Midterm exam

Stefan Keine
LING 20: Introduction to Linguistic Analysis
Due: 23:59, 1 November 2021

Instructions:
The exam consists of 10 parts and is worth 90 points. Your answers must be uploaded as a single PDF file to CCLE. Please double-check that you upload the entire exam to CCLE! Read the instructions carefully, and answer all questions legibly. At the end of the exam, you will find the IPA chart, the list of binary articulatory features, and the feature specifications for the sounds of Common American English. Whenever you are asked to use binary articulatory features, use the feature inventory on p. 15 of this exam.

Honor Code:
Please type your name below this sentence:

"I affirm that the work on this exam is entirely my own and that I have obtained no help from other people; nor have I helped another student."

type name here: [redacted]

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1 *5 points*

Each of the following pairs of sounds differ in exactly one articulatory feature. Please state this feature and indicate for each of the two sounds what value of the feature this sound has. For example, if the pair was [t] and [d], the answer would be that these two sounds differ in the feature [±voiced] and that [t] is [–voiced] and [d] is [+voiced].

(a) [ɡ] *and* [ŋ]

[ɡ] is [-nasal] and [ŋ] is [+nasal]

(b) [c] *and* [cʰ]

[c] is [-aspirated] and [cʰ] is [+aspirated]

(c) [ɛ] *and* [œ]

[ɛ] is [-rounded] and [œ] is [+rounded]

(d) [ɱ] *and* [m̊ɱ]

[ɱ] is [+voiced] and [m̊ɱ] is [-voiced]

(e) [d] *and* [ɾ]

[d] is [-flap] and [ɾ] is [+flap]

2 *14 points*

Based on the feature specifications on p. 16 and 17, please state for each of the following sets of sounds which articulatory feature or combination of features the sounds in that list have in common that no other sound in Common American English shares. For example, if the list were "[p], [pʰ], [b], [m]", the answer would be "[+stop, +bilabial]" because all three sounds have the features [+stop, +bilabial], and there are no other sounds in Common American English that are [+stop, +bilabial].

(a) [k, kʰ]

[+stop, +velar, -voiced]

(b) [g, b, d, ɾ]

[+stop, +voiced, -nasal]

(c) [s, ʃ, f, θ]

[+fricative, -voiced, -glottal]

(d) [l, ɬ, ɹ, ɻ]

[+approximant, +alveolar]

(e) [u, ʊ, ɔ, o͡w, ɔ͡j]

[+back, +rounded]

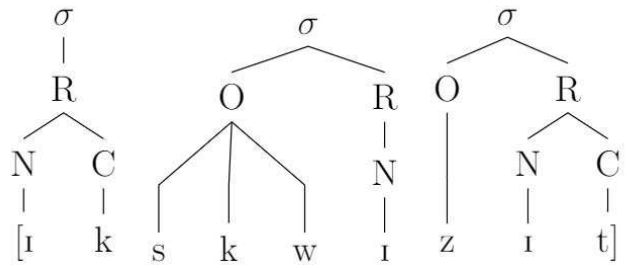
(f) [e͡j, a͡j, ʌ, ɑ, ɛ, æ, ə]

[-rounded, -high]

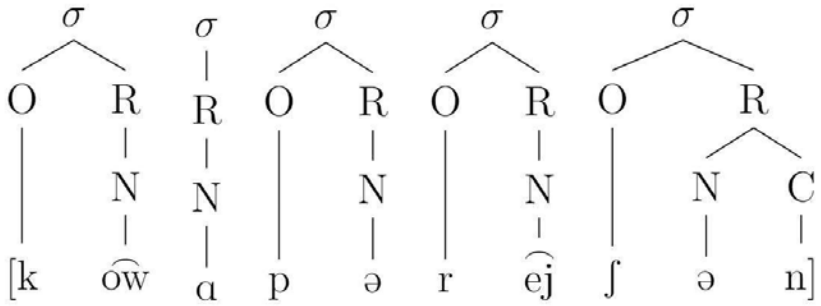
3 *12 points*

Show how our syllabification algorithm syllabifies the following words. Use the "tree" notation to indicate how each word is divided into onsets, nuclei and codas and how these elements are grouped into rhymes and syllables.

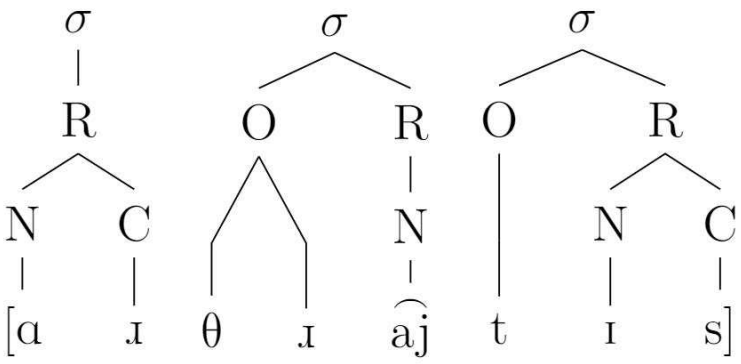
(a) [ɪkskwɪzɪt]



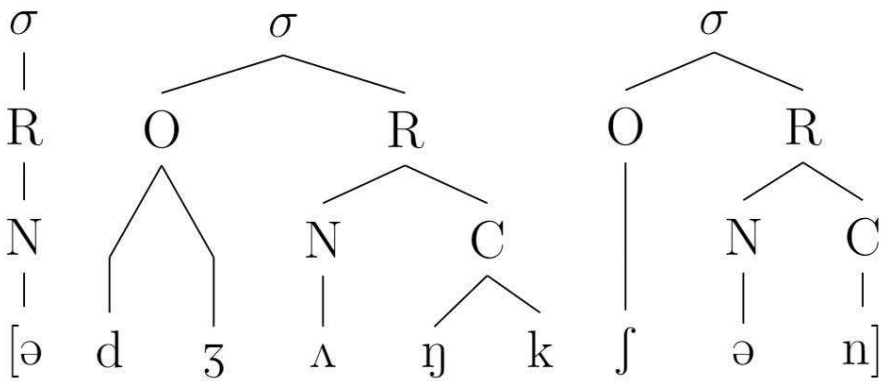
(b) [ko͡wɑpəɹe͡ɪʃən]



(c) [ɑɹθɹa͡jtɪs]



(d) [ədʒʌŋkʃən]



4 *8 points*

For each of the sound pairs below, indicate whether they are allophones of different phonemes in English by circling "yes" if they are and "no" if they are not. If you circle "yes," write on the line that follows a minimal pair that shows this. Write this minimal pair both in English orthography and in the IPA.

		allophones of different phonemes?		
[u] and [ʌ]		*yes*	*no*	[ɡun] 'goon' and [ɡʌn] 'gun'
[pʰ] and [p]		*yes*	*no*	
[f] and [θ]		*yes*	*no*	[fɪn] 'fin' and [θɪn] 'thin'

5 *14 points*

In English, there are three forms in which past tense can be productively realized (in what follows, we will ignore irregular past tense forms like *go – went, make – made, fit – fit,* etc.):

Group 1		*Group 2*		*Group 3*	
Infinitive	Past tense	Infinitive	Past tense	Infinitive	Past tense
[bʌz]	[bʌzd]	[be͡jk]	[be͡jkt]	[lo͡wd]	[lo͡wdɪd]
[sa͡j]	[sa͡jd]	[stʌf]	[stʌft]	[bæt]	[bætɪd]
[gɹæb]	[gɹæbd]	[ʃɪp]	[ʃɪpt]	[pʰɪt]	[pʰɪtɪd]
[kʰɑl]	[kʰɑld]	[kʰɪs]	[kʰɪst]	[sɪd]	[sɪdɪd]
[pʰlæn]	[pʰlænd]	[wɪʃ]	[wɪʃt]		
[se͡jv]	[se͡jvd]	[fɹɑθ]	[fɹɑθt]		
[lo͡wð]	[lo͡wðd]				
[vju]	[vjud]				

The situation here is similar to what we saw for expressing the plural in class. First consider only **groups 1** and **2.**

(a) When is the past tense element realized as [d] and when is it realized as [t]? State a generalization.

[t] appears after voiceless consonants
[d] appears anywhere else

(b) The distribution of [d] and [t] is conditioned by a phonotactic constraint on English codas we already saw in class. State this constraint.

*Coda
/ \
/ \
[-voiced] [+voiced]

A voiceless sound may not be immediately followed by a voiced sound within the same coda.

(c) Given the constraint you stated in b., what is the underlying form of the past tense element? What is the rule that changes how the past tense element is realized when the phonotactic constraint is violated?

/d/ is the underlying form

Change /d/ to [t] if it follows a voiceless sound.
/d/ --> [t] / [-voiced] __

Now consider **group 3.**

(d) It is a general fact about English that the sequences [tt], [td], [dt] and [dd] are all impossible within a coda. State a set of binary articulatory features that picks out [d] and [t] but no other sound of Common American English.

[+stop, +alveolar, -aspirated, -nasal, -flap]

(e) Using these binary articulatory features, state a single phonotactic constraint that excludes the four combinations [tt], [td], [dt], and [dd] within a coda.

*Coda
/ \
/ \

[+stop. +alveolar, -aspirated, -nasal, -flap]

[+stop. +alveolar, -aspirated, -nasal, -flap]

(f) Recall from c. above what the underlying form of the past tense element is. Given the constraint in d., state a rule that changes the underlying form to [ɨd] when the phonotactic constraint you gave in the previous part is violated.

/d/ --> [ɨd] / [+stop. +alveolar, -aspirated, -nasal, -flap] __

6 *7 points*

As we discovered in class, not all onsets are possible in English. Out of the following onsets, only the ones in the column on the left are allowed in English. The ones on right don't conform to the phonotactic constraints of English (marked by "*").

possible onsets	*impossible onsets*
[st]	*[ðt]
[sw]	*[zg]
[dʒ]	*[ʒd]
[z]	*[ʒk]
[sk]	*[vm]
[sn]	*[zp]
[g]	*[ðʔ]
[fl]	*[zn]
[θɹ]	
[vj]	
[bl]	

State a single phonotactic constraint on English onsets that prohibits all of the impossible onsets but still allows the possible ones. This constraint should not involve disjunction ("X *or* Y"). Use our binary articulatory features to write the constraint.

*Onset
/ \
/ \
[+fricative, +voiced] [+stop]

7 *5 points*

Consider the sounds [ɦ] and [ʝ] in the following Dwarvish words.

[pyɦəɾ]	‘kitchen’	[flɪpɦə]	‘folder’	[ətɦul]	‘golf’
[iʔʝʊs]	‘cast’	[ɑsjetɪʃ]	‘ascetic’	[poʝu]	‘mat’
[plyɦə]	‘bake’	[kwoʝ]	‘outlet’	[flɪpjə]	‘woman’

Based on these words, what is the relationship between [ɦ] and [ʝ] in this language? Are they allophones of different phonemes or allophones of the same phoneme? Please briefly explain why.

These sounds are not in complementary distribution. The sounds are allophones of different phonemes. The data shows that the occurrence of [ɦ] vs. [ʝ] cannot be predicted from the context or environment of the sound. For instance, both sounds are able to precede [ə] and [u], and both sounds are able to follow [p].

8 *11 points*

Consider the phonetic transcription of the following Martian words, along with their translations. The sounds [k] and [x] are in complementary distribution, and so are the sounds [g] and [ɣ]. Their distribution can be accounted for with a single phonotactic constraint and a single rule.

[ɣalix]	‘lava’	[ɔkŋugmi]	‘red’
[xuknu]	‘manicure’	[wɑʔxn̥il]	‘clock’
[kmaɲ]	‘pedicure’	[ɒɹudxid]	‘small’
[aɸeɣm̥i]	‘zero’	[zigɱekɲo]	‘glue’
[ʔɨgŋɔ̃ʝ]	‘end’	[siɣzuxlɪŋ]	‘earthling’
[ɯɣtaknim]	‘heat’	[afoxʃaʒɱu]	‘discovery’

(a) State a generalization about when [k]/[g] and [x]/[ɣ] appear, respectively.

The velar oral stops [k] and [g] only occur before voiced nasals.
The velar fricatives [x] and [ɣ] occur anywhere else.

(b) What are the phonemes?

[x] and [ɣ]
[+velar, +fricative]

(c) State a constraint that prohibits the underlying forms in the right environment. State this constraint using binary articulatory features. The constraint must be a single statement ("It is not possible to have …") and must not involve disjunction ("X *or* Y").

*[+velar, +fricative] [+voiced, +nasal]

(d) Based on this constraint, provide a rule that changes the underlying forms in the right environments. Write this rule in plain English and use binary articulatory features.

Change /+velar, +fricative/ to [+stop, -fricative] if it precedes [+voiced, +nasal]

(e) Now express this rule using our formal notation.

/+velar, +fricative/ --> [+stop, -fricative] / __ [+voiced, +nasal]

9 *7 points*

Let us consider two phonological rules in Rosharian, a language spoken in the mythical world of Roshar. The first rule changes / i / to [a] if it occurs at the end of a word.

(1) **Rule 1:**
Change / i / to [a] if it occurs word-finally.

(2) *Examples of rule 1:*
/ po͡wvi / → [po͡wva] 'cranberry'
/ ʃætri / → [ʃætra] 'kiwi'

The second rule changes an oral stop into a fricative if it precedes a high vowel.

(3) **Rule 2:**
Change / [+stop, −nasal] / to [−stop, +fricative] if it precedes [+vowel, +high]

(4) *Examples of rule 2:*
/ tupɪt / → [tuɸɪt] 'melon'
/ so͡wduli / → [so͡wðuli] 'lychee'

Against this background, the underlying form / topi / becomes [topa] in Rosharian. This is the only possible pronounciation.

a) Based on the underlying form / topi /, what is the result that is produced if Rule 1 applies first, followed by Rule 2? Show the output of each rule.

Underlying form:	/ topi /
Rule 1:	[topa]
Rule 2:	---------
Output:	[topa]

b) What happens if the two rules apply in the opposite order? Again, show the output of each rule.

Underlying form:	/ topi /
Rule 2:	[toɸi]
Rule 1:	[toɸa]
Output:	*[toɸa]

c) What is the relationship between the rules (no interaction, feeding or bleeding)? Briefly explain why (1–2 sentences).

Rule 1 bleeds Rule 2.

If Rule 1 first changes the high vowel /i/ to the low vowel [a] at the end of the word, Rule 2 can no longer apply since the context of an oral stop preceding a high vowel no longer exists in the word.

10 *7 points*

Let us consider two phonological rules in Fillorian, a language spoken in the mythical world of Fillory. The first rule changes / z / to [s] if it precedes a voiceless sound.

(5) **Rule 1:**
/ z / → [s] / ___ [–voiced]

(6) *Examples of rule 1:*

/ ɑztir /	→	[ɑstir]	'strawberry'
/ tɔzpman /	→	[tɔspman]	'turtle'

The second rule changes / h / to [ʔ] if it follows a fricative.

(7) **Rule 2:**
/ h / → [ʔ] / [+fricative] ___

(8) *Examples of rule 2:*

/ oðhan /	→	[oðʔan]	'cantaloupe'
/ so͡wʃhuli /	→	[so͡wʃʔuli]	'dragonfly'

Against this background, the underlying form / rɔ̃jzhun / becomes [rɔ̃jsʔun] in Fillorian. This is the only possible pronounciation.

a) Based on the underlying form / rɔ̃jzhun /, what is the result that is produced if Rule 1 applies first, followed by Rule 2? Show the output of each rule.

Underlying form:	/ rɔ̃jzhun /
Rule 1:	[rɔ̃͡jshun]
Rule 2:	[rɔ̃͡jsʔun]
Output:	[rɔ̃͡jsʔun]

b) What happens if the two rules apply in the opposite order? Again, show the output of each rule.

Underlying form:	/ rɔ̃jzhun /
Rule 2:	[rɔ̃͡jzʔun]
Rule 1:	[rɔ̃͡jsʔun]
Output:	[rɔ̃͡jsʔun]

c) What is the relationship between the rules (no interaction, feeding or bleeding)? Briefly explain why (1–2 sentences).

There is no interaction between the rules since the changes they make do not actually affect the conditions that determine whether or not the other rule occurs.

For example, Rule 1 does not change manner of articulation of a sound, meaning the sound will remain [+fricative] and Rule 2 does not change the voicing of a sound, meaning the sound will remain [-voiced].

THE INTERNATIONAL PHONETIC ALPHABET (revised to 2020)

CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k g	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			r					ʀ		
Tap or Flap		ⱱ		ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

Symbols to the right in a cell are voiced, to the left are voiceless. Shaded areas denote articulations judged impossible.

CONSONANTS (NON-PULMONIC)

Clicks	Voiced implosives	Ejectives
ʘ Bilabial	ɓ Bilabial	’ Examples:
| Dental	ɗ Dental/alveolar	pʼ Bilabial
! (Post)alveolar	ʄ Palatal	tʼ Dental/alveolar
ǂ Palatoalveolar	ɠ Velar	kʼ Velar
ǁ Alveolar lateral	ʛ Uvular	sʼ Alveolar fricative

OTHER SYMBOLS

ʍ Voiceless labial-velar fricative

w Voiced labial-velar approximant

ɥ Voiced labial-palatal approximant

ʜ Voiceless epiglottal fricative

ʢ Voiced epiglottal fricative

ʡ Epiglottal plosive

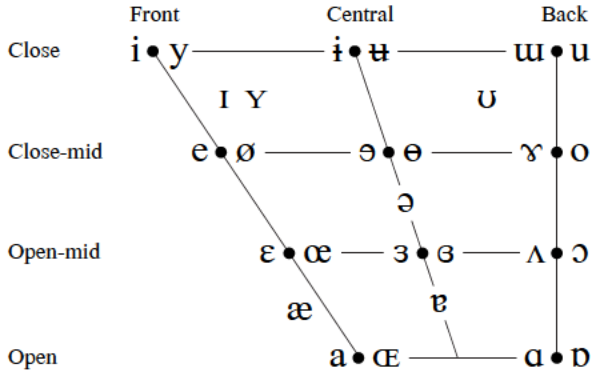
ɕ ʑ Alveolo-palatal fricatives

ɺ Voiced alveolar lateral flap

ʩ Simultaneous ʃ and x

Affricates and double articulations can be represented by two symbols joined by a tie bar if necessary. t͡s k͡p

VOWELS



Where symbols appear in pairs, the one to the right represents a rounded vowel.

SUPRASEGMENTALS

ˈ Primary stress ˌfoʊnəˈtɪʃən

ˌ Secondary stress

ː Long eː

ˑ Half-long eˑ

˘ Extra-short ĕ

| Minor (foot) group

‖ Major (intonation) group

. Syllable break ɹi.ækt

‿ Linking (absence of a break)

TONES AND WORD ACCENTS

LEVEL		CONTOUR	
e̋ or ˥	Extra high	ě or ˧˥	Rising
é	˦ High	ê	˥˩ Falling
ē	˧ Mid	e᷄	˧˥ High rising
è	˨ Low	e᷅	˩˧ Low rising
ȅ	˩ Extra low	e᷈	˥˩˧ Rising-falling
↓	Downstep	↗	Global rise
↑	Upstep	↘	Global fall

DIACRITICS

◌̥	Voiceless	n̥ d̥	◌̤	Breathy voiced	b̤ a̤	◌̪	Dental	t̪ d̪
◌̬	Voiced	s̬ t̬	◌̰	Creaky voiced	b̰ a̰	◌̺	Apical	t̺ d̺
◌ʰ	Aspirated	tʰ dʰ	◌̼	Linguolabial	t̼ d̼	◌̻	Laminal	t̻ d̻
◌̹	More rounded	ɔ̹	◌ʷ	Labialized	tʷ dʷ	◌̃	Nasalized	ẽ
◌̜	Less rounded	ɔ̜	◌ʲ	Palatalized	tʲ dʲ	◌ⁿ	Nasal release	dⁿ
◌̟	Advanced	u̟	◌ˠ	Velarized	tˠ dˠ	◌ˡ	Lateral release	dˡ
◌̠	Retracted	e̠	◌ˤ	Pharyngealized	tˤ dˤ	◌̚	No audible release	d̚
◌̈	Centralized	ë	~	Velarized or pharyngealized	ɫ			
◌̽	Mid-centralized	e̽	◌̝	Raised	e̝	(ɪ̝ = voiced alveolar fricative)		
◌̩	Syllabic	n̩	◌̞	Lowered	e̞	(β̞ = voiced bilabial approximant)		
◌̯	Non-syllabic	e̯	◌̘	Advanced Tongue Root	e̘			
◌˞	Rhoticity	ə˞ a˞	◌̙	Retracted Tongue Root	e̙			

Some diacritics may be placed above a symbol with a descender, e.g. n̊ŋ̊

Binary features for consonants:
[±vowel]
[±stop]
[±fricative]
[±approximant]
[±bilabial]
[±labiodental]
[±dental]
[±alveolar]
[±postalveolar]
[±palatal]
[±velar]
[±glottal]
[±nasal]
[±voiced]
[±lateral]
[±trill]
[±flap]
[±aspirated]

Binary features for vowels:
[±vowel]
[±high]
[±low]
[±front]
[±back]
[±rounded]
[±tense]
[±voiced]
[±nasal]
[±diphthong]
[±bilabial]

Binary articulatory features for consonants of Common American English

	[±vowel]	[±stop]	[±fricative]	[±approximant]	[±bilabial]	[±labiodental]	[±dental]	[±alveolar]	[±postalveolar]	[±palatal]	[±velar]	[±glottal]	[±nasal]	[±voiced]	[±lateral]	[±trill]	[±flap]	[±aspirated]
[p]	−	+	−	−	+	−	−	−	−	−	−	−	−	−	−	−	−	−
[pʰ]	−	+	−	−	+	−	−	−	−	−	−	−	−	−	−	−	−	+
[b]	−	+	−	−	+	−	−	−	−	−	−	−	−	+	−	−	−	−
[m]	−	+	−	−	+	−	−	−	−	−	−	−	+	+	−	−	−	−
[t]	−	+	−	−	−	−	−	+	−	−	−	−	−	−	−	−	−	−
[tʰ]	−	+	−	−	−	−	−	+	−	−	−	−	−	−	−	−	−	+
[d]	−	+	−	−	−	−	−	+	−	−	−	−	−	+	−	−	−	−
[n]	−	+	−	−	−	−	−	+	−	−	−	−	+	+	−	−	−	−
[ɾ]	−	+	−	−	−	−	−	+	−	−	−	−	−	+	−	−	+	−
[k]	−	+	−	−	−	−	−	−	−	−	+	−	−	−	−	−	−	−
[kʰ]	−	+	−	−	−	−	−	−	−	−	+	−	−	−	−	−	−	+
[g]	−	+	−	−	−	−	−	−	−	−	+	−	−	+	−	−	−	−
[ŋ]	−	+	−	−	−	−	−	−	−	−	+	−	+	+	−	−	−	−
[ʔ]	−	+	−	−	−	−	−	−	−	−	−	+	−	−	−	−	−	−
[f]	−	−	+	−	−	+	−	−	−	−	−	−	−	−	−	−	−	−
[v]	−	−	+	−	−	+	−	−	−	−	−	−	−	+	−	−	−	−
[θ]	−	−	+	−	−	−	+	−	−	−	−	−	−	−	−	−	−	−
[ð]	−	−	+	−	−	−	+	−	−	−	−	−	−	+	−	−	−	−
[s]	−	−	+	−	−	−	−	+	−	−	−	−	−	−	−	−	−	−
[z]	−	−	+	−	−	−	−	+	−	−	−	−	−	+	−	−	−	−
[ʃ]	−	−	+	−	−	−	−	−	+	−	−	−	−	−	−	−	−	−
[ʒ]	−	−	+	−	−	−	−	−	+	−	−	−	−	+	−	−	−	−
[h]	−	−	+	−	−	−	−	−	−	−	−	+	−	−	−	−	−	−
[l]	−	−	−	+	−	−	−	+	−	−	−	−	−	+	+	−	−	−
[ɬ]	−	−	−	+	−	−	−	+	−	−	+	−	−	+	+	−	−	−
[ɹ]	−	−	−	+	−	−	−	+	−	−	−	−	−	+	−	−	−	−
[ɻ̊]	−	−	−	+	−	−	−	+	−	−	−	−	−	−	−	−	−	−
[j]	−	−	−	+	−	−	−	−	−	+	−	−	−	+	−	−	−	−
[w]	−	−	−	+	+	−	−	−	−	−	+	−	−	+	−	−	−	−

Binary articulatory features for vowels of Common American English

	[±vowel]	[±high]	[±low]	[±front]	[±back]	[±rounded]	[±tense]	[±voiced]	[±nasal]	[±diphthong]	[±bilabial]
[i]	+	+	−	+	−	−	+	+	−	−	−
[ɪ]	+	+	−	+	−	−	−	+	−	−	−
[ɛ]	+	−	−	+	−	−	−	+	−	−	−
[æ]	+	−	+	+	−	−	−	+	−	−	−
[ɨ]	+	+	−	−	−	−	−	+	−	−	−
[ə]	+	−	−	−	−	−	−	+	−	−	−
[u]	+	+	−	−	+	+	+	+	−	−	−
[ʊ]	+	+	−	−	+	+	−	+	−	−	−
[ɔ]	+	−	−	−	+	+	−	+	−	−	−
[ʌ]	+	−	−	−	+	−	−	+	−	−	−
[ɑ]	+	−	+	−	+	−	+	+	−	−	−
[e͡j]	+	−	−	+	−	−	+	+	−	+	−
[a͡j]	+	−	+	+	−	−	+	+	−	+	−
[a͡w]	+	−	+	+	−	+	+	+	−	+	+
[o͡w]	+	−	−	−	+	+	+	+	−	+	+
[ɔ͡j]	+	−	−	−	+	+	+	+	−	+	−