

Indian Institute of Technology Madras
Presents
NPTEL
NATIONAL PROGRAMME ON TECHNOLOGY ENHANCED LEARNING
Introduction to Modern Linguistics
Lecture-17
What is Phonology

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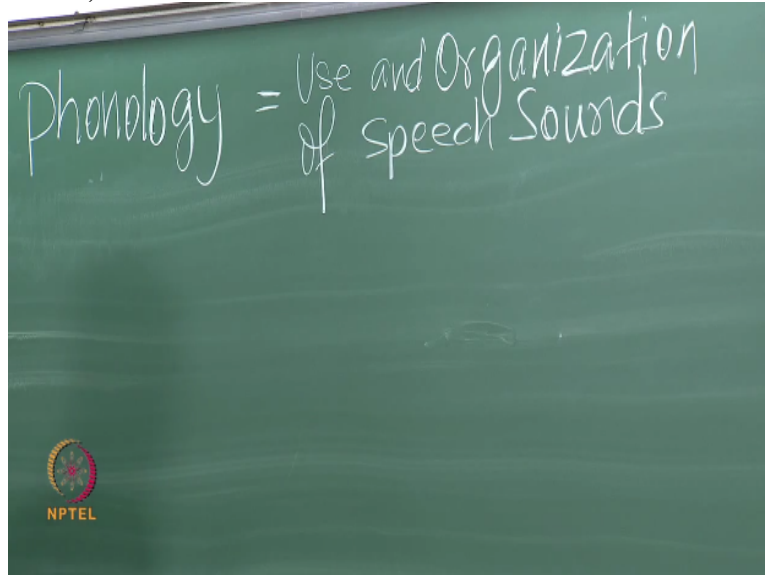
Good morning sir lovely okay I want you to be both physically and mentally present in the class you know you cannot participate in any exercise unless you do it wholeheartedly okay we have been talking about production of speech sounds we have done two modules now we began with talking about what makes language a unique system of communication you know design features of language and then all of last few weeks how do we produce different kinds of speech sounds.

How many different kinds of speech sounds there are how do we describe one sound differently from the other the terms the terminology the phonetic transcription and all that sort of thing I know it is a lot of new terms for you but with a little effort you can remember them and you can use them at the quiz I am going to ask you also about the definitions of these terms later this month okay plus transcription plus fill in the blanks etc a lot of objective information please bear with me .

Beginning today we will take up the third module of the course that is phonology now what is phonology what is the difference between phonetics and phonology very crudely very briefly in phonetics we have been talking about individual sounds one sound at a time how is it produced what are the characteristics of this sound whether it is palatal or bilabial whether it is voiced or voiceless whether it is back or front whether it is a vowel or consonant a diphthong or monophthong .

We have been talking about its characteristics but beginning today we will talk about the groups of these sounds a sound in a speech sounded context phonology is the study of speech sound in use please write.

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How do you pronounce this word phonology what was the earlier subject called phonetics not phonetics that was phonetics this is phonology what does it do it studies the use and organization of speech sounds or sounds of natural languages now when you say use it automatically means organization when you say organization it means use its redundant to have both the words what I am trying to tell you is that none of us none of us ordinarily speaking there may be one or two sounds occasionally .

When we say a mango but even a mango comes before mango we do not speak single sounds in isolation nobody goes and says pah and keeps quiet and nobody goes in say and ha keep quiet you know human situations are very dynamic you can say uh when somebody is tired fatigued irritated bored or had a quarrel with his wife or his boss then he says hah these are exceptional situations you know natural situations human situations are very dynamic .

That is why you know we cannot statistically always predict human behavior that is why you know human behavior remains beyond formal like descriptions but by enlarge let us say 80 % 85 % of the times you know we speak speech we use speech sounds in a context we never say just how do we do that does anyone do that so whatever I have told you during the last few weeks is nothing but fiction is idealization it is trying to understand if very complex thing in an extremely simple manner oversimplified manner.

It does not happen that way in real life sounds are distorted sounds are glorified sounds are exaggerated sounds are whispered so all these description of saying this is voice this is voiceless this is bilabial this is X this is Y is nothing but fiction you do not have test it in real life in you know those of us who are from computer science and you know it if you tomorrow do some project in speech processing you will find that this entire lot is only an idealized description in real life.

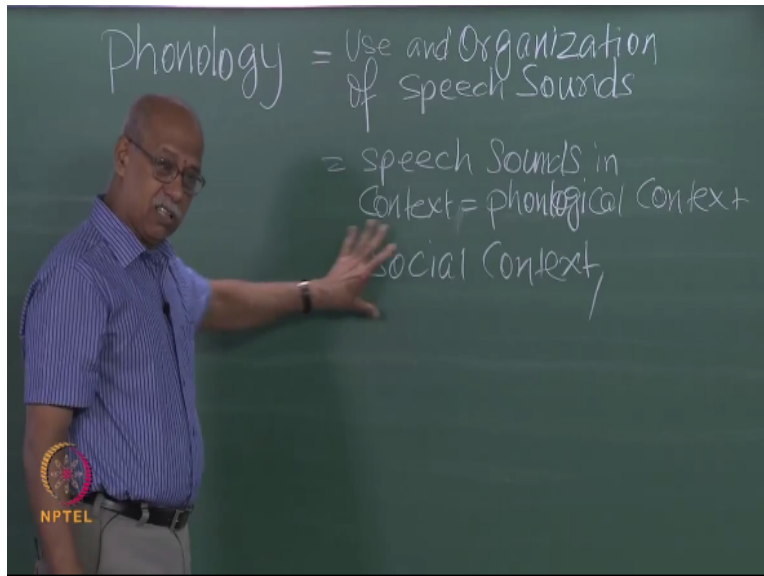
If you look at human language if you watch yourself speaking you will find that sounds merge into one another they get distorted they get exaggerated they become longer than long they become shorter than short you know when you are angry etc the whole lot of things happen and yet that is where you know the beauty of mind comes and yet we understand one another we expect to be understood by one another we speak without worrying whether I am producing voice or I am not .

It is not like motorcar where you have to worry whether your car is in first gear or in the third okay whether you are going at the right speed or greater or lower lots of Indians who speak lots of Chinese speak at very huff at very rapid tempo and yet they are understood lots of others they speak at a very slow tempo and yet they are understood human language in use has much greater variation than the idealized description we saw last week do you agree yes or no please yes it is so it is idealized.

What is phonology you know phonetics is study of sounds in isolation but phonology is the study of sounds in context one next to the other you might say just this is voiceless well nobody speaks like that you said house so voicing spreads to say house him it vibrates so ha not voiceless it is voiced okay because it is in context but even voiced sound can become voiceless if it comes in a context of I am not saying will become voiceless I am saying can become voiceless if it comes in the context of voiceless sounds .

You know just as there is social context there can be please write phonological context

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Phonology studies speech sounds in context okay and it is called phonological context right and is not just phonological context when you use language then there is more than phonological context there can also be social context say for example this is phonological context but there can be social context who are you talking to are you talking to your mother or to your father do you do you think people use different languages when they talk to mother and to their father yes or no .

Do you use the same kind of Telugu with your mother and your father do you or do not you please speak up and I am going to cry if you do not speak do you speak the same kind of Telugu with your mother with your father what is the difference plus minus you know are respectful word I will say there is respect also for mother but with mother you might not say miru you might say knee you might not say asp Pithaji up but right okay .

We have we can have different kinds of words different kinds of pronunciation social context also influences language are you angry are you happy are you irritated are you bored you know.

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What is Phonology

- **Phonetics** = Study of Sounds in Isolation
- **Phonology** = Study of Sounds in Context
- **Social Context** : Speaker (Mood..., Memory)
Community (Dialect, Slang...) Setting
(Domain, Topic, People...)
- **Phonological Context** : Before/After Another
Sound,
- **Change in Features** : Elision, Insertion,
Lengthening, Reduction

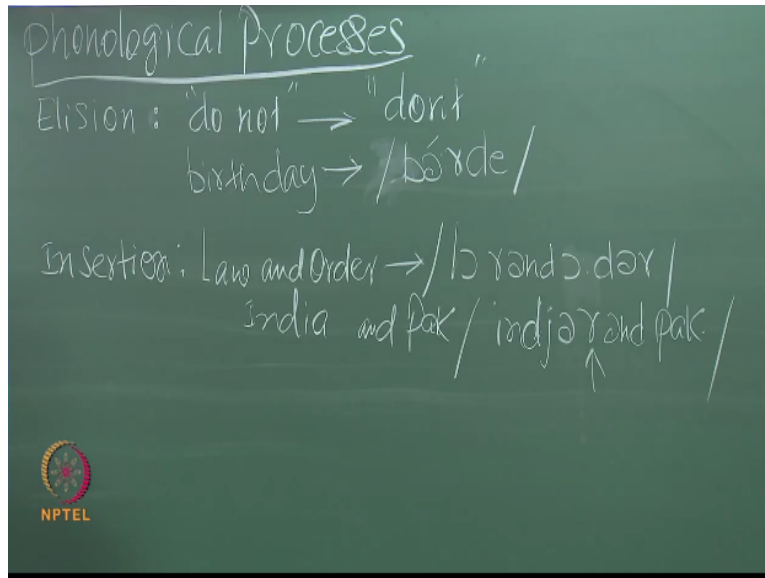


What kind of good are you speaking a standard language are you speaking slang are you speaking to a friend are you speaking to an enemy are you speaking to someone you are very close to are you speaking to someone you hardly know are you speaking when running for the railway train okay the variety of social situations change language change your pronunciation change your use of a speech sound similarly a variety of phonological contexts change your speech sounds.

What kind of words what kind of situation you know is it next to a voice sound it is after the voiceless sound does it come before lot of consonants does it come after lot of vowels does it come at the end of the word does it come at the beginning of the word you know there is difference between at the beginning of the word and at the end of the word okay there is difference between pot and top say pot and top when you say pot both your lips part but when you say top both your lips shut tight say it .

You do not say top do you see that we do not okay so all this fiction that is bilabial voiceless explosives is fiction it does not happen that way in real life you know so there is phonological context okay all speech sounds can in context undergo these processes please note a lesion they can be deleted you know deleted how often we say do not I do not want it we sometimes I don't want it what happens they all .

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You know phonological processes they are very elision do not may become do not what happens what happened okay about may become bout okay but they saw me we deleted it maybe just they come for my birthday you know look at this song I will use phonetic transcription birthday may become birday how often do we say can you please come for my birthday party we say can you join me for birthday party and yet we understand one another because the context provides that context called or there may be insertion and extra sound may come in such an extra sound my get in you know where you go to England and you hear a lot of English people .

You don't have to go to England you can hear them on YouTube you know many of them pronounce this word as how do they pronounce it Lauren order okay this re comes in when they have to say India and Pakistan they quite often end up saying India and Pakistan India and Pakistan okay and extra re gets in becomes this gets in extra or you know in the pronunciation of many of us film becomes filling right have you heard that.

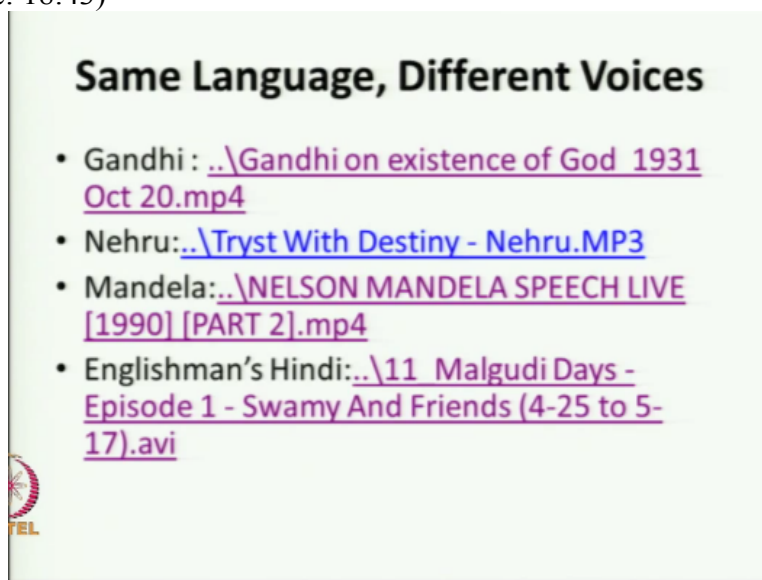
Yes or no right in the pronunciation of many of us in Bihar Bengal we don't say station we say a station we don't say speech we say a speech or in Punjab you know they gives a peach they go to sedation they place supports okay it happens you know an extra sound will come in and it a sound may be lost okay our sound may become longer next to someone in Sanskrit you know we have the phenomenon of Sandi in Telugu we have the phenomenon of Sandi am I right .

Okay when you say Maha and akash it becomes mahakash okay it becomes so much longer or it may become shorter when it comes to a very long sound you know otherwise ordinarily

speaking it is dine but it becomes dinner I becomes it in English dine dinner reside residence I becomes eel lots of you know these processes happen in other words in context features change it is no longer the same thing as it is in isolation because you don't speak in isolation the context the contextual influence is very important.


The point here is the question here is can we write a grammar of these things can we see only X will come before Y only Y comes next to X that is the entire goal of phonology and if you can do that then you can create machines which can speak like human beings which can understand human beings okay .

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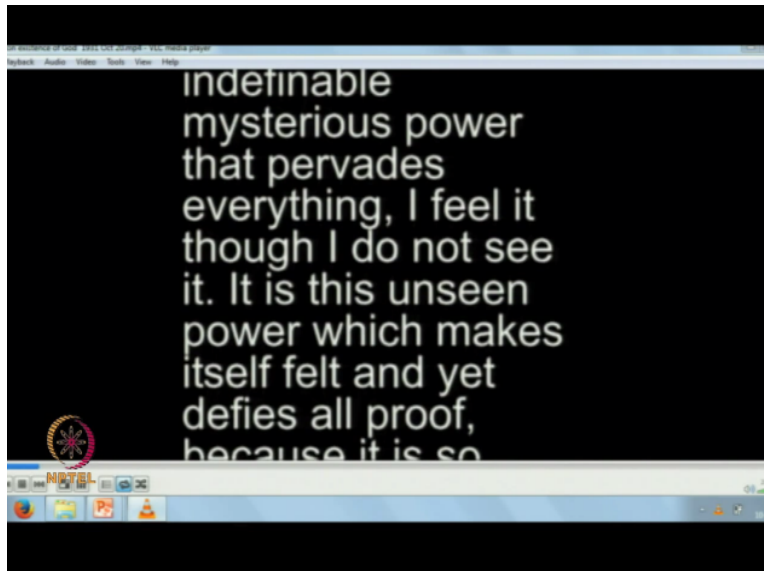
Same Language, Different Voices

- Gandhi : ..\Gandhi on existence of God 1931 Oct 20.mp4
- Nehru:..\Tryst With Destiny - Nehru.MP3
- Mandela:..\NELSON MANDELA SPEECH LIVE [1990] [PART 2].mp4
- Englishman's Hindi:..\11 Malgudi Days - Episode 1 - Swamy And Friends (4-25 to 5-17).avi



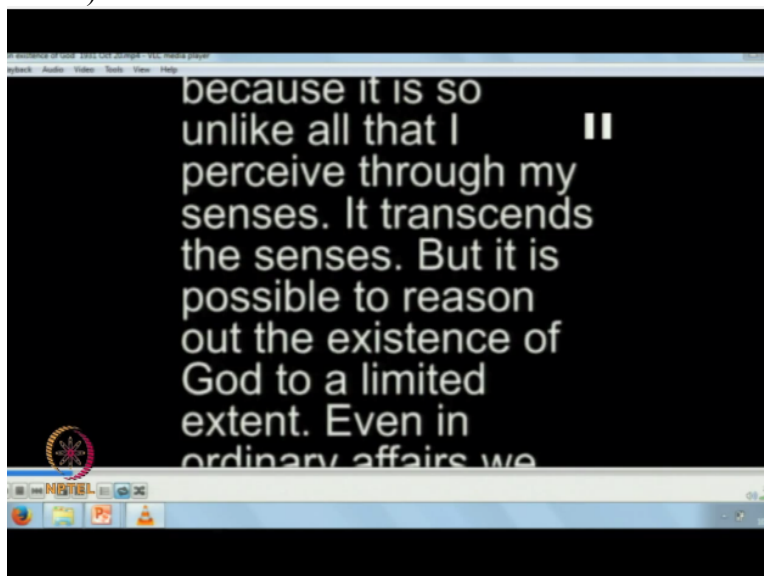
Let us look at some variations the same language but look at you know you can close your eyes and you can say they are not the same people would you mind closing your eyes don't look at them just listen and see if it is the same person speaking.

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Don't look at that person please just keep your eyes closed and I am going to ask you some questions open your eyes who is speaking a man or a woman and a young man or an old man how do you know because you know the voice okay Indian or non Indian an Indian okay can you listen again and pay attention to some peculiarity which you may not find in somebody else voice .

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Does Gandhi says senses what does he say come on make a guess Gandhi won't get angry with you right you know we have these individual little variation that is why even on phone when your speakers are not before you can immediately recognize whether it is your friend or your worst enemy speaking okay how do we know that because our mind is tuned to recognizing

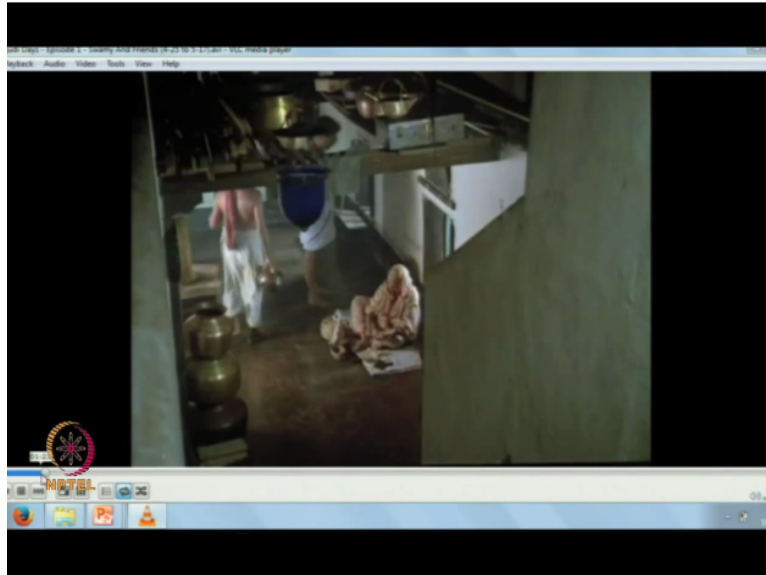
tiny variation of language okay now you know absolutely little small variations of language I am going to play something else okay .

Close your eyes do not look at the audio video and just listen tell me who is speaking don't look at the audio don't look at the video please I am going to ask you again the same questions close keep your eyes closed who is speaking a man or a woman young or old ,old Indian or any other country Indian or any other national African but you saw the video please you have you I gave the game away but please open your eyes okay do you think he sounds different from Gandhi Nelson Mandela says Gandhi influenced him much more than anyone else okay did you think Gandhi also influenced him in his English.

He has his own voice very characteristic can you recognize anything typically African in his voice .

Does he say ugly or ugly okay please listen try and see if he sounds any different what gives you the impression that he is an African if you did not look at him there are you know I have not trained you we will look at these features we will look at these individual features okay lets listen to something else okay and learn to identify variations close your eyes once again please close your eyes.

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I am sorry it is in Hindi how many of you know Hindi okay not fair test anyway but let me see who is shouting a man or a woman how old okay listen again who is this speaking a man or a woman a woman old or young very old or old okay an old lady how do you know the quiver in their voice yes vocal cords do not remain as flexible as they are in your case you know old people's vocal cords do not vibrate as rapidly as they vibrate in your case you know that is how we recognize okay here is an old man and all of us can mimic .

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Close your eyes once again who is this a man or a woman young or old Indian or European listen again did you see it or do you know from the voice each of us brings some peculiarity our own I can give you lots of examples you can talk the same song the same speech two people produce it in two entirely different ways okay to produce it in two people produce them in two different ways and phonology is the study of these differences and yet this is important and yet these similarities okay yet.

We understand in spite of these distortions in spite of the quivering of the old speaker in spite of the voice of the very young in spite of being in a rage or giving a lecture happily we understand one another and phonology is a study of these processes okay I you know you there is no point giving you many more examples I am sure you agree that variations come in natural languages because of variation in contexts there is phonological context there is social context there are other kinds of emotional linguistic and paralinguistic or you know extra linguistic factors that influence your speech .

Sometimes you deliberately do this sometimes you do it involuntarily without realizing that you are speaking rapidly without speak realizing you are speaking loud or that you know in all kinds of other features in other words come back to generalizations
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What is Phonology

- All can produce all (kinds of) sounds.
- Languages have limited no. & kind of sounds.
- They differ in no. & kinds of sounds.
- No sound is uttered alike in different contexts.
- /p/ in "pit", /p/ in "put" are different
- /i/ in "pit", /i/ in "give" are different.
- People speak differently on different occasions.
- Yet listeners recognize the words. How?



Theoretically are we together are so far all I have tried to tell you is that phonetics talks about individual speech sounds but individual speech sounds do not happen in natural languages correct number two languages speech sounds occur in contexts there can be at least two

different kinds of contexts close your eyes and tell me what kinds of contexts there can be there can be phonological context sounds coming next to other sounds, sounds coming between other sounds, sounds coming at the end of other sounds there can be phonological context there can be social context .

You are speaking to someone who is very close to you intimate someone who is a stranger someone with whom you are not on good terms someone much older than you someone much younger than you all of us speak to young people you know are very young children in a very different way can anybody give me an example of how you speak in Telugu to a child who is about one or about two year old invite the child to your home or just ask the child what is his name okay.

Can you do it and can you give me an example let Telugu come in the do you say me parently do you say that okay what do you say oh simply Piron parapa don't we do that do it go do you go to a young child and say can I have your full name please do you do that what do we ask name okay here okay give me some example in Tamil or Telugu speak up please so that the camera catches you speak to the camera please how would you say that in Telugu okay any of it is a girl child for that more polite more polite you know they are actually an experiment .

Some Western researchers some American researcher one day at a birthday party dressed a child a girl child in boys dress and lots of guests came and said hi lion hi tiger hi king how are you okay and then the same child at another party who was dressed as a girl and everyone said hi sweetie hi honey okay you know the social factor is not that one is being good or bad it is not that one is being respectful or disrespectful language is a part of culture and there are culture related variations just as there are linguistic variations.

Now culture related variations are not so easily predictable we cannot say in this party how many guests will tell this girl hi honey hi sweetie or hi ugly little thing get away okay we don't know you know people might we have not reached those levels of knowledge where we can confidently predict human behavior but linguistic variations can be predicted you know these are the two things I have tried to tell you so far .

That none of us speaks or produces a speech sound in isolation they come in a context okay and there are at least two contexts what are those close your eyes and tell me for the logical context and social context ,social context is not so easily predictable not yet we do not know enough but phonological context is predictable we can say whether the sound coming here is likely to be voiced or voiceless front or back this or that X or Y okay why does that happen let us move further are we together.

Do you understand theoretically all of us can produce all kinds of sounds but we do not there are some sounds with a peculiar to Telugu peculiar to Tamil is not Tamil what is it you know you have to roll your tongue okay Tamil okay how many non Tamil speakers can you speak that way please can you okay are there similar sounds in Telugu, Malayalam has it's not Malayalam okay any Malayalam speaker here okay right how do you pronounce the name of your language right okay .

Similarly there are sounds in English when you say vision okay it is peculiar actually it comes from French is not even English okay only Frenchmen and some Englishmen can do it in Indian language only Urdu has this okay so even when theoretically all of us human beings can produce any sound we don't through influence of culture through the fact that we are born in a particular community in a particular family our language excludes some sounds includes some others okay.

That is why all languages have only limited number of sounds no language have 200 different kinds of sounds do they how many sounds are there in Telugu make a guess there is no punishment for going wrong as I said English has 44 okay how many that is the letters okay not speech sounds when you can go back you can count okay please you know we are learning in Hindi there are 39 okay in my mother tongue maybe there are 36 or 37 okay .

You know even when theoretically it is possible for any language to have any number of speech sounds languages have relatively few sounds. We are yet to come across language which has 63 discrete sounds mostly they are between 35 and 50 okay making use of mostly there may be if there is an exception I don't know so these sounds differ in number and different kinds there are many languages which don't have as English.

As which don't have as many consonants as Sanskrit has or as Malayalam has okay there are differences moreover you know not only that there are restrictions that are fewer speech situation and this is a baffling problem this is the baffling challenge for engineers who want to do engineering in natural language processes in NLP in speech processes .

No person speaks on two occasions exactly alike not even the best of singers some variation a nanosecond longer vibration of vocal chords or in nanosecond you know or a nano centimeter more or less opening of jaws or pressure on a different part of tongue all of these things together change the sound is never exactly again sorry it is never exactly the same variations do come in actually there has been a philosopher a Greek philosopher and we have similar opinions in Indian philosophy as well .

Which says that we do not swim in the same river twice okay by the time you have gone to the river the river has flown okay it is another set of water another drop of water and at the mass of water similarly you know no matter how hard you try it is almost unlikely that you can produce all these speech sounds the same way as you did about a minute ago or about a second ago we don't speak alike on all occasions and yet we recognize the speech sounds.

We understand we use them we feel happy and unhappy because of those sounds in the party a lot of people are speaking there is noise and yet two people can talk understand one another computer cannot there have been attempts computer recording it is called cocktail effect okay lots of people speaking a computer cannot recognized for computer .

That is a noise whereas human beings can cut all the other sounds and if you want to talk only to a mother or to wife or husband or brother or father you just listen to them even in a crowded railway station in a crowded Airport in a train and a party anywhere okay this is the capacity of human mind but the point is how does this capacity work this capacity works because your mind remembers recognizes and uses recognizes remembers and uses rules concerning variations of speech sounds.

What kind of shape is it likely to take in this situation compared with another situation do you understand are you with me two people are with me are you with me yeah right please keep saying that otherwise I feel very nervous okay so and no sound is uttered alike in two

different contexts look at the example I have on this screen we call it bilabial okay but look at pop in as I give you the example earlier pot and top when you say pot lips part .

When you say top lips do not part they just stay put look at poor in pit and input when you say pit your lips are spread also for path but when you say put your lips are rounded also for pe why is it rounded can you give me an answer because of you because of ooh the following sound is ooh why does it is spread because the following sound is e with flat lips so you know to say that this is bilabial this is labial etc is nothing but idealized representation of speech or look at E itself you know look at the next sound e he is not the same again.

I told you can you give me three term level for e it is it voiced or voiceless it is a vowel therefore it is voiced what are the three term levels is it front or back ii as in leave as in grief is it front he is front closed or open closed rounded or unrounded unrounded I said ee is front closed unrounded now look at E in both in pit and in give just say pit and say give where does he come from does it come in the front of the term and please say again and give it give do you think II in both the instances is produced from the same point where does it come in the first front where does it come in the next back .

You so these things are extremely dynamic and yet even though this is the beauty of the mind this is the power of mind even when it has shifted from front to back we recognize this is it partly we recognize because you know the word and we think it is this way but who has sat down and told a child he is not the same thing in give as it is in pit does anyone do that do phoneticians do that to their children .

Nobody does that is the power of the mind you know what is that power what is that algorithm you know that is what we have to capture people speak differently on different occasions yet listeners recognize the words how do they what kinds of factors are there in play.

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Change in Features

- cat+s = /kæts/
- dog+s = /dogz/
- horse+s = /horsɪz/
- ask+ed = /askt/
- move+ed /mu:vd/
- want+ed = /wɔ:ntɪd/



Look at some more examples you know in English we say plural marker is but it is not this in every everywhere you know after cat it is pronounced as so that it is cats but after dog it is this is how is it pronounced dogs what does it happen can you can you make a guess why it happens why cats but not dogs or why dogs but not cats the effect of the context immediately preceding sound is voiced or voiceless and speech being dynamic does not get enough time to exist but it may if they speaker so likes okay.

Many of us in India we say dogs okay we can but ordinarily speaking in standard English this is what happens the question is why so once we look at this kind of data we can say look look in English we can predict we can tell our computer computer when you see s coming after voiced sound then produce it as elsewhere produce it as we can we can make these rules okay similarly look at another example past tense in English written with Edie but produced differently after asked it is voiceless it is asked okay.

But after voiced sound it is voiced it is not moved it is voiced okay context phonological context can be predicted to a great extent .

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What is Phonology?

- Speech variants : [əŋ] before vowel, [ə] elsewhere
- Speech variants : [ŋ] before [k], [n] elsewhere
- Allophones, Phonemes & Diphones
- /p/ in [ˈpi:k], [kept] and [ki:p] are different.
- /t/ in [tæks], [kæts] and [sæt] are different.
- /k/ in [kæp], [tæks] and [pæk] are different.
- One can replace another, but /k/ can not replace /t/ or /p/; meaning will change.



You know in ordinarily you see in every language you see in Telugu okay you have Chapa fish but when you add plural does it become chapa ullu you know all goes away it something else comes in harmony comes in you know speech and you can predict that chepa with lu will become not chapallu okay it will become triple ooh okay so similarly you know here we can we have the same article but before vowel it is an.

So you say an orange an egg an enemy but a friend a guava that is purely phonological context or the sound nasal sound before tea it is end you can say and but when the following is sa then you say thank sang rang and even in Indian languages you do not say Ganga you say Ganga do you say gonna do we say gonna go do we say Telan Ghana what do we say Telangana because the following sound which is the velar sound also influences the nation.

So there are you know in all languages of the world there are influences of context and you know you can you can find examples in any language you like but you know look at the three words their peak and kept and keep okay when you say peak lips a spread lips part but when you say kept okay lip has already tongue has already moved to the position of alveolar Ridge for toe and you say kept you know your lower lip slightly moves towards teeth and when you say keep lips don't part okay.

So with so it curve there are some variations which bring a change in meaning but there are some other variations which don't induce such.

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What is Phonology?

- Sound Variation

/pit/, /pin/, /pil/, /pik/, /pip/, /pit]/...
/pen/, /pein/, /pæn/, /pin/, /pɒn/
/pæn/, /bæn/, /kæn/, /mæn/, /tæn/, /ræn/
[p^heɪnt], [ə'p^hɔ:ɪnt], [ʌpər], [kæp]
[ə't^hend], [ə't^hæk], [ʌtər], [a:rt]
[ə'k^haunt], [ə'k^hjuz], [ʌkər], [pa:rk]



You know a changes look at variation in these word if you if you know you have pit or p et but if you change ta with no meaning changes okay there are all kinds of variations change na with la it becomes another word change le with ke it becomes another world but if you change it with spread lips or lips together the meaning doesn't change whether you call it top or top meaning doesn't change there are different kinds of variations in this module in phonology in the next few weeks we will study speech variations and how we can predict them thank you have a good day .

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