Today’s agenda: Phonology

- Introducing phonemes and allophones.
- How to figure out if two or more sounds are phonemes or allophones in a particular language. (An algorithm of solving phonology problems).
- Doing some phonology problems (problem-solving skills)

Phonology

- While phonetics studies how speech sounds are articulated, what their physical properties are, and how they are perceived, phonology studies the organization of speech sounds in a particular language.
- As it turns out, while two or more languages may have the same sounds, no two languages organize their sound inventories in the same way. Let’s look at an example.

[s] and [ʃ] in Japanese vs. English

- In both English and Japanese we hear the sounds [s] and [ʃ]:
  - Japanese: [ʃimasu] “do”
  - English: [slæʃ] “slash”

[s] and [ʃ] in Japanese vs. English

- In English, however, the occurrence of each sound is unpredictable.
- Given [ʃə], which sound do you think should occur in the blank?
- Either one can, giving us two words with two different meanings:
  - [ʃ] “shore” vs. [ʃə] “sore”
[s] and [ʃ] in Japanese vs. English

• By contrast, in Japanese, we do not find pairs where [s] and [ʃ] create a difference in meaning.
• In Japanese, if we have [ʃimasu], and a choice of [s] and [ʃ], we predict that only [ʃ] may occur in the blank: [ʃimasu] “do”.
• Similarly, if we have [ʃan], we predict that only [s] may occur in the blank: [ʃan] “three”
• If we make the wrong choice in the blank, we get a nonsense word. Japanese cannot have [ʃimasu] or [ʃan].

Phonology

• Phonology addresses questions related to the sound system of a given language. Basically:
  1. Which sounds are predictable and which sounds are unpredictable in a given language?
  2. What are the rules regulating the occurrence of predictable sounds?
  3. How can we state speakers’ knowledge of these rules in a ‘formal’ notation?
• We discuss the first two questions today and the third on Wednesday.

Phonological knowledge is subconscious

• Native speakers of a particular language typically treat certain sounds as being the same, even when they are phonetically different, e.g.,
  - the [l] in lay and play
  - the [t] in top and stop
• But other sounds are considered different even when they sound the same:
  - [ɹaɪr] ‘rider’ and [ɹaɪr] ‘writer’

Phonemes vs. allophones

• Phonologists explain the difference by invoking a distinction between phonemes and allophones.
• A phoneme is a sound that distinguishes meaning in a language, whereas an allophone is a phonetic variant of a particular phoneme that does not affect meaning.

Minimal pairs

• Phonemes create words that differ in meaning. Hence, they are contrastive.
• But how do we know if two sounds are contrastive in a particular language?
• Answer: Minimal pairs.
• A minimal pair is two words with different meanings that are identical except for one sound that occurs in the same place in each word, e.g.,
  - seed [sid] and seat [sit]

Phonemes or allophones?

• So, bearing this in mind, let’s consider more examples from English.
• Based on the minimal pair light [laɪt] and right [raɪt], are the [l] and [r] phonemes or allophones in English?
• Based on the minimal pair pan [pæn] and ban [bæn], are the [p] and [b] phonemes or allophones in English?
Phonemes or allophones?

• How about these further minimal pairs?
  seat [sit] and sit [sɪt]
  fool [fʊl] and full [fʊl]
  sip [sɪp] and zip [zɪp]
  leaf [lɪf] and leave [lɪv]

Phonemes or allophones?

• How about these further minimal pairs?
  seat [sit] and sit [sɪt] → [i] & [ɪ] are phonemes.
  fool [fʊl] and full [fʊl] → [u] & [ʊ] are phonemes.
  sip [sɪp] and zip [zɪp] → [s] & [z] are phonemes.
  leaf [lɪf] and leave [lɪv] → [f] & [v] are phonemes.

Aspiration in English

• Now, let's consider the following (made-up) minimal pairs:
  a. tar: [tʰæːr] vs. *[tæːr]
  b. star: [stæːr] vs. *[stʰæːr]

• Now, here's the question: Are the two sounds [tʰ] and [t] phonemes or allophones in English?
  • Since [tʰ] and [t] are not contrastive in English, they are two allophones of the same phoneme, which we might represent here as /t/. (Notice the slash, rather than the square bracket, notation.)

Aspiration in Thai

• But now consider aspirated and unaspirated voiceless stops in Thai.
  [pʰaa] “forest”  [pʰaa] “to split”
  [tʰam] “to pound”  [tʰam] “to do”
  [kʰat] “to interrupt”

• Are these sounds phonemic or allophonic in Thai?

Nasal vowels in English

• How about nasal vowels in English? Are they phonemes or allophones?
  • First, let's try to find (or construct) a couple of minimal pairs:
    a. ban [bæn] vs. *[bæn]
    b. bat [bæt] vs. *[bæt]
  • Is the contrast here phonemic or allophonic?

Nasal vowels in French and Akan

• Now, consider nasal vowels in French:
  gars [ɡ̥ɑr] “lad”  gant [ɡ̥ɑnt] “glove”

• Are they phonemes or allophones?
  • How about Akan, a Ghanian language?
Distribution: contrastive vs. complementary

- From all these examples, you should have noticed that different allophones occur in different environments, that is, where one of them occurs, the other doesn’t, and vice versa, which is not the case with phonemes.
- We say that allophones occur in **complementary distribution**, whereas phonemes occur in **contrastive distribution**. And this is the key way to distinguish between a phoneme and an allophone in a given language.

Sounds in ‘free variation’

- Occasionally, two sounds in a language can be in free variation, that is, they may optionally occur in the same context without affecting meaning.
- For example, English stops may or may not have an audible release in final position.
  - **mat** [mæt] or [mæt’]
- The IPA symbol for ‘no audible release’ is ‘.
- Obviously, since sounds in free variation do not create a difference in meaning, they are __________.

Phonemes are abstract entities

- So, phonemes are meaning-distinguishing sounds, whereas allophones are phonetic variants of the same phoneme that occur in specific contexts.
- Notice that this means that phonemes are actually abstract entities in your head rather than actual sounds that come out of your mouth.
  
  Phoneme: /t/
  
  Allophones: [t] [tʰ] [t’]

Phonemes are abstract entities

- The psychological existence of phonemes can be noticed in native speakers’ slips of the tongue, e.g., **key chain** [ki tʃeɪn] may come out as [tʃɪ keɪn], but never as *[tʃɪ kʃeɪn].
- This shows that the affricate [tʃ] is stored in the mind as a single unit, just as [k] is.

Steps for solving phonology problems

- Given two sounds and a set of data, the task is to determine if the two sounds are separate phonemes or allophones of the same phoneme in a language. To do that, we proceed methodically.

Minimal pairs?

- **Step 1:**
  See if there are any **minimal pairs** in the data where the two sounds in question are in **contrastive distribution**. If yes, then the two sounds are phonemes. If not, then proceed to step 2.
Overlapping or complementary?

• Step 2:
  Find out if the two sounds are in overlapping or in complementary distribution.
  - If overlapping, then the two sounds are most likely two different phonemes (but we cannot be sure).
  - If complementary, then the sounds are allophones of the same phoneme, in which case we state the phonological environments in which each allophone occurs and then move to step 3.

Which is underlying, and which is derived?

• Step 3:
  Once you determine the environments in which each sound occurs, it is time to determine which one is the underlying form and which one is derived. In most cases, the sound that appears in more environments can be taken to represent the underlying phoneme.

Write a rule!

• Step 4:
  Now, you are in a position to write a phonological rule that shows the process whereby the allophones are derived from the underlying phoneme.

Some phonology problems: Tagalog

• Now, consider these Tagalog words:
  1. [datiŋ] “to arrive” 6. [daɾaŋ] “will complain”
  4. [daɾatiŋ] “will arrive” 9. [daɾiŋ] “to complain”
  5. [maɾaŋ] “pickpocket” 10. [maɾaŋ] “to go pickpocketing”

• Question: Are [d] and [ɾ] phonemes or allophones?

Sindhi

24. Sindhi
The following data are from Sindhi, an Indo-European language of the Indo-Aryan family, spoken in Pakistan and India. Examine the distribution of the phonemes [ŋ], [ɾ], and [b]. Determine if the three are allophones of separate phonemes or allophones of the same phoneme. What is your evidence? Is the relationship among the sounds the same as in English? Why or why not?

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<td>“leaf”</td>
<td>“opportunity”</td>
<td>“learn”</td>
<td>“right”</td>
<td>“door”</td>
<td>“hood of snail”</td>
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Standard Italian

25. Standard Italian
Consider the following data from Standard Italian, an Indo-European language of the Romance family, spoken in Italy. Answer the questions that follow.

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<td>“dry”</td>
<td>“rest”</td>
<td>“bottom”</td>
<td>“black”</td>
<td>“people”</td>
<td>“scrap”</td>
</tr>
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i. Are there any minimal pairs? If so, what are they, and what can you conclude to be true of Italian from these minimal pairs?

ii. State the phonetic environments in which the sounds [b] and [br] appear. Identify any natural classes of sounds that appear in the environments you’ve provided.

iii. Given what you know about the distribution of sounds and the environments you listed in ii, are [b] and [br] in complementary or contrastive distribution? Please explain your answer.
Standard Spanish

Tojolabal

Mokilese

Summary

- **Phonemes** are meaning-distinguishing sounds. They are unpredictable. They are abstract entities.
- **Allophones** are phonetic variants of the same phoneme. They are predictable by rule. They are the physical sounds we produce.
- Phonemes become allophones via phonological processes, which are represent formally as phonological rules. We discuss how to do this on Wednesday.

Next class agenda