Introduction to Cognitive Psychology

Dr. Naveen Kashyap
Department of Humanities & Social Sciences
Indian Institute of Technology, Guwahati

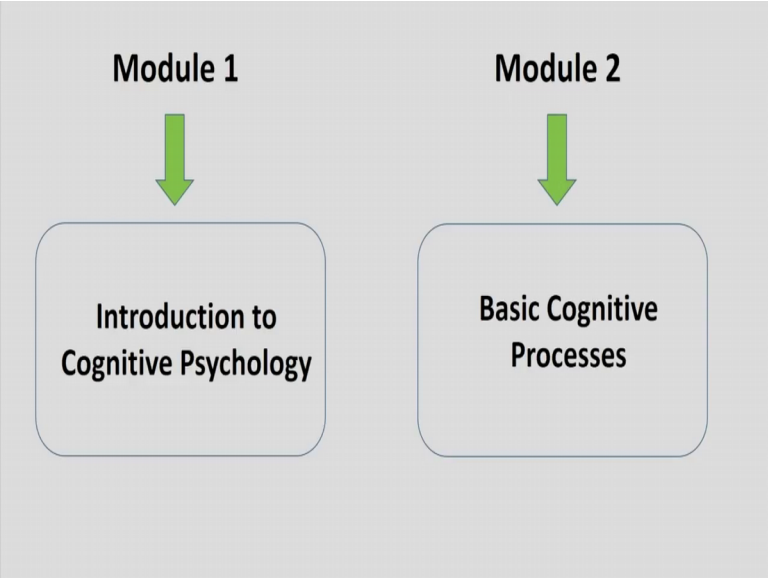
Lecture – 30
Course Summary

Hello friends, welcome to this last lecture on the course on Introduction to Cognitive Psychology. Now, over the past 12 weeks we have been dealing with several areas of cognitive psychology starting with introduction to cognitive psychology, the chapters on perception, attention, then the chapter on memory various forms of memory, then into language and thought thinking process problem solving reasoning and decision making an ending, finally with decision making. So, this last lecture I have dedicated to basically summing up what we did in this 12 weeks. So, what I will do in this particular lecture is briefly get back to each section that we did along this 12 weeks and review what we did in all of these lectures and, basically also sort of refresh you into what each topic that we wanted to do or that covered.

So, basically it is a review kind of a lecture and it will be very very brief every free touching into our topics that were content of each lecture for each week. So, the lecture was designed in basically 4 modules. The total scores of cognitive psychology comprised of 4 modules and within these modules we had different lectures each module had 2 to 3 subtopics and, they had their individual lectures and all of them comprises to packet of thirty lectures, which then was divided into a 12 week period referring back to what is cognition.

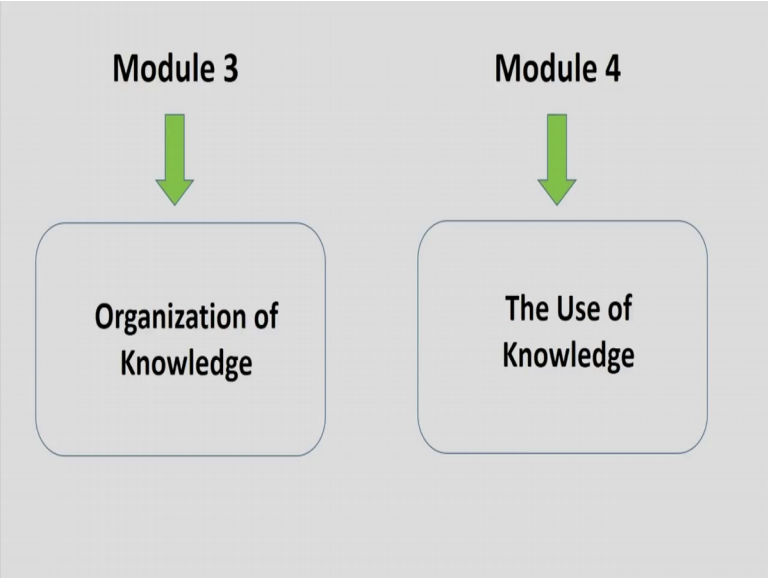
So, what is cognition basically cognition is a mental activity. And so, cognitive psychology with it studies how these mental events, or mental representations which are basically the representation of any event, or any object in the external world, how they are manipulated and studied. And so, in this course on cognitive psychology, what we tend to do is study how these manipulations or mentally meant is done by the mind, or the brain. And so, that is what we will do in this whole lecture there is an outward, or an outline of this particular review lecture.

(Refer Slide Time: 02:50)



So, basically this course on cognitive psychology comprises a set of 4 modules the first module that, we did had 2 lectures onto it and the module was called introduction to the study of Cognitive Psychology. And it had lectures on the history of the cognitive psychology and also on the methodology with it. In module 2 we covered some of the basic cognitive processes which are applied on to mental events on to mental representations and, the cognitive processes that we studied in our in this particular course was basically perception and attention. So, we will be then evaluating these 2, or studying or reviewing these 2 cognitive processes. And, also I think we did memory onto it. The 3rd module was basically organization of knowledge.

(Refer Slide Time: 03:39)



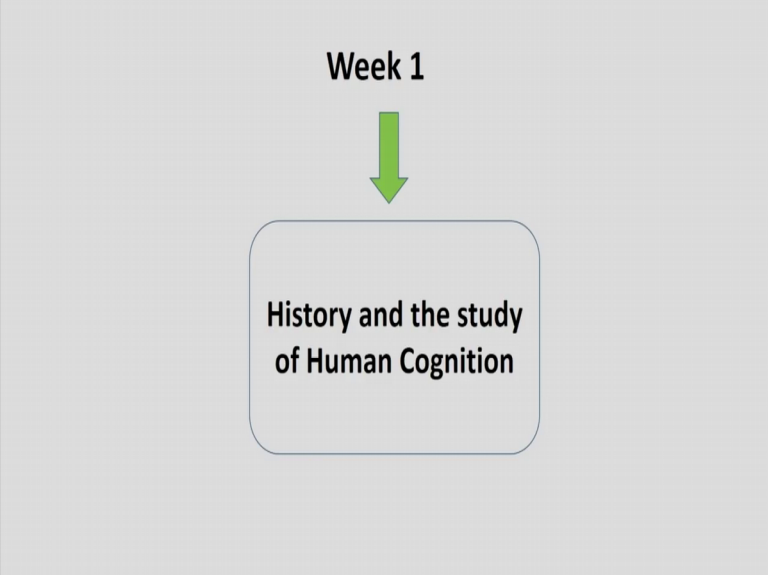
So, the first two modules basically tell you the first model basically focuses on what is cognition and, what is cognitive knowledge and, what is the background of cognitive psychology the history of cognitive psychology and, how does it develop what are the research methodologies in it and that kind of a thing. The second module covered on to basic cognitive processes how an input is taken and this input which is taken from the various senses and organs, how they are converted into meaningful organizations, or into knowledge, or mental representations.

So, basically it is the pre processing it is those processes those cognitive processes, or those cognitive work benches, where draw information which is captured through our primary senses, they are pre processed before meaning is generated out of it. In module 3 we looked at organization of knowledge. So, given the fact that the basic cognitive processes are able to extract information from the raw input, that is given up by the senses these input has to be safe somewhere, or it has to be kept somewhere in a particular format which is called mental representation.

And so, this third module were basically focused on to, how this mental representation is stored and where it is stored into what is the format and, how it is accessed what are the limits of it and so on and so, forth. So, is basically the organization of knowledge into the human brain. And the 4th module was once the knowledge is stored once the knowledge has been attained by the basic cognitive processes and they have been stored, or

organized into the memory how are they accessed and what how are meaning generated out of it, or how is this knowledge successfully used is what the fourth module looked into. And so, what we will do from now on from the next slide onwards, we will take up each of these module one by one and then explain to you what we covered there and how it relates to the next module or the next chapter.

(Refer Slide Time: 05:44)



So, under module 1 in the week 1, what we did was we looked at the history and the study of human cognition. So, the first week which first and second week which are part of the first module, there we looked at briefly at the history of cognitive psychology, how does cognitive psychology come into being, what does it study, what are its proponents, what are the basic principles governing cognitive psychology and, after that we also looked at the various research methodologies, which are available for doing cognitive psychology for someone whose interested in cognitive psychology what are the research methodologies that you are going to do.

So, we started a journey into this section of history and study of human cognition by studying, or by basically reading about the basic debates and philosophy for example, the debate about nativism and empiricism, or the debate about mind body problem. Now, these debates what empiricism nativism, or mind body problem or nature nurture issue they describe, or they form the basic core of their cognitive psychology comes in because, it was the philosophers before the coming after the real science of psychology

that they wanted to study what is the difference between the mind and, the soul and what I wanted to study what is the mind and they were interested these philosophers are the ones who were interested, or on how human beings do things that they do. So, they had no idea what the mind is or the brain composed of another point of time, they wanted to study why individuals why humans are different and so, they proposed these theories.

Now, for example, the empiricism and nativism theory, they emphasizes one of it emphasizes the role of heredity in producing knowledge, or in gaining knowledge and the other emphasizes the fact that human beings are born with a blank state of mind, but later in life through experience they develop knowledge.

So, knowledge is not something which is passed on from heredity, it comes on through the interaction with people interaction with the environment. So, these debates basically move forward the idea of what is the basis of cognitive psychology. Further on we went ahead and studied the basic schools of psychology, we looked at the basic schools of psychology schools like structuralism, functionalism, gestalt school the school of behaviorism and the cognitive school. And all these schools what they did was they provided us the basis or the reason how cognitive psychology developed as a field.

So, these schools the study of these schools gave us an idea of what is cognitive psychology what is the content of cognitive psychology and, how these schools mattered in the coming after the field of cognitive psychology. Especially the cognitive revolution the idea of cognitive regulation, or the cognitive school, they for the first time introduced the fact that behaviorism believed that stimulus response is how a particular behavior is related to a particular kind of a stimulus. And so, behaviorism believed that there is nothing called the mind there is nothing called the brain, there is nothing called mental activities, or mental events and so, each response that a person does each behavior the person does is directly related to the upcoming stimulus, or to any external, or internal stimuluses.

And so, for the first time when the cognitive revolution comes in people started focusing on the o in s r and so, the o was introduced which basically meant that stimuluses do not directly respond to directly give response or directly produce behavior, but rather there was an organism or, there were a human mind which controlled responses. So, stimulus responses were not kind for mechanistic rule, but in organism or a human mind

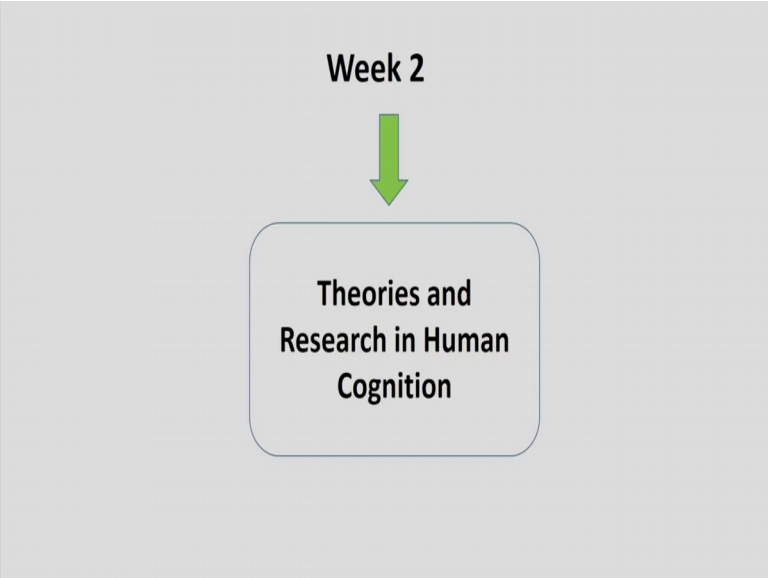
controlled the response and this is for the first time the cognitive revolution produced the idea, or the cognitive school of thought produced the idea that the human mind is responsible for producing all kind of inputs.

Further on we looked at the definition of what mental events are, we looked at what are mental representations for example, what mental representations are mental representations are basically representations or these are encodings of any event, or any person place or thing into the human mind. So, anything that happens in the external environment has to be steady in the brain, in a particular format in the mind in a particular format and that about mental representations are and so, these representations are have a format and a particular kind of a encoding.

So, the format describes what the mental representation, in which way it is encoded and the content of mental represented describe what it wants to say. And we explained it in that chapter in terms of both the special as well as the pictorial definitions, or the special and the propositional kind of representations of how particular information can be represented in the human brain. So, that is what we did in this section.

Further than that we also looked at several other schools of thought, or several other paradigms, which went ahead and described, how cognitive psychology progress for example, we looked at the evolutionary school we looked at the connectivism school the information processing paradigm and so on and so, forth. In addition to that we also looked at why study the brain, if you want to study. So, cognitive psychology and the reasoning that was provided there was because, study of the brain for studying cognitive psychology provide us not only identify ability effects, but also it gives us the adequacy effect, it basically means that studying the brain, will tell us what functions are responsible for or what kind of mental activities are a small related to what kind of brain activations and that way our relation or correlation can be mashed up.

(Refer Slide Time: 11:28)



In the second week we went ahead and studied theories and researches in human cognition. In this particular lecture, we looked at the various research methodologies that has been used for creating, or studying cognition. And the three primary research methodologies that we studied was just the methodology of behavioral approach, the correlational approach, the casual approach and the modelling approach. Now, in the behavioral approach we primarily use three different types of measurements.

The first measurement being, the measurement of accuracy, the second measurement being the measurement of reaction time, the third measurement being the measurement of judgment and these three measurement, or these three criterias can be used to the to measure, or to design experiments in cognitive psychology beside the behavioral methodology for studying cognitive psychology, there is also something called a correlational method of studying cognitive psychology, or cognitive phenomena or mental events. And this correlational methodology uses the input from devices like such as the electrons of the graphs, or the mental the MEG the magnetoencephalo graphs.

Now, the mental the magnetoencephalo graph or the electroencephalographs, they provide us brief idea about what happens at the brain, when a particular mental event is being processed, or particular mental event is being taken care of in addition to the EG and the MEG, there are devices which are called the positive and emotions tomography the MR is and FMR is all of which provides us what happens, or tells us what happens at

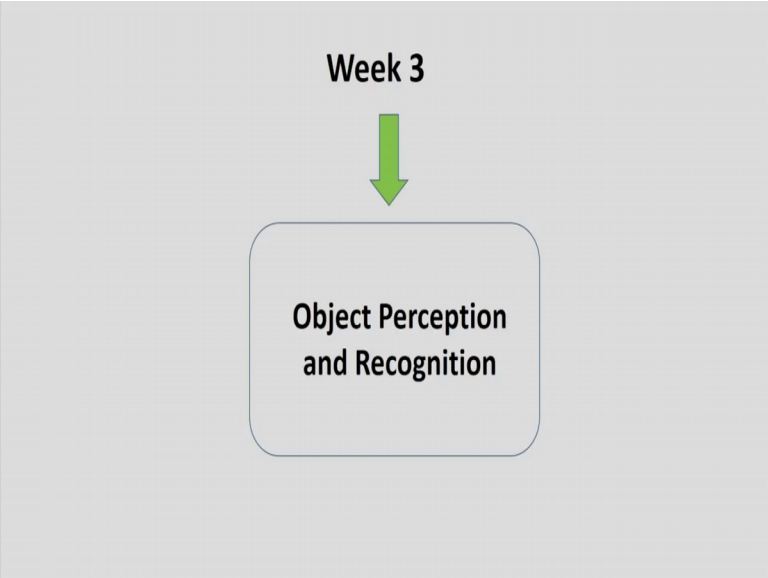
the brain when a certain mental activity is happening. And so, they gave us kind of a correlational structure. So, if some change in a mental event happens correlational change, or us simultaneous change also happens in the brain and, these equipments provide us the idea of what happens into the brain when a particular cognitive activity happens.

Beside that explain to you the causal network, where we looked at three methodologies the methodology of using neuro physiological studies, in which patients were studied for finding out what are the reasons for, or how is brain related to the particular cognitive activity, also looked at an equipment called the TMS which can specifically inhibit certain areas of the brain and study, how a particular area is related to a particular mental activity. And a third way of using drugs, or certain kind of inhibitors, neurotransmitter inhibitors for studying or inhibiting certain kind of brain region and studying the function of that brain region.

In addition to that the last method that we use, in this particular section was the method of modeling in which what we studied is there are different computer models can be generated and, these models are two in nature the box model and the neural network model and both of these models can be used to basically represent the mental activity of how a mental activity gets processed, or how a mental event gets processed. So, this is what we did in the first two week and this is what we studied in the first two chapters.

In week three we looked at object perception and recognition. And so, in this particular section, in object perception and recognition, what we looked on to, or what we studied was we looked at both the classical and the gestalt approach to perception.

(Refer Slide Time: 14:49)



And in the classical approach it was said, that there is something called distal and proximal stimulus and that is how a perception really happens. So, basically the idea of this chapter was to study, how perceptions are developed, or how information which is passed on from the sensation that is taken into the brain and that is coded into the brain to the process which is called perception. And so, two theories were studied the classical theory said that whenever something and we basically studied the visual perception, we specifically studied the visual perception, although at a later point we also described a little bit of auditory perception, but we focused ourselves into visual perception because, that is the easiest sense to study.

And so, in terms of visual perception, we studied the classical theory, which says that there is something called a proximal stimulus and, there is something called a distal stimulus and these two stimulus is interact together to form images onto the retina, which are further carried on to the specialized object recognition area or the brain in the occipital lobe and from meaning is generated.

We also looked at certain theories of other object perception for example, the bottom up in the top down theories. Now, within the bottom up theories, we looked at something called the template matching theory, we also looked at something called the feature analysis theory and the prototype matching theory. The difference being that in template

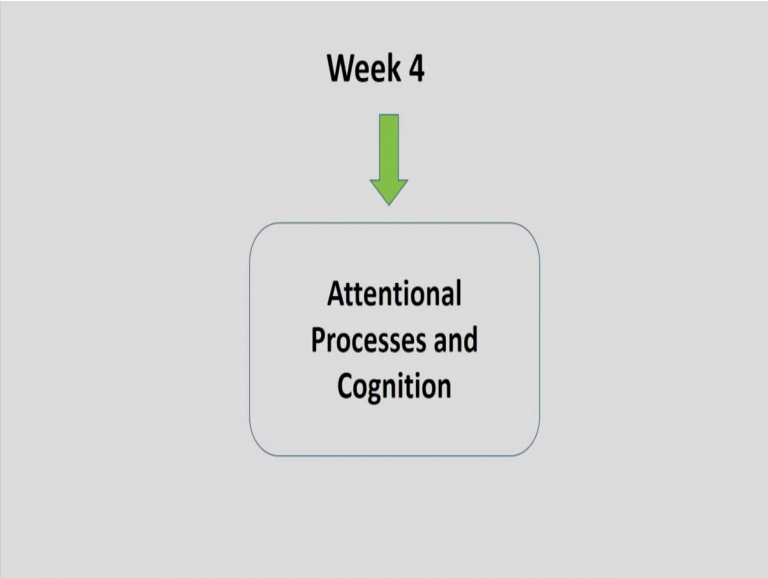
matching theory, it proposes that there are huge number of templates in the brain and that helps someone in recognizing a particular object in the external field of vision.

Whereas the feature analysis theory goes ahead and says that object recognition is not based on these kind of human templates, the reason being that so, many templates cannot be stored in the brain. So, it is instead of the number of templates stored in the brain, it is the pattern it is the feature of a particular object, which is of use for doing object recognition whereas, the prototype theory says that neither the feature analysis theory not nor the template matching theories enough because so, many templates cannot be stored in the brain and, neither the feature analysis theory tells us what a feature could be. So, the prototype model says that human brain creates a prototype and this prototype is what, actually goes ahead and helps us in doing bottom up processing.

So, what is bottom up processing in bottom up processing, we start with the very basic knowledge, we fought with the very basic inputs which are coming from the visual senses and from there, we try to do the object perception. In a position to the so, coming from general to specific, or looking at a number of information which is out there and combining the all this information to understand what an object is called bottom up process. So, it is from bottom of the pyramid going towards top of the pyramid, in a position to the bottom up process there something called the top down process. And in the top down process, we actually studied how the experience past experiences of human beings help us in object on identification in within the top down process, we studied something called perceptual learning studied change blindness and word security effect all of which displays that the human experience is enough in creating perception.

And lastly in this section on perception recognition of the perception recognition, we study something called direct perception, which is the theory which is directly opposing to the theory of classical perception and gestalt perception. So, what does the theory say, it says that human beings do not need to do anything onto the incoming stimulus, rather the incoming stimulus is has enough information the incoming light from an object in the external field has enough information, when it falls into the retina and that is enough to create any kind of any perception which is needed.

(Refer Slide Time: 18:29)



In this 4th week we ventured on to the chapter on attention and, attentional processes and cognition and so, in this section we specifically select studied selective attention. Although so, what is attention basically attention is focusing yourself into particular information. So, focusing your senses into a particular information and, we looked into the selective attention.

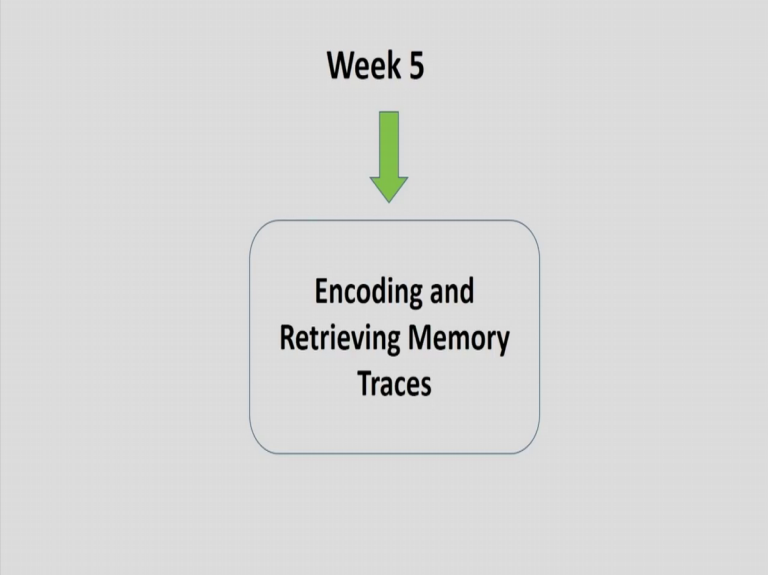
Within the selective attention we discussed several theories which are our selective attention for example, one of the theory that we discussed was the filter theory, we also looked at an attachment theory of attenuation, we looked at the late selection theory we looked at Kanbans theory and Schema theory. Now all these theories differ from each other in certain ways for example, late selection theory says that the bottleneck that is there in terms of attention is not at the start of attentional process, but at a later part of an attentional process whereas, the filter theory suggests that whatever calls whatever information falls under the perceptual system. It is filtered right there at the beginning of the attentional process the late selection theory says that this filtering happens, at the end of it and there are several reasoning, or there are several line of experimentation which has been provided for the support of these theories.

Similarly, the attenuation theory says that nothing is filtered out; in an attentional filter what happens is only the volume of information which is available is toned down. Similar to that there is Kanbans theory which talks about alertness and certain

propositional requirements and, certain other kind of a motivational needs which all come together to decide how attention is focused on to something and, the Schema theory is direct vague theory which basically goes ahead and says, that whatever is not perceived is never looked on to, and that is the reason why attention is an all or none kind of a phenomena. Beside that we also looked at how attention becomes on what conditions attentions become automatic and, how this atomicity of attention actually helps people.

It was the end of the chapter we discuss something called the psychological refractory period, it basically suggests or which basically is the time gap or the time required for somebody to process to incoming informations. So, if 2 incoming informations are given to someone who is processing up already. So, two incoming informations occur simultaneously to a person, this person will be delayed in replying to the second information. And this delay is what is called the psychological refractive period.

(Refer Slide Time: 21:05)



In the 5th week we looked at encoding and retrieving of memory traces. And so, in this particular week we looked at what is human memory. So, we discussed the popular modal model of human memory which talks about sensory memory, then the short term memory and long term memory.

Beside that we also looked at different kind of sensory memories, which are available for example, the iconic memory and the echoic memory and also the haptic memory. We

looked at what is STM and we looked at the various features of STM. Before that we also discussed in detail, what are the features of an icon and, what are the features of an echo and, how they are distinguished and we discuss several experiments of what in equine what an icon is of a sensory memory. In terms of the short term memory, we looked at what is short term memory, what is this capacity, what it can do, what it cannot do part of the kind of forgetting that it happens from short term memory, the coding in short term memory which is basically in terms of the semantics in acoustic coding, we also looked at how forgetting happens, we discussed two experiments on brown and Peterson in Waugh Norman of how forgetting actually happens in short term maybe.

Towards the end of it this section, we looked at what something called working memory. So, working memory which is an improvement on short term memories so, we looked into that. So, what is basically working memory, it is an improvement on short term memory whereas, the preposition goes that short term memory is a store, which is non dynamical in nature working memory proposes a store which is more dynamically nature, in the sense that it has three different parts it has something called a central executive, there is something called a phonological loop it has something called a visual sketchpad. And so, as against the fact the short term memory is not directly connected to long term memory, it cannot directly interact with long term memory, working memory at all points of time are connected to the long term memory. So, something called the episodic wafer.

And I provided you reasons of why this improvement was necessary and, what this improvement actually meant. So, this was the first part of the lecture. In the second part of lecture we looked at what is long term memory. So, in the first part of the lecture we looked at what is STM, what is sensory memory the codings are forgetting the variables which are affecting it and so on and so forth. In the second part of this lecture on lecture 5 between lecture 5 and lecture 6, there was another section on long term memory where we look specifically on, what is long term memory and how does coding happen in long term memory. So, basically the coding that happens in long term memory is semantic in nature, we also looked at the various forgetting theories of long term memory and some popular theories that we discussed was a decay theory the interference theory the poor encoding theory and so on and so forth.

We also discussed what is the capacity of long term memory and so, what it can store, how it can store, what it can process and what it cannot we discuss 2 basic types of recoil method 2 basic types of retrieval method from long term memory. So, if an information is stored in long term memory, how is it pushed back, or how is it retrieve back. And we discussed recall and recognition being the two method of retrieving information from long term memory. Recall being a method in which a person has to remember from, his memory and write something back in recognition some distracters are provided with the correct answer and, the person has to identify the correct answer and discriminate it from the distracter. So, these are the two methods which are there.

We also looked at something called context effect and state effects in long term memory and, we showed how varying the context and keeping the context same, while encoding in long term memory and while retrieval in long term memory, the benefit of memory is seen. We also looked at the physiological state the percentage, or the wood percentage also helps in better remembering of long term memory, or worse remembering of long term memory. We also here included the distinctions of long term memory, in terms of the declarative and procedural types.

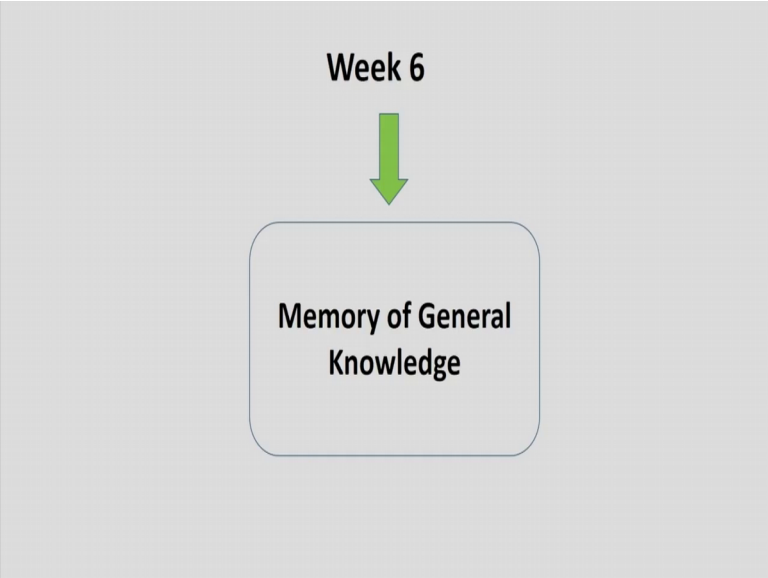
So, here itself we saw how long term memory is defined in 2 parts the declarative in the procedural type. In the declarative type the old memories are crap, which are conscious in nature whereas, in the process of procedural type the implicit memories are kept and, we also discussed how this declarative memory is further broken down into it is semantic and episodic form and, how the procedural memories are broken down into it is classical conditioning, habit and priming in several other forms of procedural memory.

So, this is what we did there at. The end of this section we looked at reconstruction of memory, or why memory reconstruction is there, how false memory is formed and what is called eyewitness testimony. So, basically what we understand is that memory is never true, whatever we store has some form of reconstruction onto it and. So, at the end of section we looked at the experimenter by loft us and several of the experiments for example, the DRM paradigm the Deese Roediger Mcdermott paradigm, which basically shows us that the memory the information which is kept in memory is never accurate, it is never a representation of the events that have happened. And it is always a reconstruction which is there and, we try to focus here, or we try to tell here I try to

evaluate and show to you that memory is never true. It is always a reconstruction of the information, or the manipulation of information which was originally stored.

In the next section of memory in general knowledge, what we did was we started the section with an introduction to the distinction between the episodic in the semantic form.

(Refer Slide Time: 26:31)



So, in the last chapter we saw how long term memory is broken down into it is declarative and procedural format and, within the procedural format we have the semantic in the episodic store. So, this section started by distinguishing between what is episodic memory and, what is semantic memory. And this section was particularly dedicated to semantic memory. So, semantic memory is that memory which holds in knowledge information only fact and things like that, daily routine events all those information are stored into something called a semantic store, or semantic a part of the long term memory.

Whereas in the episodic form, or in the episodic part of the long term memory, we have events life events which are stored and there are several different types of episodic memory which are there and so, our associated memories for example, there is something called the autobiographical memory there is something called the flashbulb memory and we discussed that at the end of the last section. In this particular section we looked at memory for general knowledge which is semantic memory. So, we looked at what is semantic memory and what are the different models of semantic memory. The

particular models that we discussed in this particular chapter was the hierarchical semantic model the or the HSM and the HSM, what we found out is that the various knowledge is which are stored in semantic memory, they are connected through hierarchies, or they connected by something called nodes and pointers.

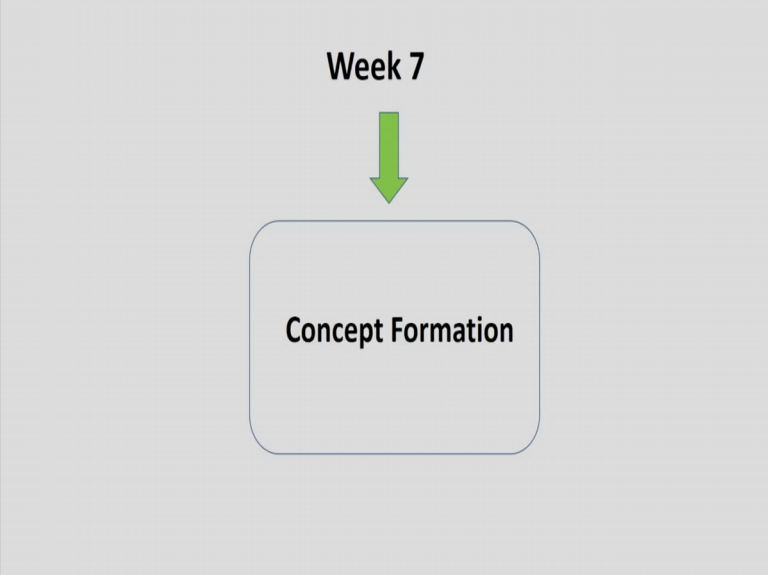
And so, new information has a super ordinate node and super ordinate node. The way information is coded is in terms of categories and concepts and so, these concepts and categories are how information is stored on to one another. And this the hierarchical semantic network model basically explained, how information this general information is stored as hierarchies within the semantic memory. Beside the hierarchical semantic model we also looked at something called the feature comparison model, which was an improvement on the hierarchical semantic model and, said that since there was some problem the criticism with a hierarchical semantic model, in terms of verification of sentences verification of information, which is present in higher the semantic model the feature analysis model says that information is not stored in terms of hierarchies, rather it is stored in terms of feature analysis.

So, based on the core features and based on the characteristic defining and the characteristic features, information is actually stored into this hierarchical networks, or information is stored into the semantic memory. We also looked at something called the spreading activation model, which says that whenever one concept, or whenever one particular information bit is excited this information this excitation, or this kind of a retrieval is spread on two concepts which are related to each other and how multiple concepts which are somehow related to each other are activated, when particular node is activated. So, how does the spreading happens, or how does energy spread from one node to the other node.

So, these are some of the models that we study into and beside that we also studied the ACT model the Andersons ACT the model which talks about three different kind of memory system. The working memory system the procedural memory, in the declarative memory and what this model said is declarative memory is entirely different from procedural memory, in the sense that in procedural memory, we have some kind of propositional thoughts and propositional structures whereas, in the declarative memory the common form of memory is looked into. And the working memory was a connection between these declarative procedural type of memory.

So, this was an end to this section on memory of general information. In the next section was based on defining what are concepts and categories.

(Refer Slide Time: 30:05)



And so, what why we wanted to study concepts and categories is because, in the earlier section on semantic memory, we saw that the node consists of concepts and categories. So, what are concept concepts are basically representations of worldly knowledge. So, however, something is represented what is the way in which particular information is represented the human brain, or human mind is what concepts are and categories are similar concepts or things which have similarities together how they are clubbed together is what is called categories. So, we looked at how categories and concepts are formed, we also looked at the various nature, or various models of concept for example, we looked at the classical view which says that how the way in which concepts are form, or how we categorize things together is in terms of the fact that the more closely two things appear together identical they are clubbed together.

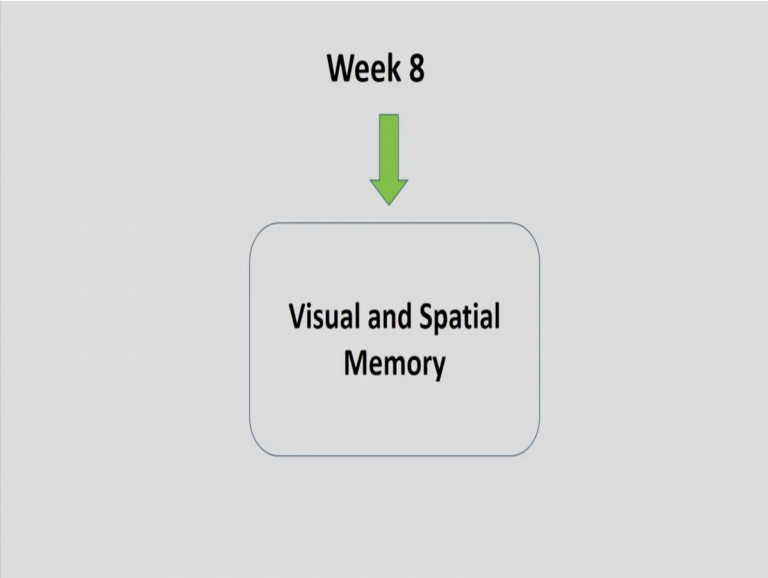
In a position to this the prototype view concept in categorization, suppose the suggest that there is an abstraction which is made out of it because; it might happen that two things may not be similar, but they are clubbed together. For example, a bird which does not has feather will be more of a bird, then any other kind of an animal. And so, this kind of violations led to the proposition, or the prototype model which says that people make abstractions people, when they look into a certain kind of a concept or certain kind of an

object people when forming categories they make abstractions of what the category element is. So, from that prototype they actually go ahead and, then include other members into that particular category, then we came to something called the schemata view an exemplar view, in the exemplar view what we looked at is that these prototypes that we talked about.

So, basically what people do is when making categorization, they look at all the elements which are present in the category. And from that they create an abstraction, they look at the commonality and based on the commonality, they create an abstraction. Now, in the prototype view the idea was that this abstraction may, or may not exist in real life, but the exemplar view suggests that the abstraction that we have made, in the prototype view does exist in real life. So, when we think about fruits I am thinking about a particular fruit maybe an apple. And so this is the exemplar view it says that when I say the category fruit, the idea that fruit is something that is that you eat it has seeds it as a particular taste and so, on and so forth, but you also think about a particular fruit for example, in orange or apple and so on and so forth. And so, this is what this particular concept of exemplar view suggests.

In addition to this chapter also explained, how concepts are really formed, what are the way in which concepts are formed. And so in this we discussed successful scanning, conservative focusing and some other methods of forming a concept. Beside that we also looked at how people acquire prototypes and, once they acquire prototypes how do they use to form this kind of a knowledge system that we have discussed in the semantic that is useful in forming and organizing semantic memory.

(Refer Slide Time: 33:09)



In the 8th week we discussed on to something called the visual and spatial nature of memory. And so, in this we looked at what is visual memory. So, visual memory is mental imagery, it is basically similar to the fact that when I ask you to think about something by closing your eyes and, when I ask you to imagine something what do you imagine. So, the same kind of thought the same kind of imagination that you do is what is called visual memory. We also looked at some mental mnemonics which are useful which are mental shortcuts, or which are mental aids which help us in remembering things and some of the mnemonics that we discussed here, where the method of loci the method of interacting images and the method of backwards.

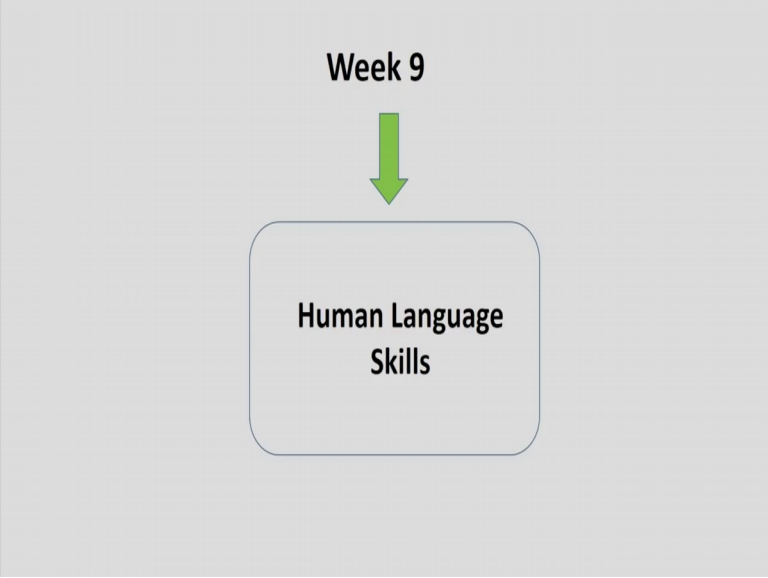
Now, what this mnemonics tends to do is they tend to organize information in such a way in such a visual manner that people tend to remember them, better and this remembering them better makes their memory better or makes better encoding of their memory. In addition to this we looked at 2 propeller theories of the visual memory of how, why visual memory is better than any other kind of memory. And the one method or the one theory was the dual coding hypothesis and the other theory was the relational organization hypothesis, where is the dual coding hypothesis suggests that whenever something is committed to visual memory, it has two codes and auditory code in a visual code and, since it has two codes it is better remembered the relational organization hypothesis say is that if the better learning is not because of the fact that any memory

which is committed to visual memory has 2 codes, it is because of the fact that there is a relation established between the number of interacting images.

And so, number of images if an images taken and if two things have to be remember two bits of a three bits of information has to be remembered and, if you make imagery of these three bits of information and make them interacting together, the interacting image is better remembered then separate images. And so, this is what the theory goes on and says and then, we looked at theories of mental rotation, which basically goes ahead and says that it is not only that we store static visual imagery.

We also are able to do mental manipulations rotations from mental images and, there are several theories out there are several experiments to prove that people are able to mentally rotate an image, mentally rotate and particular information or mental representation. In addition to that we looked at what is the nature of visual imagery and, we discussed some of the some of these nature for example, the nature of implicit encoding perceptual equivalence special equivalence and so on and so, forth. And this is where we ended the section on visual and spatial memory..

(Refer Slide Time: 35:53)



The next section was about studying language, or understanding what language was and in this section, we started by first identifying what is language and how it is different from communication. So, language has a particular format, it has a particular grammar it is arbitrary nature it has a particular structure. And then it can be used to create new

sentences whereas, communication is bounded by certain limits. So, language and communication differs in the fact that communication is restrictive in what information it can pass, but language is not restrictive because it has several features, which helps us in to communicating a number of ideas across a number of people and, it is the universal method of combining two people or multiple people together.

We also looked at the structure of language here, now in the structure of language we looked at how western language is nearly built. So, we looked at what is the basic level the phonemes level, the morphemes level, the level of the syntax, the level of the semantics, the level of the pragmatics and so on and so forth. So, at the funding level at the word level how information is we looked at the phonology and phoneme level from there we motored morphology where, the basic speech sound are combined together to give the first words. And then or the first sentences and from there we came up to the level of the syntax, which is how sentences are written in particular language.

For example we discussed the English language here. So, we looked at the grammar or the syntax. So, our sentence can be completely syntactic, but it may have no meaning and so, generating meaning out of a sentence is what is called semantics. So, semantics is the study of meaning of a language. A language could have a perfect way, or a perfect syntax which means that it could be grammatically correct, but it could produce no meaning and so, this production of meaning is what is called semantics.

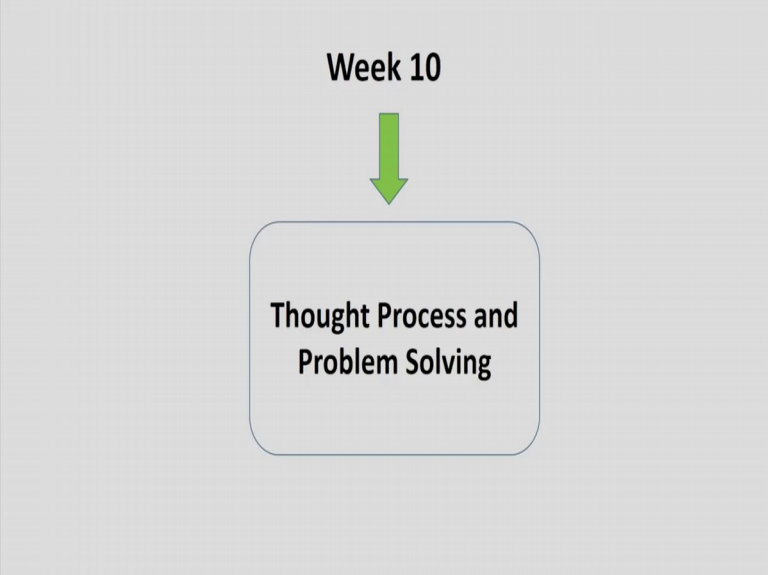
From semantics to moved on to something called pragmatics which is the social rule of how our language should be used. And so, this is what we did in this section, other than that we looked at how language comprehension happens and with language comprehension, we also looked at how text comprehension and sentence comprehension happens. Now, in language comprehension it is believed that language unlike text is continuous in nature and so, changing one phoneme can change some can change something else. So, language comprehension is basically categorical in nature, in the sense that people form categories and they understand the language which has been broken.

Since language is not broken down whereas, in text perception what really happens is that, there are something called circuits and fixations of the human eye that leads to perception of text. In terms of processing sentences sentence perception happens in

formal just way. So, people read a particular sentence, or a particular paragraph and generate, a list out of it are generated gist out of it and gist is what is remaining with people. So, meaning is or gist is what remains and all other words and meanings are taken away from it. So, this is what the perception apple, when we looked at several errors in speech production different kinds of errors which can be there and how they are compensating for language, or how they show what languages is or capable of and what is or not capable of in the end of it, we looked at something called story grammars which are basically how stories are perceived.

So, any story grammar is basically a way in which a story is made and how it is read and how the meanings are generated. So, story grammars are basically a structure of any story. And so, this ended the section on human language skills. Next came the section on thinking and problem solving and so, in this particular section, we started by first defining what a problem is, we looked at two different kind of problems the problems of the ill defined and well defined problem and the routine and non routine problems.

(Refer Slide Time: 39:21)

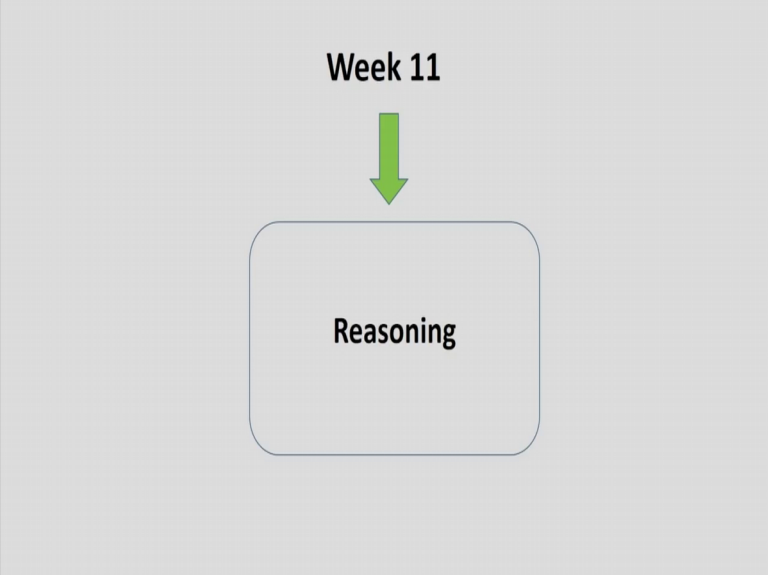


So, we looked at both this kind of problems which other out there and, what is the difference between that. We also looked at different kinds of problems which exist for example, we have the analogues the arrangement problem, the divergent problem, the transformational problem, the arrangement problem and the induction problem and so, on and so forth. So, we looked at different kind of problems which could be out there.

We also looked at the various approaches to the solution of problem for example, the behavioral approach where we looked at trial and error is the reason of how a problem is solved and, we also looked at the gestalt approach, in which it is the phase of induction and the phase of waiting which leads to the final answer. So, a stage where people just do not do anything and, they wait and that leads to the; I experienced and that generates the solution. We also look at various variables which affect problem solving for example, problem representations, it could be mental said functional fixedness or 0 types we can help in the formation of ill defined problems, or how what can the errors be there in problem formation.

We looked at various strategies and problem solution for example, we looked at the algorithmic strategy, we looked at the strategy of heuristics and, we looked at the means end strategies. So, there are different strategies how a problem can be solved and at the end of this we looked at what is creativity, what are different kinds of creativity which is out there and we looked at two dimensional view of mapping creativity.

(Refer Slide Time: 40:46)



Next section that we discussed was a section on reasoning. And in this section we looked at how the reasoning and decision making the last two sections are basically sections in which we looked at the higher order cognitive processes. Up till now, up till before language or till language, it was the basic coronary process which was taking

information from perception sensation attention memory and they were creating raw materials.

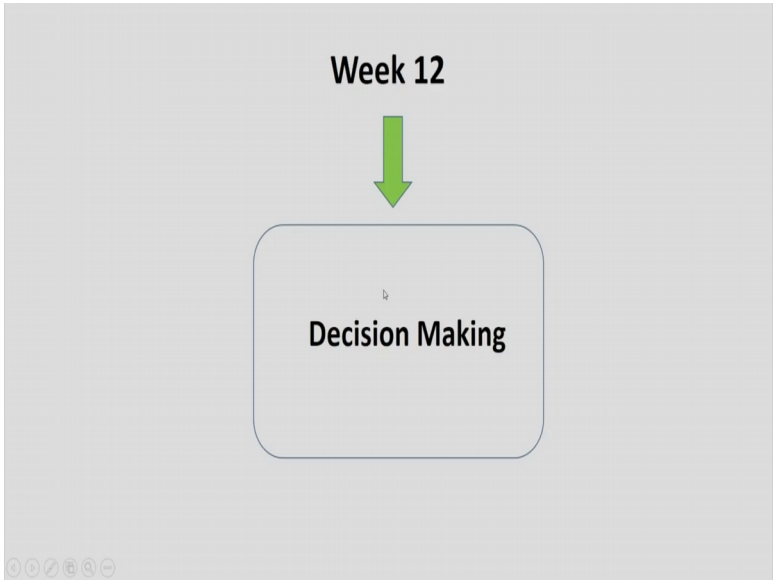
From the sections on thinking when problem solving reasoning and decision making interpretations are made of these mental representations and so, in reasoning we looked at what is reasoning. So, basically reasoning is an evaluation of conclusion, which is given which is based on a given meaning. So, we looked at what is reasoning and how reasoning is used, or how evaluations are generated. Beside that we looked at different kinds of reasoning.

So, the two kinds of reasoning which are there which is called deductive reasoning and inductive reasoning within the deductive reasoning we have the syllogistic reasoning and we have the conditional reasoning, we also looked at inductive reasoning which is another form of reasoning, how we come from general to specific. So, this is the kind of differences which we looked into. We also addition to that we also looked at several criticisms of these reasoning processes. In addition to that we also looked at what is judgment, how does judgment really work and what is the meaning of judgment.

So, basically judgment is reasoning the applied to a given information for generating a particular conclusion. We looked at several errors in judgment into this section for example, some of the errors that we discussed was the error on availability heurist the available error on the representative heurist and the anchoring in, what these errors really mean is that these errors lead to faulty judgments, or lead to inconclusive judgments. So, availability heurist is a heurist in which leads to improper judgment which basically means that we trust people trust their memory more and based on that they make the judgments. Similar to that the representative heurist gives the fact that, since a particular information a particular line of information which is available from memory since it represents or it is very representative to a certain kind of category people make these kind of judgment errors. And similar to that is the anchoring in effect or anchoring error.

When in addition to that there are several other biases which can appear in judgment for example, the hindsight bias, the bias of illusory correlations, or the bias conjugation fallacy and several other kind of errors it is there.

(Refer Slide Time: 43:08)



In the last section we discussed something called decision making. So, this is the last process which happens after reasoning in judgment. Once reasoning and judgment is there a number of options are available to choose from and so, decision making a process, where we go ahead and look at the number of options which are available to us and make a final choice. Now, whenever we they make this choice this change is always under certain kind of risk and certain kind of uncertainty and so, as humans we always wish to make the best choices which are there and which is rational.

So, what is the rational choice the rational choice is the one which gives you which maximizes your profit, but minimizes your loss and that is what we tend to do. So, this is what decision making was all about. Now, we looked at two different ways of making decisions first was the normative view, where we looked at something called the expected utility theorem and the violations of it. Now, in the expected utility theorem we looked at what is expected utility and we calculated that expected utility, or the descriptive model of decision making suggests that decision making has to be made in terms of what is the utility of particular option and what is the probability of that option happening.

And we looked at this kind of a calculation and the option which gives us the maximum utility and has the maximum probability of occurrence is the one we select. And we looked at that this is how a rational decision maker should make the decisions.

But with humans enough information is not available, or information is not available and so, there tend to make irrational choices, or irrational interpretations. So, what they tend to do is they trying to do violations of this expected utility by doing something called preference reversal, or reversal shifts which basically means that, if they choose an option one in a particular situation they keep on reversing, or they keep on shifting the choices in a situation 2 situation 2 and so, on 4. Whereas, the expected utility theory believes that if a option A is chosen and the condition one, the say option should be chosen under n number of different conditions which stress to occur. And so, we looked at some descriptive theories of decision making the theory that, we looked at is called the prospect theory, which basically says that the gains and losses which comes out of a particular decision are mapped on to different dimensions.

Larger gains has show smaller increase, or smaller increase in feeling whereas, smaller losses show higher increase in pain. And so, losses and gains are interpreted differently by human beings also the fact that not only these gains and losses of how it is the way a particular game and, our particular option is presented to you whether it is a gain frame, or a loss frame well decide what option are you going to choose from a number of options which are given to you. So, given the fact that a particular option is given to you, in a gain frame people choose sure bets, but if something is given to you in a loss frame people are more risky. So, people are more risk aversive in a gain frame whereas, people are more risk prone in a loss frame.

Beside that we also looked at something called 2 phenomenon of psychological accounting and sunk cost effect which are basically demonstration, or extensions of what prospect theory suggests. It suggests that people tend to throw good money after bad money which basically means that people value those options which have taken a large part of their money and, but still are un-enjoyable whereas, they do not go for better options which have taken in lesser money, but are more enjoyable. Similarly when people have to spend on things which have been assigned a certain psychological account people will not like to invest onto those options whereas, if some particular loss, or particular gain has not been psychologically accounted for people would like to spend more money on to it.

The last section we looked at how effect, it interacts with decision making and what is the role of effecting decision making. And when they looked at there are two modes one

is the effect mode and the other is the descriptive mode. In the descriptive mode people more conservative more people are tend to think in non effective way and, tend to donate more whereas, in the effective mode people make decisions in terms of how they feel about it and so, they are more conservative and they are influenced more by the sweep of or the scope of the particular effect. So, this in total is the number of things that has to be studied that any course on cognitive psychology has to happen. And as you can see we started our journey from the history of community psychology moved on perception attention, then memory several forms of memory, then language thinking and problem solving decision making visual memories and so on and so, forth.

So, this course was an attempt for from my side to basically introduce you to a very basic knowledge of cognitive psychology, although cognitive psychology this is just an introduction and this is just the starting point of a cognitive psychology, any course of cognitive psychology each chapter of this section can be expanded further and can be studied further into more basic fields. And once you do a course on cognitive psychology the other fields that opens up are cognitive neuroscience, or fields of neuroscience cognitive technology and so on so on and so forth. So, the whole field of cognitive science then opens up with you because, cognitive psychology is an inherent part of any cognitive program, or brain and behavior program in any western university, or any university which is out there.

So, I hope that you enjoyed this whole 12 weeks ride with me enjoyed, each part of it there were points at which you may not have understood you are free to some concepts, you are free to write back to me and consult with it. I am probably sure that you enjoyed this whole write for 12 weeks, I would like to then say a final goodbye to you and hope you do good in your exams, goodbye.

Thank you.