LING 450/550
19 Features

Exam Breakdown

Part 1 (29 questions, 37 pts)
- 4 anatomy/articulator terms
- 1 VOT
- 19 IPA symbols
- 1 phrase written in IPA, you write in the English
- 4 phonation questions

Part 2 (26 questions, 38 pts)
- 3 airstream mechanisms
- 11 acoustics concepts/terms
- 5 spectrogram reading
- 3 stress/tone/intonation
- 2 features
- 2 natural class

Questions for Final Review

Practice: Greenlandic Eskimo Vowels

Practice: Greenlandic Eskimo Vowels

[a], **[i] , [u].**

[i] , [u] become [e], [o] before uvulars and word finally.

Phonological Features

GROUPING PHONES

READ: HAYES 4

HW: NATURAL CLASSES

HW: PHONOLOGICAL FEATURES

What's Wrong with the IPA Features?

The feature set used by the IPA is designed to clearly and simply pick out each individual sound from all other sounds.

It also does a reasonable job of picking out basic *classes of sounds* like "fricatives" or "alveolar consonants," but there are some classes of sounds that are not easily described using IPA features.

◦ Example: the class of stops, affricates, and fricatives make up a natural class called *obstruents*. In many languages, all obstruents (and <u>only</u> obstruents) undergo similar phonological changes like *word-final devoicing* or *voicing assimilation to a following consonant in a cluster*.

Which Features to Choose?

In order to easily describe patterns of phonological rules that apply only to obstruents, we need some feature or set of features that uniquely describes *all obstruents and only obstruents*.

- The feature that does this is [sonorant]: all obstruents are [–sonorant]
- All *sonorants* (everything that isn't an obstruent) are [+sonorant]

How Many Features Do We Need?

If we restrict ourselves to binary features:

◦ In a universe with 2 kinds objects we need 1 feature to describe everything.

◦ In a universe with 3 kinds of objects, we need 2 features to describe everything.

◦ In a universe with 4 kinds of objects, 2 features will still be enough if we pick the features carefully (i.e., if we pick out more abstract features that several objects share). In reality, objects are rarely similar in ways that are most efficiently describable, so we often need more features than the minimum required mathematically.

− CIRCLE

+CIRCLE

−TRI
− CIRCLE

−TRI
+CIRCLE

+TRI
− CIRCLE

+SYM
− ROUND

+ SYM
+ROUND

− SYM
− ROUND
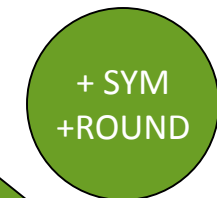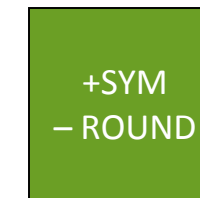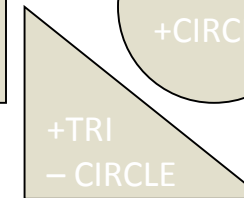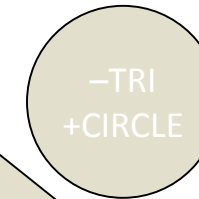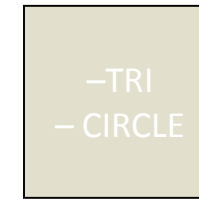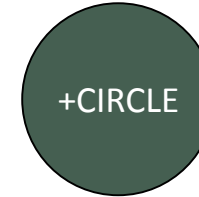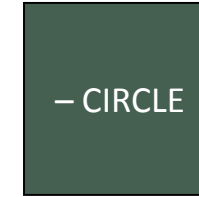
Consonant Manner Features

Vowels	Glides	Liquids	Nasals	Stops	Affricates	Fricatives
+syllabic	– syllabic					
– consonantal		+consonantal				
+approximant			– approximant			
+sonorant				– sonorant		
+continuant				– continuant		+cont.
0 delayed release				– d.r.	+delayed release	

Consonant Manner Features: Describing Natural Classes of Manner

Use the minimum number of features necessary to uniquely pick out the sounds you're interested in:

- Vowels: [+syllabic]
- Glides: [–syllabic][–consonantal]
- Liquids: [+consonantal][+approximant]
- Nasals: [+sonorant][–approximant]
- Fricatives: [–sonorant][+continuant]
- Affricates: [–continuant][+delayed release]
- Stops: [–delayed release]
- Stops & Affricates: [–sonorant] [–continuant]
- Liquids & Glides: [–syllabic][+approximant]
- Liquids, Glides, & Nasals: [–syllabic][+sonorant]

VOWELS	GLIDES	LIQUIDS	NASALS	STOPS	AFFRICATES	FRICATIVES
+SYLLABIC	– SYLLABIC					
– CONSONANTAL		+CONSONANTAL				
+APPROXIMANT			– APPROXIMANT			
+SONORANT				– SONORANT		
+CONTINUANT				– CONTINUANT		+CONT.
0 DELAYED RELEASE				– D.R.	+DELAYED RELEASE	

Consonant Place Features

Major place features:

◦ [labial]: active articulator is lower lip.
  ◦ [labiodental] passive articulator is the upper teeth.

◦ [coronal]: active articulator is tongue blade or tip.

  ◦ [distributed]: active articulator is tongue blade (vs. tongue tip): [+distributed] = *laminal* (blade), [-distributed] = *apical* (tip)

  ◦ [anterior]: passive articulator is alveolar ridge or teeth.

  ◦ [strident]: "the airstream is channeled through a groove in the tongue blade and blown at the teeth." [s z ɕ ʑ ʃ ʒ ʂ ʐ], a.k.a. *sibilants*

◦ [dorsal]: active articulator is tongue body.
  ◦ Subdivisions use the vowel features [high], [low], [front], [back].

Consonant Place Features (cont.)

Other place features:

◦ [lateral]: air flows around the side(s) of the tongue: [l ɬ ɮ ʟ [ʎ ɬ ʟ]. All other consonants are [– lateral] (a.k.a. *central*).

◦ [round]: includes lip rounding: [w ʍ ɥ] and anything with the [ʷ] diacritic. All other consonants are [– round].

◦ [tense]: applies to the semivowels [j ɥ w ʍ].
All other consonants are [0 tense].

Consonant Place Features

(Using fricatives as examples)

	bilabial		labio-dental		inter-dental		alveolar		alveolo-palatal		palato-alveolar		retroflex		palatal		velar		uvular		pharyn-geal		glottal	
	ɸ	β	f	v	θ	ð	s	z	ɕ	ʑ	ʃ	ʒ	ʂ	ʐ	ç	ʝ	x	ɣ	χ	ʁ	ħ	ʕ	h	ɦ
+labial					– labial																			
– labio-dental		+labio-dental		– labiodental																				
– coronal				+coronal										– coronal									
0 anterior				+anterior				– anterior						0 anterior									
0 strident				– strid.		+strident						– strid.		0 strident									
0 distributed				+dist.		– dist.		+dist.				– dist.	+dist.	0 distributed									
– dorsal														+dorsal								– dorsal	
0 high														+high		– high						0 high	
0 low														– low				+low				0 low	
0 front														+front		– front						0 front	
0 back														– back		+back						0 back	

Laryngeal Features

◦ [+voice] applies to voiced sounds.

◦ [+implosive] applies to implosive sounds.

◦ [+spread glottis] applies to:

- ◦ breathy-voiced sounds
- ◦ aspirated consonants
- ◦ [h]

◦ [+constricted glottis] applies to:

- ◦ creaky-voiced sounds
- ◦ ejectives
- ◦ fortis stops in Korean
- ◦ preglottalized consonants
- ◦ [ʔ]

Laryngeal Features

voiceless (except [ʔ h ʍ])	breathy	modal	creaky
– voice	+voice		
– spread glottis	+spread glottis	– spread glottis	
– constricted glottis	– constricted glottis		+constricted glottis

Vowel Features

	high front				high central		high back			mid front				mid central				mid back				low front		lo cen	low back	
Vowel	i	y	ɪ	ʏ	ɨ	ʉ	ɯ	u	ʊ	e	ø	ɛ	œ	ə	ɵ	ɝ/ɚ	ɞ	ɤ	o	ʌ	ɔ	æ	œ	a	ɑ	ɒ
high	+high									– high																
low	– low																					+low				
front	+front				– front					+front				– front								+front		– front		
back	– back						+back			– back								+back				– back			+back	
tense	+tense		– tense		+tense		+tense		– t	+tense		– tense		+tense		– tense		+tense		– tense		0 tense				
+/−	–	+	–	+	–	+	–	+	+	–	+	–	+	–	+	–	+	–	+	–	+	–	+	–	–	+

Other Vowel Features

[ATR]: used for languages that have a vowel contrast between *advanced tongue root* [+ATR] and *retracted tongue root* [-ATR] articulations.

[long]: used for languages with a vowel length contrast

[nasal]: used for nasal or nasalized vowels

Note that none of these distinctions need to be phonemic in order to use the feature. For example, English does not have any phonemically nasal vowels, but the feature [nasal] can be used to describe allophonic nasalization of English vowels:

[+syllabic] → [+nasal] / ＿＿＿ [+sonorant, – approximant]

vowels   *get nasalized*   *before*   *nasal consonants*

Sample Phonology Problem: Spanish

1. What are we interested in?   [d] vs [ð]

   Write out the environments in which the sounds occur.

Data

drama	"drama"
doloɾ	"pain"
dime	"tell me"
kaða	"each"
laðo	"side"
oðio	"hatred"
komiða	"food"
anda	"scram"
sweldo	"salary"
duraɾ	"to last"
toldo	"curtain"
falda	"skirt"

Environments

[d]	[ð]
#__ɾ	a__a
#__o	a__o
#__i	o__i
#__u	i__a
n__a	
l__o	
l__a	

2. Look at the environments. The sounds are in complementary

   [d] never occurs after a vowel
   [ð] always occurs after a vowel

   Note that although [ð] *always occurs between vowels in this data set, the following vowel is not conditioning the change, since* [d] *can be followed by vowels too (e.g.,* [anda]*).*

3. Since the sounds are in this distribution, they are likely:

   a) allophones of the same underlying phoneme, or

   b) two different phonemes.

4. Write the rule: /d/ → [ð] / V___

Sample Phonology Problem: Spanish

The rule stated with segments is: /d/ → [ð] / V____

From this problem we know Spanish has the consonants
[d k m n r f ð s l w] and the vowels [i e a u o].

◦ In reality there are many other sounds in Spanish (e.g., [β x r]), but these need not concern us here: *use what you are given in the problem.*

◦ [–sonorant, +voice] is sufficient to pick out just [d] and [ð] from our given set of sounds.

◦ [+continuant] is sufficient to distinguish them from each other; [+distributed] or [+delayed release] would also work.

◦ As far as our data goes there are no syllabic consonants, so [+syllabic] suffices to pick out all vowels.

The final rule, using features:

$$\begin{bmatrix} -\text{sonorant} \\ +\text{voice} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{continuant} \end{bmatrix} \ / \ \begin{bmatrix} +\text{syllabic} \end{bmatrix} \_\_\_$$

Sample Problem:
Chamorro Vowel Harmony

Chamorro Data

gumə	"house"	i gimə	"the house"
tomʊ	"knee"	i temʊ	"the knee"
lɑhɪ	"male"	i læhɪ	"the male"
gwihən	"fish"	i gwihən	"the fish"
pecʊ	"chest"	i pecʊ	"the chest"
tunuʔ	"to know"	en tinuʔ	"you know"
huluʔ	"up"	sæn hiluʔ	"upward"
otdut	"ant"	mi etdut	"lots of ants"
lɑgu	"north"	næn lægu	"toward north"

Chamorro Vowels

	front	back
high	i	u
mid	e	o
low	æ	ɑ

Identify the changes taking place:

Note what doesn't change:

Find the natural class:

Describe the change in words:

Write a rule with formal notation:

Sample Problem: Chamorro Vowel Harmony

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Chamorro Vowels

	front	back
high	i	u
mid	e	o
low	æ	ɑ

Identify the changes taking place:
u → i, o → e, ɑ → æ

e, i

Note what doesn't change:

Find the natural class:
[+syllabic, +back]
(i.e., back vowels)

Describe the change in words:
back vowels become front when preceded by a front vowel in the preceding word (possibly with intervening consonants).

Write a rule with formal notation:

$$\left[+\text{syllabic}\right] \rightarrow \left[-\text{back}\right] \ / \ \begin{bmatrix} +\text{syllabic} \\ -\text{back} \end{bmatrix} (C)\# (C) \ \underline{\quad}$$

focus set   structural change   conditioning environment

Practice: Features, Natural Classes

Japanese ("Altaic") ([ɸ] represents a voiceless bilabial fricative)

[ku̥sa] 'grass'

[kasu̥] 'scum'

[aku̥] 'evil'

[ku̥da] 'tube'

[su̥dare] 'bamboo blind'

[ɸu̥tari] 'two people'

[bɯŋka] 'culture'

[kagɯ] 'furniture'

[su̥ika] 'watermelon'

[ɯba] 'wet nurse'

[ɯsagi] 'rabbit'

[mɯda] 'uselessness'

[su̥su̥me] 'advice'

Are the vowels [ɯ] and [u̥] contrastive in Japanese or are they in complementary distribution? If the former, state the minimal pairs; if the latter write a rule expressing this distribution.

. Mandarin Chinese (Sino-Tibetan) (tones have been omitted). The character [ɤ] represents a mid-back unrounded vowel.

ɕiɛ 'to write'   xao 'good'   xei 'black'   ɕiao 'small'

ɕyn 'to smoke'   xou 'behind'   ɕyɛ 'snow'   ɕiŋ 'star'

xu 'lake'   xɤ 'drink'   ɕi 'west'   xua 'speech'

1. Based on the above data, are the sounds [i] and [y] separate phonemes of Mandarin or allophones of one phoneme? If separate phonemes, provide minimal pairs as evidence; if allophones of one phoneme, write a rule describing their distribution, stating the environment in terms of natural classes.

2. Are the sounds [x] and [ɕ] in contrastive distribution or complementary distribution? Proceed the same as in the above question.

Reminders

Wednesday: Review and Project

Evaluations Posted