Principles and Parameters in Natural Language
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Lecture – 01
Introduction

Topic now, which word of this is familiarity with you familiar to you I mean in a way all the words should be familiar to you right, but which word of out of these 3 4 makes more sense to you.

Student: Language (Refer Time: 00:33)

Language very nice I was expecting that, how about natural language any idea have you heard about any other kind of language which is

Student: Programming language

What is that called if you talking about programming language

Student: Machine language

Artificial language right. So, and what is artificial about programming language.
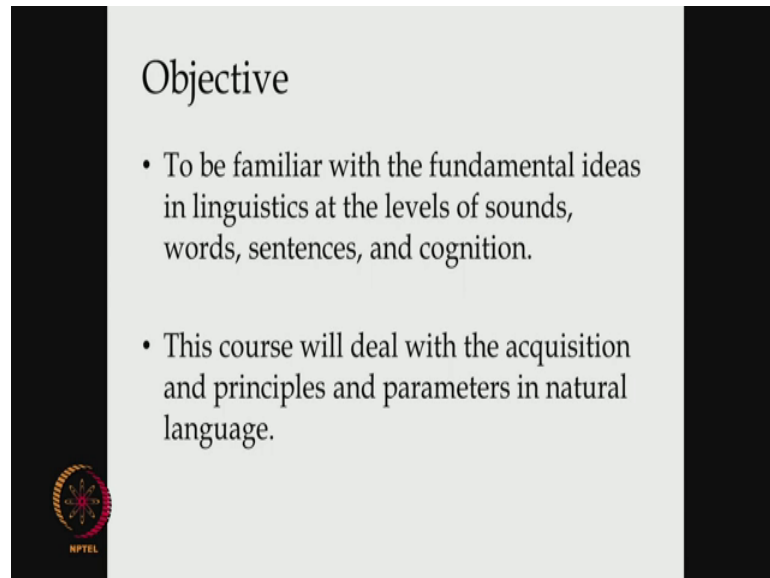
Student: Manmade man made

Humans have invented and do people speak that.

No. So, right in the beginning I want to draw your attention to this thing natural language means the language that people speak. This is not directly in opposition to what we know as artificial language artificial simply means the languages or language that machines communicate with; am I right about the programming language only machines understand that language and some people who write that who write several things using that language people do not speak that language right all right.

So, that is the part of natural language principles and parameters I am coming to you in a few minutes. So, that is that is about the name of this course, here is a little bit of details about me and the course evaluation my name is Rajesh Kumar, I teach in the Department

of Humanities and Social Sciences my office is located in 3 4 5 H S B the this is my these are my phone numbers office number and mo mobile number and my email I d.
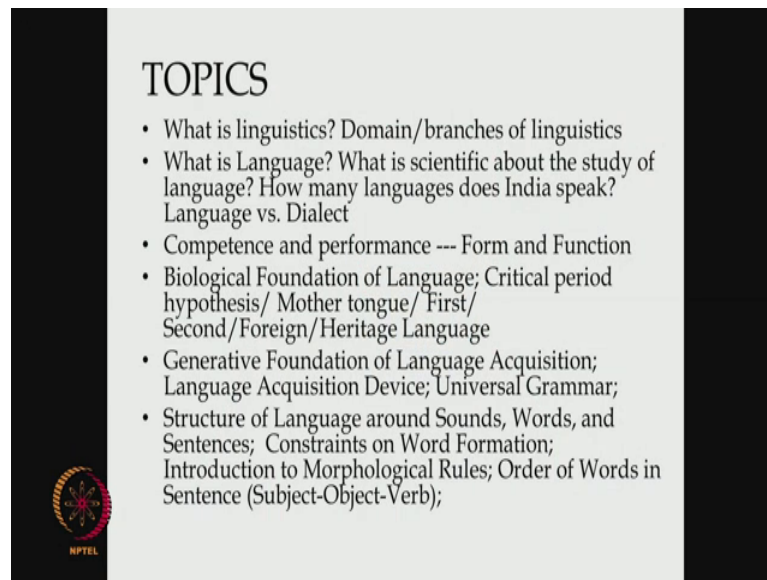
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This is the objective of this course I must tell you right in beginning this what we are going to do throughout the semester, it is in short if I have to summarize everything that I have to do I can talk about it in 2 sentences that we are going to talk about some fundamental ideas of ideas about how we study language and again when we talk about language we mean natural language. Language that we speak we will we will be talking a lot about that we will be setting up several parameters with that, but keep in mind when we there is something else which is which is obvious when we say natural language natural language is not the language that is written.

So, we are not talk we are not going to be discussing about textbook language or writ10 language, we are only going to be talking about spoken language, which is natural language that people speak. And particularly how we study that and how we learn language is going to be part of that and then we will be looking at that at the level of sounds words and sentences in particular we will be looking at sentences that is language at the level of sentences. Since we are beginning with language and it is fundamental ideas, we will briefly go through sounds words, but we will be spending most of our time at the level of sentences all right.

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Again I have listed some of the topics that we will be discussing you are more than, welcome to take a look at these topics there are 12 of them and again I am going to send you these topics and we will stick to these topics I will try to cover each one of them in a week. So, far I have a design for 12 or 13 weeks, I have kept 1 or 2 weeks free if we need more time to a spend on a topic we can we should have scope for maneuvering.

So, we will begin with the general things like what is language and linguistics and how we study them, how we learn a language in the first week and then we go on and on to look at. In the second week or so we look at language at the level of words and sounds and words and then soon after will be going at the level of sentences.

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So, these are the 13 12 or 13 topics that we will be looking at.

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These are the 2 textbooks which we will be using for this course I have not listed them in chronological order, Culicovers book is more recent that was published in 2009; however, I have put them in the order of priority a more important book for this class is going to be Liliane Haegemans book what is known as introduction to government and binding theory.

Its a voluminous book it should be available online too; however, the both the books are available in the library, please try to last year or sometimes somebody had sent me a link of this thing available online, I do not have that link ready please find out find it out for yourself and if you find a PDF link for either one of the 2 books or both the books send it send that to me too, but whether you need a hard copy or a soft copy do get hold of these books these are the 2 books we will be using for this for this class and most of the topics that I have shown you and that we are going to be discussing you will find in these 2 books.

So, let us let us look at some of the preliminary things that we started discussing with the names with the name of this course and even before I look at these things I wanted to ask you this question, what do you think what will you looking forward to when you walked into this course, when you registered for this course what do you think what did you think you will be learning and again if this was a first year class or second year I would have framed this question different differently, but let me ask you this question directly since you have gone through several classes. Can I get some of responses what do you think you were expecting when you registered for this course. Did you have any idea when you registered for this course what will be this course about what are your majors how many of them how many of you are from electrical engineering computer science computer science.

Student: (Refer Time: 08:05)

Nobody

Student: (Refer Time: 08:07) mechanical.

Oh. So, electrical engineering and mechanical right nobody from computer science wow all right. So, and rest of you are from mechanical engineering.

Student: Yes.

All right

Student: Aerospace aerospace.

Aerospace and others any anybody else from any other department no aerospace electrical engineering and mechanical engineering can I conclude with these 3 or anything else all right.

Now, So, I am a still waiting for your response or you were just how do you get into this kind of class do you choose or you have been sent.

Student: Chosen (Refer Time: 09:00)

You have chosen this class oh then it is more relevant a question. So, when you had an option to choose for this class, I am not asking you why you chose this class that is not import that is not very important. After you chose this class what do you what did you think you will be learning in this class and please do not tell me the things that you have seen in the slides, just tell me what you thought.

It cannot happen you know why I am asking you this question, it cannot happen that you did not think this is not a this is not a class on advanced applied mechanics or some obscure topic of an of either electrical engineering or mechanical engineering, this is something different from what you do in general what you do or what you have been doing regularly right. I am only trying to trying to repeat my questions again and again please tell me no you did are you saying that you did not think about anything you thought about the

Student: Tokenization and the stemming of words (Refer Time: 10:16)

Tokenization and a stemming of words that is how words are built

Student: (Refer Time: 10:24) severity and something related to computer science (Refer Time: 10:27)

All right

Student: Processing natural language

Processing natural language all right someone else

Student: More about natural language (Refer Time: 10:39)

That is how we learn.

Student: Language

Language anybody anybody else

Student: How languages are evolved over a time how a natural language (Refer Time: 10:55)

How natural language comes to the more no

Student: I find English pronunciation difficult to navigate through. So, I think I can understand nuances of pronunciation (Refer Time: 11:14)

All right more no I get an idea how; however, and before I begin saying something I must tell you, will be you will need to speak despite of cameras around I will make sure that you speak. It does not happen that you do not speak and I continue giving you a monologue from here; like I said this is this is going to be something new for you, something that you that you do not do on you on your regular schedule.

So, it is important for me to make sure that you understand what I am saying, only then we move together we move further together there is no point me going one going from one topic to the other without taking you together. That is one of the things which is going to be important for me and I will try to make sure I will need your help the reason why I am talking I am saying this is I need your help for that. So, please talk and let me know that you understand not only on quiz one quiz 2 and final exams on a on a regular basis. So, that we move together.

I will the things that you mentioned we will be talking about all of all of them for sure and I am positive even though we are not going to be talking about directly talking about how to improve your vocabulary or a pronunciation directly, it is going to going it if you pay close attention to some of the things that that is going to help you for sure. And the also it is required for me to tell you most of the things that we are going to be discussing here are going to be helpful in understanding how natural languages are processed through machines, but how we cut words in a smaller pieces we will we will be talking about that from the perspective of natural language, but not from the perspective of processing in a machine.

So, that will be left to you to use how what you learn here and how you use them for processing them in machine. I and let me say sentence or 2 about that I have been interacting with many people not a lot of them who are working on this campus on natural language processing, but in other places and to tell you the truth honestly I have not worked on natural language processing myself; however, I know about the field and I am familiar with the discussions in that field.

We this deal only we deal with natural language and when it comes to the use of understanding how language works, I am using a broad term how language works and application of all that to make an intelligent machine right you I think you understand what we mean by intelligent machine and as you know in the last not even 20 years 15 years or so or even 10 years. If you look at machines 10 years ago and you look at machines now we definitely find much more intelligent machines beginning from a mobile phone to camera or computers.

In all these things the contributions of computer scientists people working on natural language processing and to be modestly acknowledging people working with natural language as well they have a huge contribution in that; however, when it comes to the interaction between language and machine as you know languages work with artifice sorry machines work with artificial languages.

One of the goals of scientists and particularly computer scientists and people with working with language whether we whether they are working on natural language processing or natural language itself or machines in general computer scientists. One of the goals in the modern time it has been a goals since last 50 years and it is going to be it is going to continue for another 50 years or I hope until people have achieved that.

To design a machine which works the way humans do particularly a machine that works the way human mind does, we will be taking up a couple of topics to see how human mind works and as a as a matter of acknowledgment we do not have machines that work like human minds, we do have machines that work to a great extent, we can we can we can press one on phone or say one on phone and the machines are capable of transmitting that work verbal signals into electrical work electrical ones and transmit it to another machine and get you some more information more relevant information, you we have

seen this thing in a variety of ways in our lives, nowadays this had changed many industries.

However, we need people need to work on that a lot all right and probably I will talk about a couple of topics of that too, but mostly we will be will be moving around natural language and how that works how we learn and how what it is anyway.

So, let us say let us start with couple of fundamental questions and these are whether we are talking about principles and parameters of natural language or any course related to language these are some of the elementary questions we need to understand and answers have you heard this word linguistics what does it mean?

Student: Study of language

Study of languages

Student: (Refer Time: 17:58)

Right now we will we will refine that in a moment, but you are right you are right anybody else, I think that that is about it that is in short it means it is a discipline which studies language. We will talk about language in a moment, if I ask you a question what is the difference between language and languages besides being besides the distinction between singular and plural, what difference what does it mean to you language and languages; like we understand the distinction between artificial language and natural language I at least in the on the first day of this class I want you to understand the difference between language and languages and then it will make more sense when we discuss things further any idea no.

If I ask you how many languages do you speak what is going to be the answer how many languages do you speak.

Student: 3.

What is your name?

Student: Manoj.

Manoj three.

Student: We speak 3 languages.

So, such a such as.

Student: Tamil, English and Hindi.

Tamil, English, Hindi you.

Student: 2.

And your name

Student: Ali

Ali and they are.

Student: English and Hindi

Student: 4

4 and your name is.

Student: Prashanth

Prashanth the and the languages are

Student: Hindi, Tamil, Telugu

Hindi, Tamil that is only three.

Student: English, Hindi, Tamil, Telugu

English, Hindi, Tamil, Telugu great is there anyone here who speaks just one language should I take it as no right.

Do you know anybody these are very general and broad questions that I am asking you and I ask you just not just like that I do want you to think about these things as well.

Do you know anyone who speaks just one language yes.

Student: (Refer Time: 20:24)

Sure who do you know who do you think speaks just one language somebody said yes this side.

Student: My grandmother speaks only one language.

Your grandmother speaks just one language which is

Student: Telugu.

Telugu you.

Student: I speak English Hindi and Telugu.

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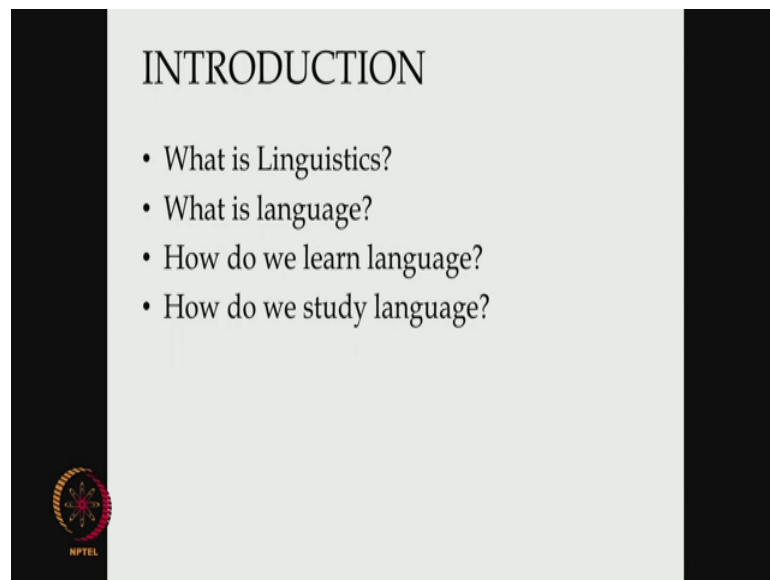
English Hindi and 3 right anyone else who knows someone who speaks just one language.

Student: Animal's animals

Animals is that is that what you say and your name sir

Pavan

Pavan, which languages which animal do you know which speaks just one language tell me the name of animal.

Student: (Refer Time: 20:58)

Oh you can you can just say anything every lang every animal

Student: Deer

Deer fine I mean you have talked to them. So, which language do they speak I am not I am not please do not get me know, I am not trying to make fun of you just generally asking which language do they speak.

Student: I do not know.

You do not know right, but you are sure if you do not know then how are you sure that they speak just one language.

Student: Sounds same everywhere.

Sounds same all right it is interesting do you understand; understand this thing which simply means we need to understand at 1 point the difference between how humans talk or communicate or maybe how animals communicate. Are there similarities between 2 types of communication system are they totally different, at this time it will be safe to assume that they are different because we do not understand, do we do you understand what they say a sound all the deer that you find on this campus or anywhere else probably they sound same, but do they sound like us.

So, there is definitely a difference between us and them. So, that that will be one of the things at one point I had that topic listed the difference between human and non human communications, but I deleted; however, I will talk about that at one point in time. So, yeah what?

Student: It may contain the body language like (Refer Time: 22:40)

The human language is too right

Student: Huh

Sure definitely. So, we can restrict that further by verbal language or when we say natural language that they are the verbal part of it is embedded in that sign language or

body language or of course, we have ruled out artificial language or my point is other types of communications are out of it.

Now, body language, sign language, all of them are all of them are also part of language that we speak right, it is not that if we speak a natural language we do not use body language or we do not use symbols or signs there they are all together combined; however, a we will be talking about only natural language part of that and b there is no denying of the role of sign language or body language in our communication system they play a huge role huge; huge role in that.

In fact, I have studied something which is not very authentic scientific research it says when we talk to one another; more than 50 percent of communication comes from nonverbal means of more than 50 percent of what you understand out of that communication comes out of nonverbal part of it. And I am I am being modest in saying 50 percent they go all the way of saying 80, it is that is difficult for me to understand a little bit and then there is another professional ethical problem, that if only 20 percent comes from natural language, then are we spending that much time on just 20 percent of it is it is that is an sound right, but nonetheless that is that is very interesting conclusion.

So, as you see here coming back we speak several languages right and if I take a summary of that let us say Hindi, English, English is definitely part of everybody's answer Hindi may be part of lot of peoples answer Tamil, Telegu right and maybe few more languages either as a replacement of these 2 or in addition to these 2 am I right.

Now, So when we say let us say 4 5 of these languages I will I will come back to more questions more related to that later, are there similarities between these languages now we are talking about Hindi, English, Tamil, Telugu, Malayalam, Hindi, English, Tamil, Telugu, Malayalam any other language represented here.

Student: Kannada

Kannada, Hindi, Eng, Tamil, Telugu, Malayalam, Kannada, Hindi, English anything else

Student: Marathi

Marathi very nice any anyone else speak fast, anything else just I am that is not important for the for me to figure it out at this time just generally curious in the name in names Punjabi anybody, Rajasthan, Marwadi, no all right.

So, any do you find anything similar in these languages you do not we do not have time for answer for that question, we will we will answer this question slowly later are these languages different from one another.

Student: Yes.

Yes.

Student: Yes.

Very different right. So, much so that a Telugu speaker may have difficulty understanding Malayalam right or Hindi speaker definitely has difficulty understanding Tamil right at the same time Tamil speakers understanding either Kannada, Malayalam or Telugu or any other language my point is there exist differences among languages right at the same time there are similarities among these languages right, when you hear someone speak Hindi or Tamil right and you are not the speakers of these languages do you will definitely find something familiar even though you do not understand much is this point clear to you right.

Now, I will stop by making 2 points and then we will continue with the rest of the things later the 2 points that I am trying to make is which are related to the other 2 other part of the title of the course, languages that we speak or for that matter that anyone speaks in the world, we are not only talking about 5 6 languages, we are talking about all the languages of the world that people speak. There are similarities among all of them all of them at one level or at many levels are similar to each other, the way they are similar to each other or the reason why they are similar to one another is because they follow certain principles.

So, that is the principle part of language and the differences that you find among languages they are located around parameters because lot of there are lot of parameters parametric differences between one another therefore, they are different from one an one another.

So, the principles and parameters part means principle and parameter part means the following languages are similar to one another following certain fundamental principles; following certain universal principles at the same time along the lines of certain universal parameters languages are different from one another right.

Its a natural question comes to mind when we talk about language is if languages if the purpose of language is to talk is to communicate would not it be easier and nicer if all of us spoke just one language. Then for a it the problems that a Hindi speaker may be may be interacting with while talking to Tamil speakers or vice versa would not exist right, we do not have to learn English, we do not have to worry about pronunciations, we do not have to worry about many things. Even though that will be easier we do not have that then the naturally the question comes which you are asking about evolution of language why do we speak so many languages.

If that is if that creates some or many kinds of difficulties or I do not want to say confusions, but difficulties then why do we speak? So, many languages get this question. So, I just want to give you these questions to think about them and we will answer some of lot some of them lot of them over a period of time, this is the other part of that yeah one more in the next one minute I will wind it up.

The there is a difference between the 2 words that I told you language and languages, lang when we say language we are talking about common things among all the languages, we are talking about fundamental principles of language, we are talking about underlying system of languages right.

For example, lot of you are mechanical engineers are from applied mechanics if we say car what is the fundamental principles driving all the cars, beginning from Tata Nano to rolls Royce or Mercedes or any other cars that you know what is the fundamental thing fundamental thing that is common among all of them.

Student: (Refer Time: 32:05) combustion.

Combustion right I expected that answer from you besides steerings and other things that is not an answer we expect from engineers. So, auto combustion engine is the fundamental thing rights without that principle know we do not have a car we do not have a machine that drives a vehicle.

So, like you find something common among all the cars when we say cars we when we say car we do not mean Mercedes or Tata Nano right and I am not I am giving you these 2 names only for 2 extremes I am not talking about the value of value of cars.

In short similarly when we say languages, we mean all these names that you have mentioned or many others that we have not or that we do not even know the names of; however, when we say language we mean fundamental underlying principles all the languages of the world, I have already drawn your attention to that such things are called principles underlying language we will be discussing with that. So, if this making sense that is difference between language and languages right difference between artificial language and natural language and to some extent things that we are going to be doing and ah. So, we stop here.