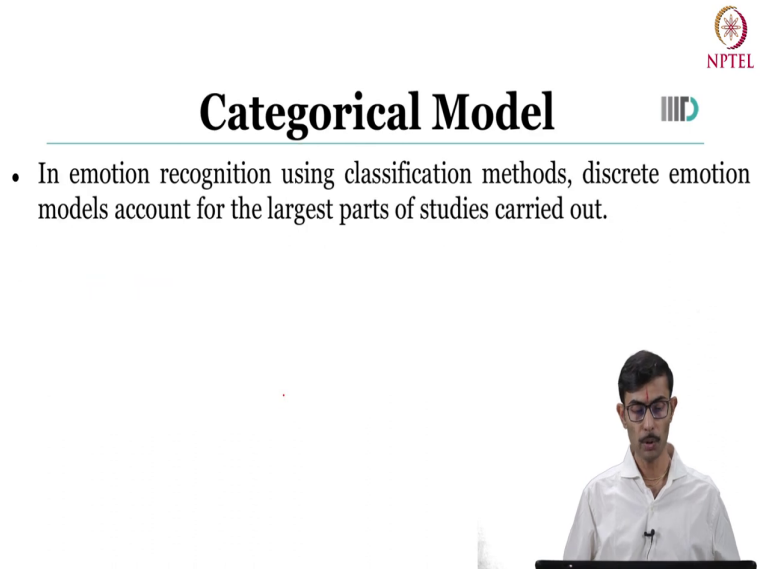

So, we will now discuss about what exactly is the categorical model? And what exactly is the dimensional model? Ok. Now, we have already understood that how can we represent the emotions? What are the different ways and in detail? We will see in the next session. So, see you.