Introduction to Cognitive Psychology
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Lecture – 27
Reasoning – 02

Hello friends, welcome back to the second section on Reasoning and judgment. Now in the last class we looked at what is reasoning? And how does reasoning differ from something called judgment and decision making. And we defined reasoning, judgment and decision making as higher order cognitive functions; which basically mean that reasoning judgment and decision making into and including problem solving these are the culmination point of any cognitive process or any cognitions.

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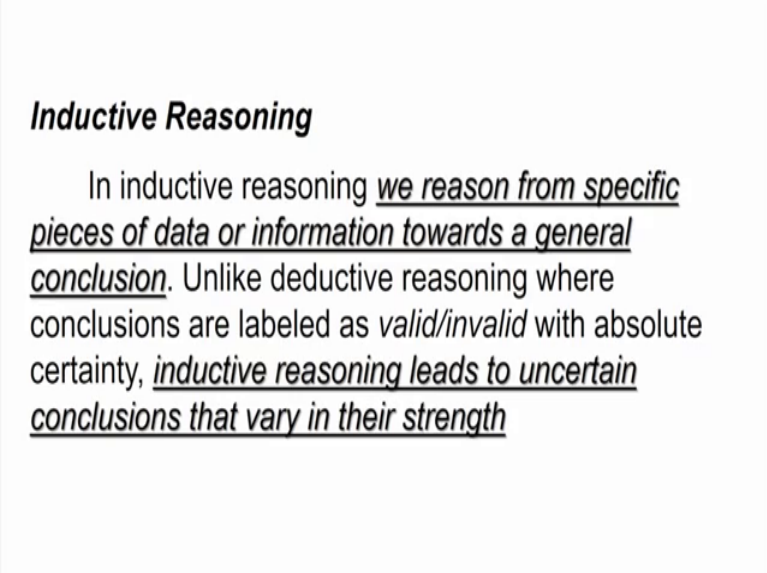

Now what do I mean by this? As you discussed over and over again, the basic processes of perception, attention, learning, memory they take in information from the environment and create mental representations and store it into the memory; what problem solving and reasoning judgment and decision making do is make meaning out of these representations by manipulating the representations in specific patterns or in specific ways; so that is what are these things do.

Now, what is reasoning? Reasoning is basically using certain well known principles or using certain rules of law, to validate certain premise; so that is what reasoning is all

about. So, reasoning is making information or making from based on some previous evidence, making meaning of some mental representations or making meaning from somewhere from information which is stored into the memory. Judgment is basically a step ahead of what reasoning is and so what judgment is basically is, to look at evidences provided by reasoning and to make a to make number of choices available or basically to judge or to gather evidences against all the alternate interpretations; which are available for a particular mental representation or a particular information which is in memory.

And decision making is a step ahead of judgment, in which what we tend to do; is we tend to choose among all the alternatives which are available through judgments. So, what judgment tends to do is basically it sorts of filters all the available interpretations which are reasoning and decision making then goes ahead and makes a choice of what particular kind of interpretation from the data that you want to keep.

Last class with these informations we also looked at something called focus on errors and so why focus of errors are needed. And we looked at the fact that focus of errors the study of focus of errors deals because errors tell you what is the amount of or what is the number of hindrances which are available in making correct interpretations. And so looking at errors basically provides you with a lot of information of what to do and what not to do and so knowing about what not to do; actually trains help you train in a particular way of thinking oh that is why we need to focus on errors.

Now, beside that we also looked at two different kinds of objective reasoning which was there and these were syllogisms or syllogistic reasoning and something called conditional reasoning. syllogistic reasoning and conditional reasoning. So, these two types of reasoning that we looked in the last class; now in terms of syllogisms what we tend to do is, we tend to validate the existence of a conclusion from a premise. So, promise are statements in syllogistic reasoning; we are given certain statements which are called premises.

Now these premises are valid or invalid so we have to decide whether they are valid or not and so based on this validity; we judge whether a particular conclusion following two premises or a two statements which are there logically follow or not. That is what we do in syllogistic reasoning; so in terms of syllogistic reasoning in another word what we tend to do is couple of statements are given each of the statements are valid and so what

we then need to do is based on what the statements are, we need to define whether the conclusion that is coming out of it is valid or not and that is what is syllogistic reasoning.

Then we looked at some factors which produce error in syllogistic reasoning for example, atmospheric effects, bias beliefs and so on and so forth. Besides that we also looked another kind deductive reasoning, which is basically called the conditional reasoning; in conditional reasoning what we have is, we have a statement which has an antecedent and a precedent and these antecedent and precedent part of a statement is in the form of if and then and based on the statement or looking at the statement what we tend to then do is; go ahead and validate the existence of a conclusion. So, basically a statement is given and the statement is you know if then form. And we then look into it after looking into it there is a conclusion which is given and we need to then look at the conclusion and a second premise is also given. So, based on a statement and a premise we have to decide whether the conclusion logically follows or whether it is validated or not. And we looked at four optional things which can happen, so once we have a statement in if then form which has an antecedent and a consequent following that we have as a premise.

Now, the premise can with the statement with the intense statement the premise can make four different kind of possibilities; one is the premise can affirm the antecedent, it can deny the antecedent, the premise can affirm the consequent and the premise can deny the consequent. And based on that a conclusion is given and we have to basically go ahead and tell what whether the conclusion is valid or not. Now the conclusion validly the conclusion there are some shortcuts or heuristic in this kind of reasoning and that is tolerance and what the response and what does it really mean? So, every time we found the antecedent or we denied the consequent the conclusions are valid.

So, these are the out of the four possible responses these two will always be true. So, if the premise is validating the antecedent or denying the consequent in those terms the conclusions which follows from the premise and the statement will always be true. So, that is what our conditional statement or a conditional logic or a or a conditional reasoning really works. Beside that we also saw several factors which go ahead and then produce errors in conditional reasoning.

Now, one thing is in deductive reasoning, we always look at validity of a statement. So, validity of a statement says that, the fact that whether the conclusion is a logical conclusion or a logical following from the premises or the precedence which has been given. We never look at the truth conditions. So, there is a difference between a truth conditions and a valid condition; a valid condition may or may not be true, but a truth condition is always valid and so that that is the one difference and so in these in deductive reasoning we never look at that. Another interesting thing that we that we have to understand is that deductive reasoning is basically coming from general to specific. So, you have a general conclusion, some general conclusions given to you and then you have to go ahead and testify or verify specific statements and that is the format of what a deductive reasoning is.

In today's class what we are going to do is we are going to look at another form of reasoning; which is called inductive reasoning or inferential reasoning and so inductive reasoning what we tend to do is; we tend from specific, we need to generalize statements. So, specific instances are given and from those specific instances we have to come up with a general conclusion. And so one primary difference between inductive and deductive reasoning is, in deductive reasoning it is basically coming from general to specific; so it is more of less like a top down process and so what happens here is that there are certain general conclusions which are given and a specific thing has to be or specific statement has to validated against it.

In comparison inductive reasoning goes the opposite way; certain specific statements are given to you and so from those specific statements you have to then go ahead and follow a general conclusion and so that is what inductive reasoning is all about. So, this is one difference which is there. Now in terms of deductive reasoning we already looked at the validity of the conclusion and so that is the core of deductive reasoning; whereas, in inductive reasoning we look at conclusions in terms of the strength.

So, conclusions are never 100 percent valid 100 percent true and. So, we always in deductive reasoning we look at the strength of a conclusion so how strengthy or what is the probability of the conclusion to be holding true and so that is what we do in inductive reasoning. So, inductive reasoning is making inferences and all around the world, or all around you will always look at inductive reasoning. So, another kind of reasoning is

inductive reasoning; lets then go ahead and understand what inductive reasoning is all about.

So, in inductive reasoning; we reason from specific pieces of data or information towards a general conclusion. For example, statements like Barney is a dog; who barks and from that and then Fallon is a dog; who also barks, Robin is another dog which also barks and from that if we conclude that all dogs go ahead and bark is basically what is inductive reasoning. So, there are three specific statements which are there, I have shown you three different or I have narrated three different instances of it; so all three dogs that I have mentioned actually bark and from that if we go ahead and conclude that all dogs or most dogs actually bark is what is inductive reasoning.

So, this is from coming from specific data to general data; specific to general and so that is the kind of reasoning that we need to do here. So, unlike deductive reasoning where conclusions are labeled as valid or invalid on in terms of absolute certainty; we do not look this in inductive reasoning, what we tend to do inductive reasoning is it leads to uncertain conclusions that vary in strength.

So, from the very outset itself, inductive reasoning implies the fact that the conclusions will be uncertain they will not be certain at all. In terms of deductive reasoning the statements are always certain and so the what we need to do is find out the validity of the statement, but in inductive reasoning we know that the conclusions are never fully certain and so what we need to do in deductive reasoning is to find out the strength of certainty which is there. So, we never get a 100 percent certain statements.

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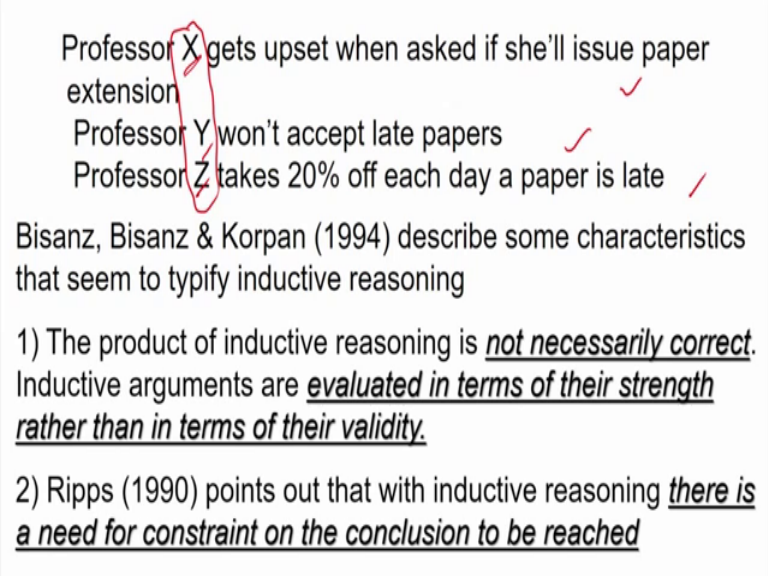

For example, look at the three statements which have been given here. Now the first statement says that professor X gets upset when asked if she will issue a paper extension and then there is another statement which says professor Y will not accept late papers and a third statement which says that professor Z takes 20 percent off each day if a paper is late. Now there are three statements which have been given and so an inductive reasoning we now need to conclude. As of the more obvious conclusion from these three statements out there, could be that professors most professors actually do not like late papers. As you see professor X gets upset, Y will not accept late papers, third Z would deduct some amount of marks from your late papers and so it is believed from here we can conclude that most professors actually do not like a late paper and so that is what is inductive reasoning right.

So, Bisanz and Korpan in 1994 describe some characteristics that seem to typify inductive reasoning. So, that is how we do inductive reasoning; so these people they gave some characteristics that seem to typify what inductive reasoning is all about. Now the product of inductive reasoning it not necessarily correct, inductive arguments are evaluated in terms of strength; rather than in terms of their validity. So, basically it is saying that inductive statements what it says is the inductive statements are not always correct in nature. Inductive arguments are not always correct in nature and so assuming that most people or most professors will not allow late papers will lead you to not

submitting a late paper and so even if there is a chance for a late paper submission you might miss it.

So, if you make this kind of statements or if you make this kind of conclusions, the strength of a conclusion being very weak; that most professors do not go ahead and accept late papers, then even if there is a chance for you to give a late paper you will not attempt it because this is what the conclusion is and you kept the strictness, you paid the conclusion in a strictness possible sense and so you are not availing that thing; because these are just three pieces of data and from these three pieces of data, you are making a general conclusion and so even if there is a chance for a late paper, you might not follow it and might not get a chance to submit a late paper which might have happen from any reason.

And so that is what it says; so one of the things is that arguments, the inductive arguments conclusion of the inductive arguments are evaluated in terms of their strength rather than in terms of the validity. So, it is not in terms of validity conclusions from inductive arguments are not evaluated in terms of whether they are valid or not, whether they are logically following or not, it is evaluated in terms of whether it is certain or not, or whether it is necessary correct or not. And the second point to be noted here or the second factor a characteristic of inductive reasoning to be noted here is that, pointed out that inductive reasoning there is a need for constraints on the kind of conclusions that you would draw.

Now, since inductive reasoning is coming from specific to general; all kind of conclusions can be drawn from it and so we have to be very constrained of what conclusion we are drawing in inductive reasoning and so this is one thing that we have to note. We cannot draw very weird statements or very weird conclusion out of it. For example one weird conclusion that can be drawn from this particular thing or this particular statement which has been given at the top here, example look at statement one two and three; is that professors with the name X, Y and Z will not accept late papers and this is not true, because if we draw this kind of a conclusion that these kind of professors which have name X Y and Z or has an X Y on Z on the name, they will not accept late papers is not a valid conclusion and so there is no truth into it, there is no certainty to into it and so this kind of constraints has to be looked at, or these kinds of constraints have to be we have to be very aware of these things.

So, in inductive reasoning two things you have to when making conclusion graph to be very or we have to be worried about two things first; that we do not actually look ahead at the strength at the validity of our conclusion, we look at the strength of the conclusion right and the second thing in inductive reasoning we are to be very sure about is that we should not be making two unconstraint conclusions. So, if we make two unconstraint the unstrained conclusion then it is not a good to be worry about this.

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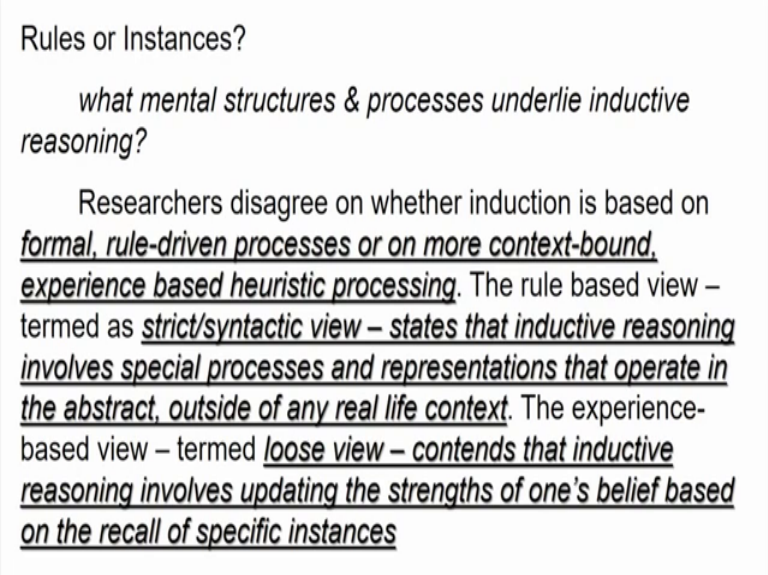

Now, there are certain what type of rules or instances support inductive reasoning? What kind of processor support mental structure support inductive reasoning. So, researchers disagree on whether induction is based on formal rule based processing or more complex bond experience based on heuristic processing. So, there are a division of people, or there are division of psychologist who differ between what kind of mental processes work into it.

So, there are groups which believe that there is a strict rule driven, or a strict formal logic driven way of looking at how inductive reasoning work and there is another group of psychologists who believe that it is more context one, that is more about a heurists which is there. Now the rule based view term as the strict or syntactic view; says that inductive reasoning involves special processes and representations that operate in the abstract, outside any real life context and so what this view believes that, the rule view believes that inductive reasoning basically follow a rule based system and so there is a logic to it,

there is a rule based system to it and this deal based system works in an abstract manner outside any real context to give the conclusions; whereas, interm in direct opposition to this, the context based view or a loose view as it is called they contend that inductive reasoning involves updating the strength of one's belief based on recall of specific instances and so the loose view or the contextual view says that inductive reasoning is based on how quickly can you validate your belief from past experience and that will give the strength to the conclusion that you are drawing.

And so this is what the difference is, one group looks at the strictness of logic or strict or they believe that rules and logics are followed and that leads to this kind of a reasoning or inductive reasoning, the other group believes that it is our beliefs or it is our past experiences which strengthens our belief on the logic on the conclusion that we are deriving from inductive reasoning and that leads to a good inductive reasoning or those processes leads to inductive reasoning.

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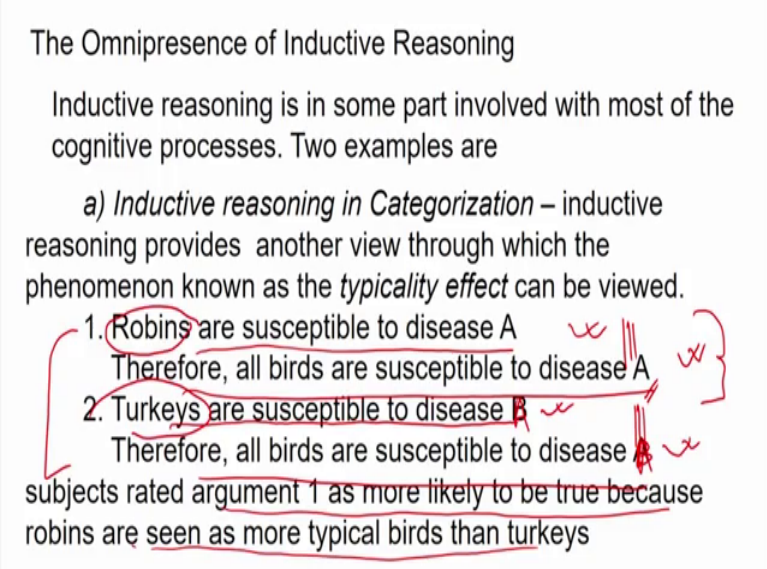

Inductive reasoning is present everywhere and that is why I have written the Omnipresence of Inductive reasoning. Omnipresence is a phenomena where something is present everywhere and so that is what we tend to do here; so only presence of inductive reasoning really means the inductive reasoning is present everywhere and we look into it yes inductive reasoning actually is present everywhere.

In most problem solvings or in terms of most problem solving strategies inductive reasoning is the idea about it. Two examples of specific city of the omnipresence of inductive reasoning is it is used in categorization. So, remember from the section on categorization and concept we look at something called categorization; so what do we do in categorization? Mostly in categorization what we tend to do is we look at specific elements and from the specific elements we find the commonality and from turn from the commonality, then we go ahead and then form a category. So, those factors which are common in many specific instances from the rule for the categorization and that is basically coming from specific to general. So, induct and that is what is inductive reasoning, inductive reasoning is coming from specifics to general.

So, inductive reasoning provides another view or thought with phenomena known as something called typicality can be viewed and so in not only in terms of categorization, the answer to typicality effect that we saw in categorization and in semantic memory can be explained in terms of inductive reasoning. Now look at the statement which has been given here, there are two statements that I have one is Robins are susceptible to disease A therefore, all birds are susceptible to disease A; this is one statement and the other statement is Turkeys are susceptible to disease B and all birds are susceptible to disease I am sorry this should be A, A is your correct here and should be correct here. The thing is in which of the statement do you think people are going to be forming more definite conclusions.

So, which are the statement has more conclusive or has more strength in terms of certainty and so you will see that most people then turn out to the fact that statement one is more true; the reason for why the statement one is more true is because Robin is a more typical bird and so which is more typical word and so the conclusions are more valid and so it is more of a it represents more of a bird and that kind of inductive reasoning or that kind of a specificity, from there we draw the conclusion and so drawing conclusions in terms of this is better then in terms of this; where Turkeys are more typical bird and so in this case the conclusions drawn from statement one is has more strength in terms of believability.

Now, subjects rate argument 1 is more likely to be true because robins are seen as more typical bird than turkeys; that is what I have been telling you that statement one is

verified by more number of people simply because of the reason their problems are more typical birds.

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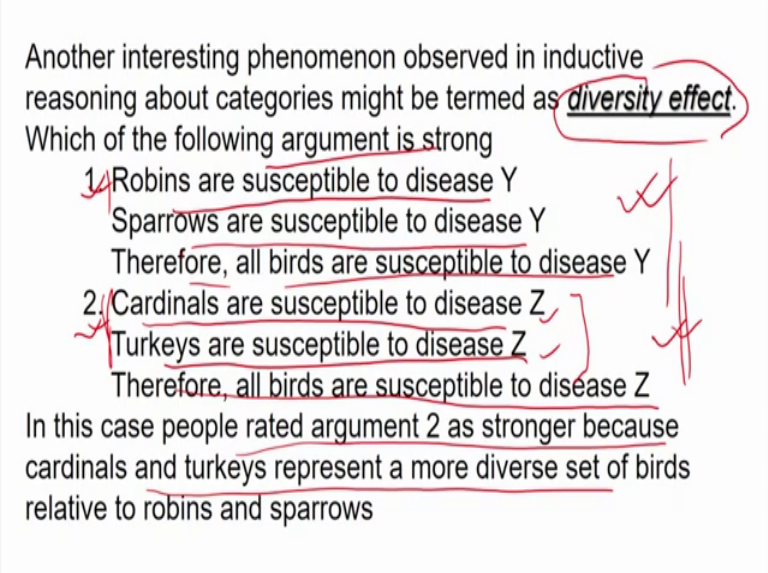

Now another interesting phenomena observed in inductive reasoning about categorization means this may be something called the diversity effect. So, just like as we have seen in the typicality effect there is something called diversity effect.

So, what is diversity effect now look at the two statement which have been given here and tell me which of these statements are more likely to be true or more likely to happen. So, we have statement one which says that, Robins are susceptible to disease Y Sparrows are susceptible to disease Y therefore, all birds are susceptible to disease Y. On other hand we have these statement which says Cardinals are susceptible to disease Z Turkeys are susceptible to disease Z and therefore, all birds are susceptible to disease Z. So, which of the statements do you think that should be true and if you are like most general people you will believe that statement two is more true than statement one the chances of the believability or statement two is more than statement one.

Now, the reason the reason here is that because cardinals and turkeys are two end of the extreme. So, starting from cardinal to turkey a whole range of birds come to it, but in number robins and sparrows are very close together kind of close together birds which are there and. So, in terms of believability effect we believe that if you want to look at all

birds, then cardinals and turkey this statement two tend to hold more weight or tend to generate more believability in subjects then statement one.

So, in this case people rated argument two as stronger because cardinals and turkeys represents more diverse set of birds and that is what I have been saying. Since cardinals and turkeys are on the two extremes of it they are more diverse kind of birds different kind of birds. So, more different kind of birds are tend to have a particular disease, we believe that most birds have it, but since the sparrows and robins are the same kind of same bird so people do not believe it and so this is another fact with something called inductive reasoning.

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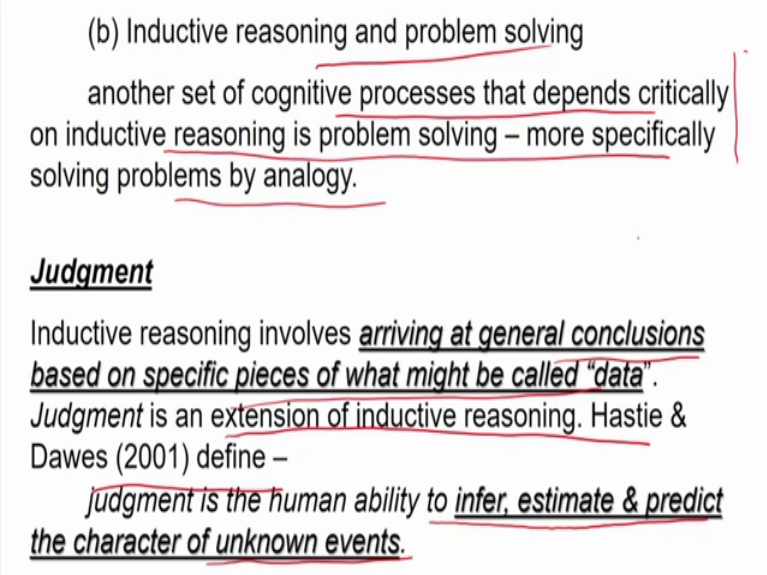

The second fact so inductive reasoning is not only in terms of categorization or if does not only solved the categorization problem, inductive reasoning is also seen in problem solving; for example, one kind of problem solving which is called analog using problem solving using an analogy basically this inductive reasoning is used. So, another set of cognitive process that depends critically on inductive reasoning is problem solving most specifically solving problems by analogy.

Now, remember the radiation problem and the war problem or the war attack problem major problem, war major problem that we have now the thing is in these cases the problem was solved by using analog using the; since in the radiation problem it was solved by using many lasers of smaller strength or smaller value, which summated the

amount of heat that is required the amount of the strength of the laser that is required for curing a disease by using many lasers. The similar thing was used for the by the major by making an analogy to this radiation problem and so he then took a number of tanks by different bridges and so attacked and own the wall.

So, this kind of a thing so basically what does this analogy that we that we saw that they major did in terms of the medical problem in the radiation problem; what he tend to do is he tend to look at two specific instances and from there he deduce this thing that one way of using a major strength, or one way of increasing strength of a particular thing is using small bits of and sources or many sources with small energy. So, many sources of smaller energy is equivalent to one source of bigger energy; why because many sources will sum it up to be to equalize the energy which is out there and so this is the generality which is there. So, one of the thing that happens in terms of inductive reasoning is inductive reasoning is also available or is also used in problem solving. So, that is end to the inductive reasoning thing.

Now, the next step in the section is about judgment; so what is judgment inductive reasoning involves arriving at general conclusions based on specific pieces of what might be called data. So, inductive reasoning is basically arriving at conclusions, general conclusions based on specific data segments which are out there. So, from specificity to generalization is what induction is all about.

So but what is judgment then? So, judgment is an extension of inductive reasoning. Hastie and Dawes 2001 they define that judgment is the human ability to infer, estimate and predict the character of an unknown event. So, in judgment what we tend to do is inductive reasoning will only provide you with the conclusion, but how what we infer from the conclusion what we estimate or what we predict from the conclusion is what is called judgment. So judgment is that particular branch or that particular higher cognitive process which does what is which looks at the data, which looks at the conclusion which has been provided by reasoning and from there it makes inferences or it makes predictions. And so judgment is a process of making predictions and inferences from data or from conclusions which have been drawn through reasoning from data; this data is available out there through the basic cognitive processes and so this reasoning are of two types they are deductive or the inductive reasoning and so judgment is basically inferring or making conclusions out of it.

And once the conclusions are available choosing one of these conclusions based on cost benefit analysis, based on how much you want to gain or how much you want to lose is what is called decision making; which we will see in the next section.

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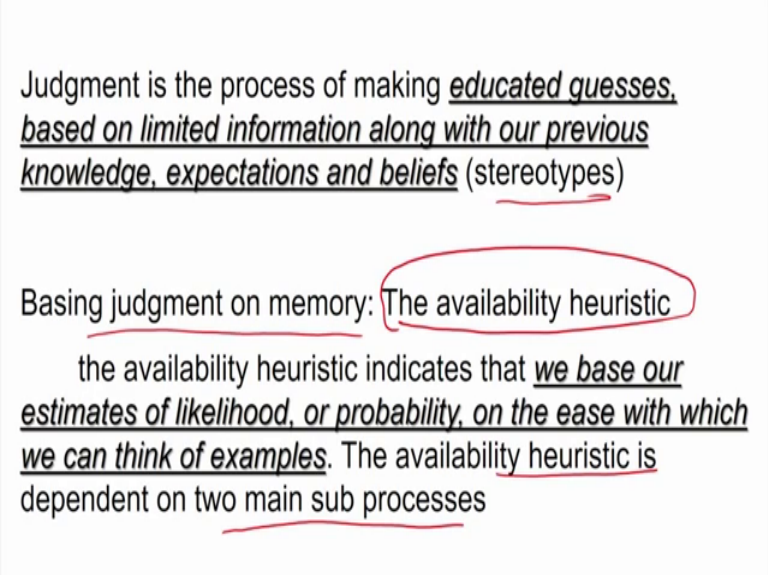

So, let us go ahead and look at what is judgment? So, then judgment is a process of making educated guess, based on limited information along with our previous knowledge expectations and beliefs. So basically stereotyping; so what judgment tale says or what judgment follows or what judgment predicts is that they are judgments are basically educated guesses, which are based on some kind of limited information. If all the information is available we will not make limited guesses. So, as you know mostly in the world we do not have all the information available with you and so there is always uncertainty and so inductive reasoning is also done in terms of uncertainty; when we know do not know the premises or we do not know the valid of the premises we do inductive reasoning from specifics to general right that kind of a thing.

And so when we want to when we make educated guesses on the limited computer, on the information which is available or due to limited computational power of the brain that we have; we make judgments right. Along with and how do we do it? We do it in the basis of the knowledge that we have, the previous knowledge that we have, some kind of expectation that we believe and some kind of believes that we hold on to and this is also equivalent to stereotyping.

Stereotyping is making some kind of a prediction or making some kind of a category for certain kind of people or labeling people by a certain category or a certain characteristic is what is stereotyping; for example, we tend to do all kinds of stereotype poor's are thieves or riches are also thieves, this kind of people is that, that can educate people are more nerdy so this kind of people is that and so all these kind of stereotyping that we tend to do women are poor in mathematics, men are very good in mathematics and so on and so forth.

So, this is basically stereotyping; stereotyping is classifying people based on certain labels or certain characteristics and that is what judgment is all about. So, given the fact that whatever knowledge we have, whatever information we have and whatever experience and believe we have we merge all them together and then make a give a statement and this statement is basically what is called judgment.

So basing judgment on memory; so there are three kinds of heuristic or there are three kind of mechanisms which are used for making judgments and these judgments are dependent on memory and so the first kind of judgment that we tend to do or the first kind of heuristic that we use in making judgments are called the availability heuristic and so what is it all about? The availability heuristic they indicate that we base our estimates of likelihood or probability on the ease with which we can think of example.

So, as for example if I give you this question, that in your whole life a number of people that you have known, what is the probability or what is the one letter of the English language from which their name starts and so from all the people that you know now immediately your answer will be s or r or t or whatever it is; s and r more two best example (Refer Time: 28:18). Now the thing is it is basically called you have fallen to something called availability or s; the reason that you know that s is the most commonly used name out there and to most names are existing over s and in the in the English dictionary most words are there from s and so you believe that s and r more common names and so this is this has to be it and that is what color heuristic is all about.

Availability heuristic speaks that the more clothes that we have the more number of the thing examples that we can think about a particular problem that that is what is call of availability heuristic and so you making predictions based on that is what is called availability heuristic right and so that that is the definition of it. So, the ability heuristic is

dependent on two main sub processes the availability heuristic again defining what availability heurist is if we tend to make judgments based on the fact that how much example is available to you or the ease with which we can think about an example, that is called availability heuristic. The easiest way that that is there which we can think of an example if that is how we make a judgment? That is availability heuristic right.

So, it is basically why do we need heuristic for judging the we need heuristic for making judgment because the three things the data may be huge first of all the data available to you is huge and so we cannot go through an organic approach finding at the judgment. Second thing we may lack the computational power; since the data is used we do not have enough computational power, to go ahead and compute the outputs of it and so we use a heuristic and the third is that computational power is there the data is huge and it is ambiguous in nature and so we tend to use heuristic for viewing its shortcut and so that kind of thing is that.

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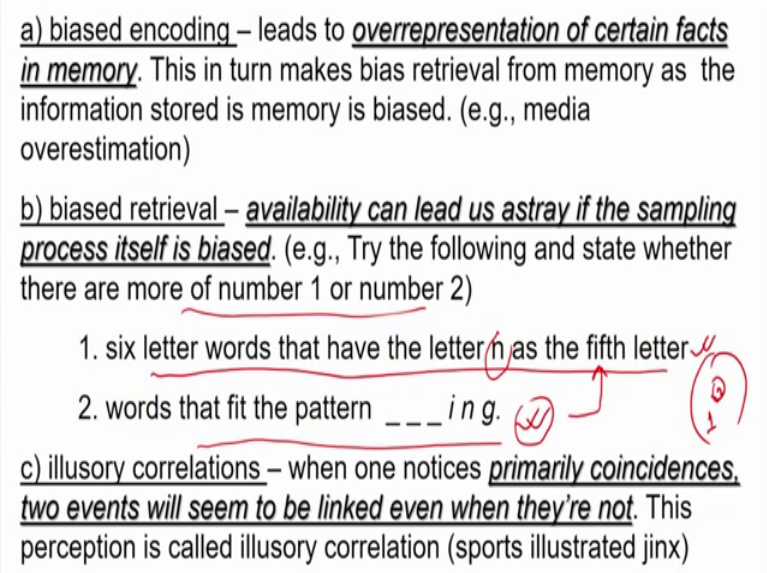

Now, the availability heuristic, it depends on two main sub processes which is there. The first is called biased and coding; now why does the availability heuristic actually be there the availability heuristic actually be there because it could be an encoding problem or it could be a problem lead to retrieval. As an encoding problem it availability heuristic can happen because an overestimation of certain facts in memory are done, because you tend to overestimate certain things right now as I asked you the question of how many people

that you remember from a certain English language the idea is that since most people that you meet or this knowledge this is given to you is that s is what you tend to meet or r is what you tend to know more people, this kind of over representation in memory basically makes you use the availability heuristic.

Now, this in turn makes the bias retrieval from the memory as the information stored in memory is bias example media over estimation right. So, one of the things for probability heuristic is bias encoding and this bias encoding could happen from media also. In a day to day world we look at a lot of media, we look at a lot of news, a lot of information which is out there and so these informations they are most of the time they are biased and the fact that since media feeds us with so much information and there is an effect which is called recency effect right.

So, the medias and speeds up with feeds are with so much information we tend to believe it or for example, one of the thing that can happen in availability heuristic is the media has been trying all along these days that; for example, looking at here what is happening is the weather is going to be foggy and so even if it is sunny. Since the media keeps on saying this over and over again and everywhere, we talk to people we tend to believe that it will be a foggy weather since it is winter and so on and so forth. Even if the weather is very sunny the conclusion that it is winter or the fact that it is winter and that media is overestimating something that leads to the fact or using of or that is lead us to make use of the ability erase and predict that or basically think that the weather is going to be all foggy and so one of the reasons is this thing; the availability heuristic is bias encoding.

Now, bias encoding also can happen with its as I said there is something called a recency effect or these days the media, if you go into the media it is all about political we all believe that most people are at this point of time are turning towards Hinduism are turning towards the construction of the [FL] or that kind of. Now the media is feeding the information to us and so we believe that all over India this is what is going to happen that most people are running towards Hinduism or favor the ram [FL] or whatever this kind of information is there and so this is what availability heuristic. Since the media is feeding us this information this is the claim that we have made, this is the idea judgment that is we have made and so we also turn ourselves to that kind of a thing or align ourselves to it because we tend to believe that this is what it is.

Now, although if you look into if we go all on our own and start looking at peoples belief system or what people believe all over and they are talking to different different people we may not find the kind of representation that media is giving us right. And since we are trusting the media the kind of representation that they are giving based on that we believe that this is what the nature of, or this is what the mood of the country is based on what they say.

Now another kind of effect, another kind of reason for why availability heuristic success is something called bias retrieval and what does it mean; it says the availability can lead us to astray from sampling process bias in the sampling process; what does it mean? So at times the retrieval of information is also bias from memory and that leads to the availability or that leads to the kind of bias which is there.

For example try the following and state whether there is more of number 2 statement or more of number 1 statement. Tell me six letter words that have a letter n in the fifth letter or a six letter word where the fifth letter is an n; how many do you think will exist? So whether you think this is more or the second is tell me words that fit the pattern i n g. Now which do you think is going to be more and so obviously, the answer that most of you are going to come up with is this one is more the second is more than the first. Now if you realize that this is i n g ending right and so if you if you believe that this is more you are wrong the reason being that this is a subset of the second a subset of first.

So, all i n g words will be six letter words with a fifth letter n and ending, but there are also other words which have a fifth letter than n and may not have an i n g ending and so one two is actually a subset of the letter two or the statement two is subset of one and so they make it can never be more than this and so this is another problem which is there a biased retrieval itself; since the way we retrieve information itself is biased that can be to the use of availability heuristics.

And the third thing is called illusory correlations and that can also lead to the availability heuristic setting in and what does it really mean in terms of illusory correlation it says that primarily coincidences two events will seem to be linked when they are really not and that is what is called illusory correlation.

So, if two events tend to happen together and just because of just because of a coincidence we tend to rate them together for example, we often hear stating statement

that cricketer was not playing very good in the first match he did not play very good, the second match he did not play very good, third match and fourth match damn and then he hit a century and so this kind of a correlation saying that three times he did not play good and the fourth time he essentially and so that was making the correlation between three after each three time you perform better that type of idea that if you perform three times bad the fourth time is always good is illusory correlation; making correlations that will be. So because each time they hit the play is the probability of what he tends to do, the probability of how the output turns out to be is only 0.5 either it does good or does bad and so each event is independent of itself.

So, basing the our idea that after three bad runs the fourth run is going to be a good run is illusory correlation or something another example is sports illustrated jinx is the same thing that I was talking about that, if some something bad is going on or if some particular model or a sports person appear on some particular journal sports magazine and since this sports magazine is known to ruin the life of many people; if a person who is doing good in sports appear on that particular magazine front cover then his life is going to get bad is what is availability heuristic and so this is illusory correlation and so this kind of correlations are also the reason for availability heuristic.

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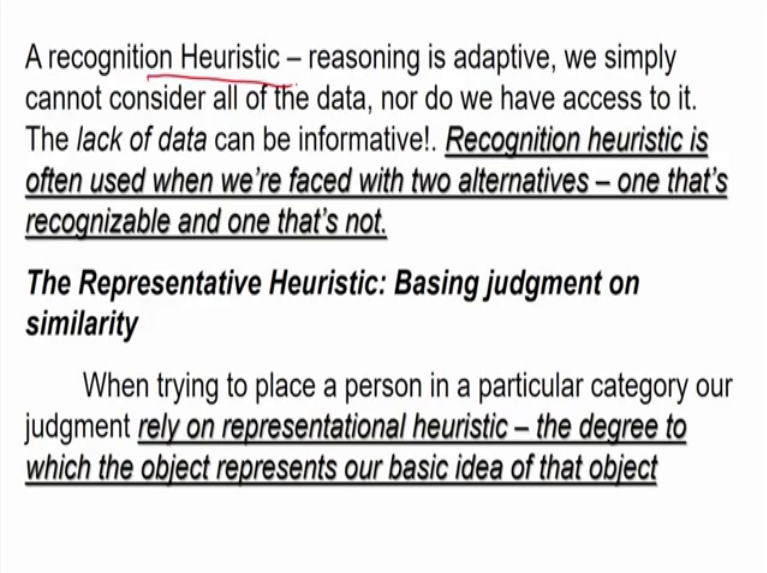

Now, another kind of thing that we need to know another kind of information that we heuristic that we tend to use is called the recognition heuristic and so what is recognition

heuristic is often used when we have faced with two alternatives; one that we recognized and the other that we do not recognize and so in cases that the information which is available to you through reasoning; one information we recognize very nicely the other recombination we do not have an idea about, we tend to pick up that recognition we tend to become that data point, that conclusion which is available to us or which we are familiar to and that is called the recognition heuristic.

So in this case what happens is if two conclusions are drawn from a body of data and through proper reasoning, we tend to make judgments favorable in terms of the one statement which we are close to or which we recognize better than the one, we do not recognize better and this is called the recognition heuristic and that recognition heuristic is the is the leading cause for the availability heuristic or the availability heuristics that we tend to use in making judgment.

Now, another kind of heuristics that we tend to use in making judgment is called the representative heuristic and what is this it is basing judgment on similarity. Now at times we tend to make judgments, we tend to make conclusions, draw conclusions from evidences based on the fact of how similar a particular set of data looks to us? So when we are trying to place a person in a particular category or judgment we rely on representative heuristic, rely on representation heuristic the degree to which people represent a basic idea of that object.

For example if we see somebody who is six feet too tall and he is walking, immediately damn we will tend to think that this person would be a basketball player; because somehow it is related it is similar that people who are taller basketball players; similarly if we and we have several kind of examples of somebody who is white, somebody who is fair, somebody is not fair and all of these are related to certain such kind of similarities which is out there and so this is what is represented a representation heuristic. So what does a definition of this says its rely on representation heuristic the degree to which an object represents a basic idea, the more object or more event represents in our memory, a particular kind of category the more representative we believe it is to be, the more similarity we believe it to be and that is what is called similarity heuristic or representative heuristic.

Now, why do we fall to the idea of representative heuristic or why do you do we actually make errors in representation or why do we use representation heuristic? One basic problem which has been or one basic reason why people tend to use similarity heuristic or representative heuristic is because they ignore something called base rate fallacy.

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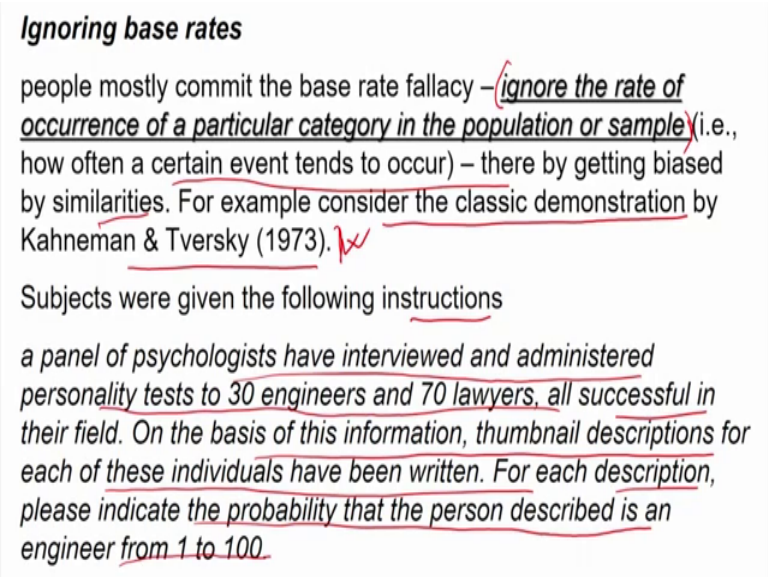

Now what is based rate fallacy; the base rate fallacies any event has a certain rate of occurrence a certain base rate of occurrence and so if we over represent that, we note that base rate we tend to fall into this base rate fallacy. So people mostly commit the base rate fallacy and what is it? Ignoring the rate of occurrence of a particular category in a particular sample right and so let us say if we know a family of people in which two people are tall let us say the son and the father is tall, we tend to believe that everybody plays a basketball in that family.

Now that is called base rate fallacy, the event of father and son or the instance of father and son are independent of each other and that does not say that everyone is tall in the family and so we cannot say it is a family of basketball players even in any basketball family it not everybody will playing it and the idea that everybody is a sports person in that particular family is wrong and that is called base rate fallacy.

That is how often a certain event tends to occur, so when we tend to ignore the fact that how often a particular event is going to occur a certain event is going to occur that is called the base rate fallacy thereby getting a biased of similarity. For example, consider

the classic demonstration by Kahneman and Tversky. So Kahneman and Tversky presented a problem and I will show you that problem so he gave this statement to people and give the following instruction.

Now panel of psychologists have interviewed ad administered personality test on 30 engineers and 70 lawyers and all successful in their field. Now on the basis of this information thumbnail descriptions for each of these individuals have been written, for each description please indicate the probability that the person described is an engineer from 1 to 100. So a certain kind of statement is given and in that statement there are certain base rates which are given and that is what people tend to over rate. Now base rates are there are 30 engineers, 70 there are the lawyers out there and the total they are 100 and what we have to tell is that a description is given to you and this based on this description you have to tell me whether the person I am describing is an engineer or not and then rate it in 1 of an 100 and so what is the descriptions subject were then given the following description this is the description which is given.

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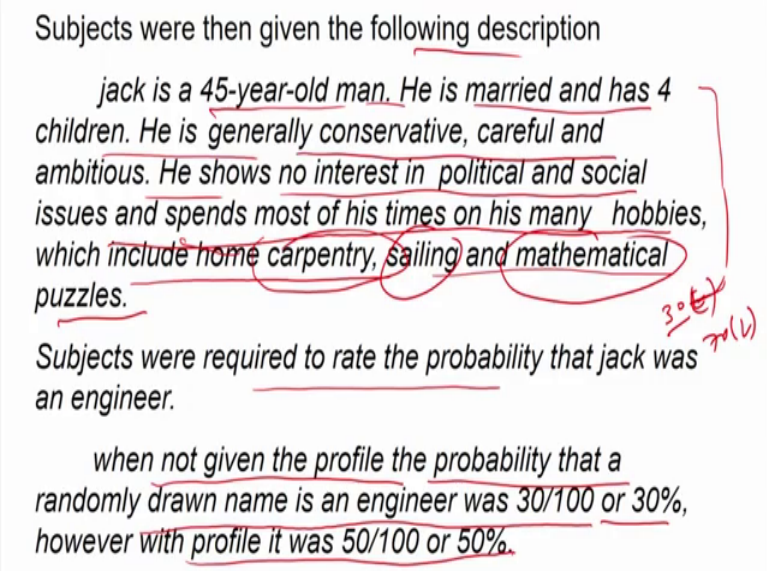

Jack is a 45-year-old man. He is married and has 4 children. He is generally conservative, careful and ambitious. He shows no interest in politics and social issues and spends most of his time on many hobbies, which include home carpentry, sailing and mathematical puzzles. This kind of a person profile is given to you right and so then you are asked to do this, so subjects were required to the rate of probability that jack was an

engineer; what do you think happened? What is the probability that jack was an engineer and immediately you will say that it is above 50 percent or 50 to 60 percent; what you are ignoring here or you are making an error this is incorrect the thing is this words that are used here in terms of his hobbies which says that is does carpentry, sailing, mathematical puzzle makes you believe that he is an engineer.

But you know that in this particular thing 70 percent people are lawyer and so there is never a chance that you will have 70 percent or they will have 50 percent chances that he is an engineer, there are only 30 engineers out there and so they cannot be extending 50 percent right and so that is the error that you are doing; because the base rate is only 30 engineers and 70 lawyers and so no matter what this statement says in terms of his thing of carpentry, sailing and mathematics because we tend to do what we tend to do? Is we intend to ignore the base rate and make similarity statements that people who are who does carpentry or people who does sailing or does mathematical jobs are tend to be engineers right; why cannot do with it is because of stereotypes.

You believe that this is the stereotype of what are engineer and this is the stereotype of lawyers and so what this is what the result they also got. So when they gave when not given the profile the probability that are randomly drawn name was an engineer was 30 upon 100 or 30 percent, however when the profile was given most people tended to judge that a random name was a engineer was 50 percent and this is the error because they ignored the base rate, if there are 30 engineers the probability cannot be 50 percent.

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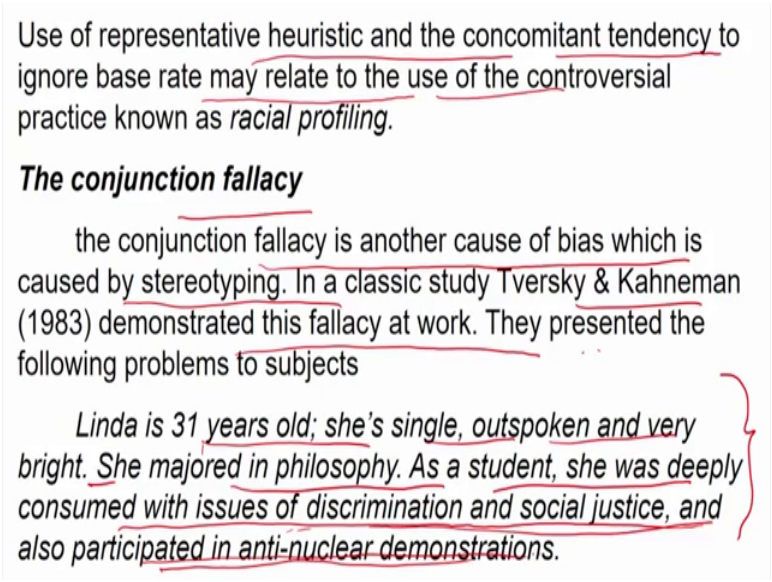

Now use of representative heuristic and the confirmation tendency to ignore base rate may relate to something called racial profiling. So when we tend to say that certain kind of races or people who are blacks tend to do more tend to be more thieves, or tend to be do more violent acts, this is basically called racial profiling or rate people who are blacks has to be more criminal in nature, this is basic because we ignore the base rate. We believe that if some people some black people do it, we tend to over extrapolate it and believe that any black that we see we tend to believe that he is the one who is doing this kind of thing.

Now, another interesting thing or another reason why this kind of representatives heuristic is used or the representative heuristic tend to fail us in making judgment is this conjugation fallacy and what does the conjugation fallacy really say; the conjugation fallacy is another cause for bias which are caused by stereotyping; what does it say? So Tversky and Kahneman demonstrated this fallacy at work, so then the conjugation fallacy is if there are two events a and b and they occur together they co-occur together what is the probability of both happening together.

So, let us first look at the statement and then I will explain you how does bias really happens. So this is the statement that Kahneman and Tversky gave people so Linda is 31 year old; she is single, outspoken and very bright. She is majored in philosophy. As a

student, she was deeply consumed with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations. So this is the basic profile of this person.

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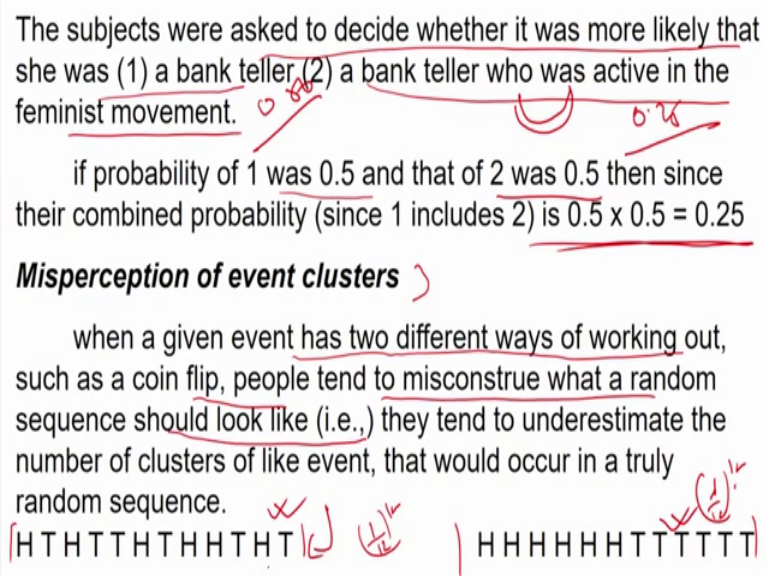

Now the subjects were asked to decide whether it was more likely that she was a bank teller or a bank teller who was active in feminist movement and so without looking at anything return the slide after this tell me what you think? Most people will agree that statement two is correct, that Linda is a bank teller who is active in feminist movement. The reason being that the last line of this says that these fields consumed with discrimination and social justice and also participated in anti-nuclear demonstration so on and so forth; and so you believe that second is having the more probability, but you are wrong the reason being that why can not a bank teller have all this thing and so the chances that she is a bank teller is higher, than the chances that he is a bank teller who was active in all these things; because any bank teller can have this right. Now this is what is called the conjugation policy or the conjugation fallacy which is out there.

Now, the probability of statement 1 was 0.5 and the probability of statement 2 was zero 0.5 and when we club them together, when we conjugate them together the probability always has to be 0.25 and that is called the conjugation fallacy. When the conjugate to events together the probability will always be lower; so bank teller who is active in feminist will have a cost probability of 0.25 whereas, a bank teller independently you are a feminist has a probability of 0.5 and so this conjugation people do not understand this

conjugation and they tend to realize that this will be more whereas, this has to be less because that is what probability says right. So that is what it is.

Now, the next thing that we look into is another reason for this bias and that is called misinterpretation of cluster events. Now when given a event that has two ways of working out, such as a coin flip, people tend to misconstrue with a random sequence should look like. So people what they tend to do is they tend to misconstrue it they cannot tend to misrepresent what a random sequence is all about? Or how randomization really works? And in this case if I give them if I give you to judge whether this is more probable or this is more probable, you tend to tell me that this is more probable because it looks like more random; whereas, if you look into it both have an equal probability of occurring and none of them are random events.

So this has a probability of 1 12th upon or 12 probability and here also is the same a single event happening that is what it is and so both events are non random in sequence, but since this looks more random to you misconstrue that this is more random, and you believe that they as a higher probability of occurring and this is the miss calibration that you tend to do. Then this is because this looks more subtle this looks more arranged and so cannot be a random sequence.

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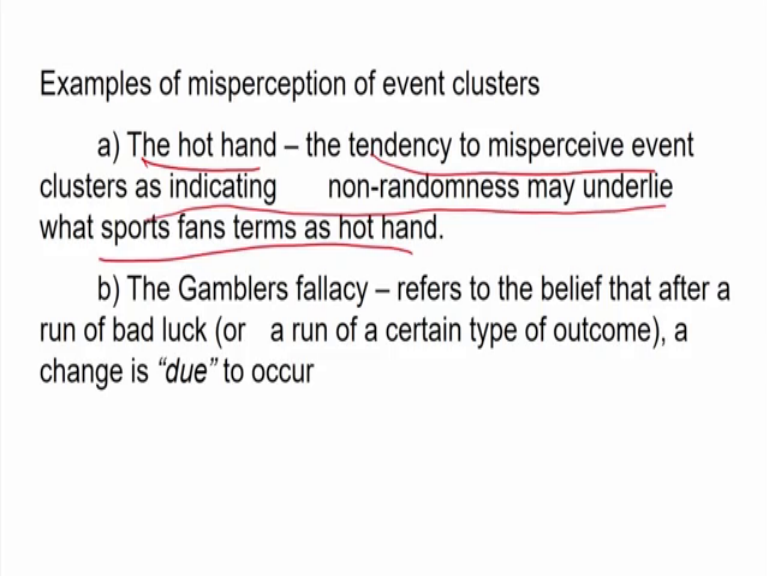

Now examples of misinterpretation of cluster events what is the interpretation of this misinterpretation of cluster events; one example is called the hot hand and what is it the

tendency to misperceive even clusters as indicating non-randomness may underlie when sports fan termed as hot hand; what is hot hand? Hot hand is basically a feature in which we believe that if some player is going very well he is burning hot, white like the sun and so in the next match also is going to do well. So if we are looking at if you are looking at Kohli batting and we believe that in one two three match he has done good, we believe that the fourth match also is going to do good because he is in that streak, that winning streak and so that is the problem; each match is independent of itself and each player is independent of itself and his own probability and the chances that because he did good in three matches the fourth match is going to do good is something called the hot hand.

Similarly, is called something called Gamblers fallacy and so what happens in gamblers fallacy; we tend to believe that if we are failing if a gambler is failing or if we are not getting good results, then the next result that is going to be good is going is or coming is going to be good because it is due in us and that is called gamblers fallacy. So if you are playing let us say a card game and three times you have failed we believe that the fourth time you are going to win, the reason being that it is this winning is due on your three failures will lead to the fourth inning; where as we all know that each event is independent of itself and each has an independent probability of 1 upon 6 in terms of dice 1 upon 53 in terms of a card game or so on and so forth and so that is what the difference is all about.

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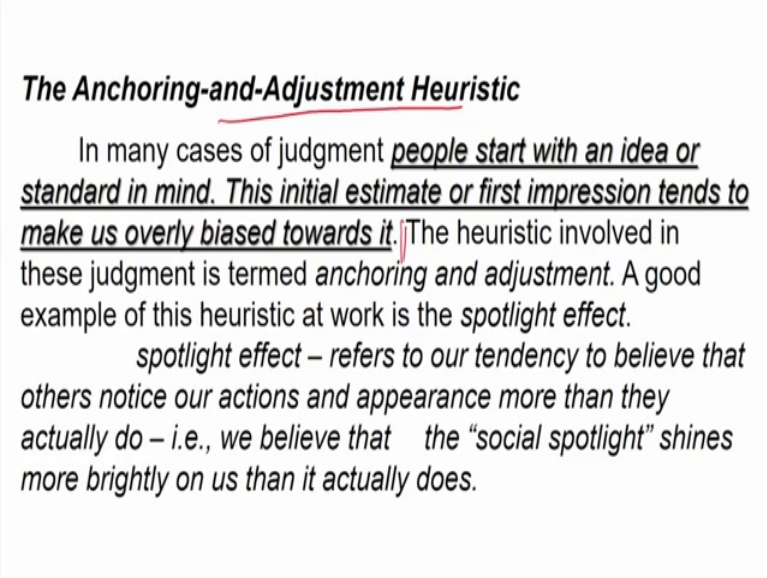

And the last heuristic that we need to see here is something called the Anchoring-and-Adjustment heuristic and what is anchoring and adjustment heuristic? In many cases judgment, people start with an idea or standard in mind and the initial estimate of the first impression tends to make our self as overly biased. So in anchoring and adjustment heuristic what we tend to do? Is before making judgments we anchor ourselves, we look inside ourselves for our experiences and believe that this is what the value should be and then we tend to then make judgments based on the anchor that we have kept.

So, we tend to look into ourselves and believe that this is how it something is going to be. So if let us take an example, so if you ask your parent that you give a statement to a parent saying that this is what I spend each day, they will anchor that when they were of your age what is the amount of money that they used to spend and based on then they will make adjustments and say that you are overspending because, when they were young and they were at your age they used to spend let us say 10 rupees per day; and based on that they made some calculations of what over the years that have been given and so they will say that your daily spending should be 50 rupees, but you know that 50 rupees is not what is good. And so this anchoring adjustment is another problem with a heuristic, what they tend to do is what they tend to do when they were when they were little like you, they would make that statement or they will make that an anchor and then make adjustments and based on that decide your pocket money or decide your daily spending and that is what is called anchoring adjustment heuristic.

So, the heuristic involved in these judgments is terms anchoring and adjustment a good example of this is something called the spotlight effect; what is spotlight effect? In spotlight effect what really happens is somebody is wearing so if I wear a torned cloth and when I enter the room I believe that everybody is looking at me and I become overly conscious; the fact is that nobody looks at me, so when you wear a pink shirt or very yellow shirt to class, you are made to wear a yellow shirt to class you believe that everybody is looking at you and this is called the spotlight effect and this is a good example of anchoring and adjustment.

The reason is that you anchor yourself saying that I am since I am wearing this disgusting clothes and so everybody is looking at you and then you make the adjustment that everybody is looking at you, you make yourself the anchor and then you make this adjustment everyone is looking at you and so you overestimate the number of that people

look at you. A number of experiments were done where it was people were made to do this kind of a disgusting wearing cloth going into a room and they were later asked how many people noticed you, and the people were actually asked how many people noticed it and it was founded there was a huge gap of how many people actually noticed them, and how many people did the person wearing the disgusting cloth or actually thought we are looking at and this is called the anchoring and adjustment heuristic.

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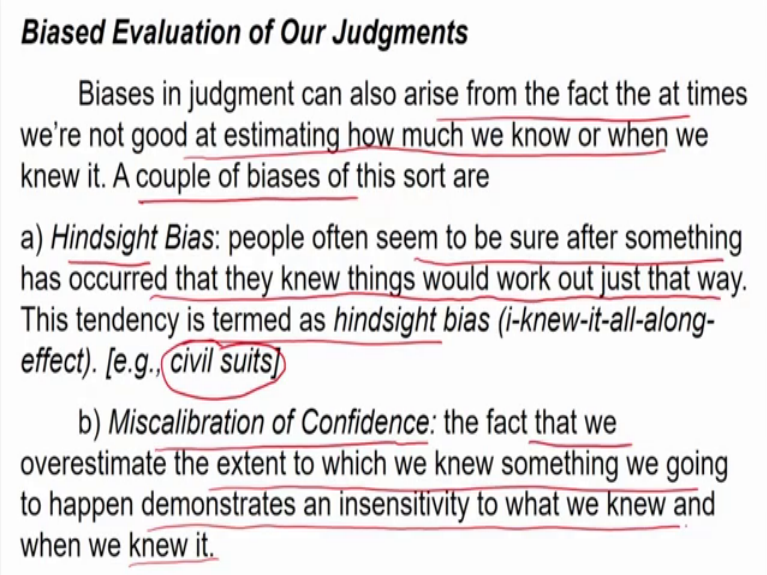

Now, our judgments can also be biased or our judgments can also be faulty in terms of certain biases which are out there. So biases and judgments can also arise from the fact that at times we are not good at estimating how much we know or when we knew it? Now a couple of biases of this type is called one of the biases called the Hindsight bias and what is hindsight bias? People often seem to know for sure about something has occurred that they knew things would work out, just the way they are and this is the tendency of what is called I knew it all along hindsight bias.

And some so at times a hindsight bias of how what people think that they knew is what is the bias or what is the kind of error that can happen in terms of judgments and it is more evident in civil suit. So in civil suit a judge has to determine the probability, defendant would have foreseen what would have plaintiff would have done? So let us say that the plaintiff did some kind of a or defendant did some kind of an gross negligence and this gross negligence leads to some kind of a problem to a plaintiff.

Now, the plaintiff then goes ahead and files a defamation suit against the defendant for certain kind of money or certain kind of compensation. Now the plaintiff will go to court as well and now the court person who is the judge has to decide whether the defendant would have seen that this kind of whatever act he did from that this kind of problem would have arisen to the plaintiff or not and so most judges then fall to this error of hindsight bias and believe that the defendant could have very easily a certain that if he did something this is the kind of problem do not have arisen and would have made the plaintiff suffer and they rule in favor of it and so this basically what is hindsight bias; it is basically the fact that people say that I knew it all along the bias that people think that they knew all and they did not look into it, though that kind of a thing is the hindsight bias. Another kind of bias is something called miss calibration of confidence.

So, at times we tend to misscalibrate of confidences about something and we take make errors for example, the fact that we overestimate the extent to which we knew something, was going to happen demonstrates our insensitivity to what we knew and what we knew and when we do it and sometimes we tend to make over confidences; we tend to overconfident of what is going to happen and when it is going to happen for example, any kind of thing that we can take, so if an experiment were done in which people were given a statement to verify and they were asked to first be positive that whatever statement was meant to be verified, they have to be first rate their confidences and then based on the confidences the truth values generated. So a certain statement was given to people and they were asked to rate this statement as correct or not and their confidence ratings were done.

So, it was found out then people who said that they were 100 percent confident that they knew the statement was true, it was founded the accuracy was 75 percent only and people who were lower in terms of confidences, we had more accurate accuracies and so this kind of errors do arise and that is called miscaliberation of confidences all right. So, in this particular section then on reasoning and judgment what we tended to do is we are tended to carry forward from what we did in the last section. In the last section we looked at what is reasoning and we looked at something called deductive reasoning in terms of conditional reasoning and syllogistic reasoning.

In today's lecture what we did was we looked at what is called inductive reasoning and what is the format of an inductive reasoning and what are the possible errors which can

be there. From there on we move into something called judgment which is basically making meaning or based on the evidences providing some kind of estimate that is what judgment is all about. And so we looked at what is judgment and we looked at three basic types of heuristics which can affect judgment, the availability heuristic, the representative heuristic and the anchoring and adjustment heuristic and in addition to that we also looked at what is biases the kind of biases that can be and these biases how they can affect our judgment? So for example, one is called the hindsight bias, I knew it all along kind of a thing.

So this you tend to have happen to know all the time when you fail you tend to say that I knew it all along and so that kind of a bias is always there; because you tend to say that you knew it all along and then there was second bias; which was misinterpreting confidences of how confidence you are on to something. So this is the end of the section on reasoning and judgment when we meet next we will be discussing a section on decision making and we will be carrying on some of the things that we have learned there learned here on to that and we look at how people make choices of judgments that has been done.

So, when a reasoning is done and after that reasoning certain judgments or certain kind of judgments are evaluators, certain kind of facts are brought forward and certain kind of rules are laid out, how do we choose among the alternatives, which are available after judgment. That is what a decision making that is what we going to see in the next section or this is their making, how choices are made among the alternatives which are available after judgment and reasoning.

Thank you.