Deducing Allophonic Rules
Part 1
Course Readings

The following readings have been posted to the Moodle course site:

- Contemporary Linguistics: Chapter 3 (pp. 70-77, 84-86)
- Language Files: Chapter 3.5 (pp. 127-133)
A Review of Where We Are

- The **phonology** of a language includes rules that affect individual phones.
  - In English, [t]/[p]/[k] are aspirated at the beginning of onsets.
A Review of Where We Are

- **The phonology** of a language includes rules that affect individual phones.
  - In English, [t]/[p]/[k] are aspirated at the beginning of onsets.

- Because of such rules, we must distinguish between
  - **Phoneme**: the sound as represented in memory /X/
  - **Allophone**: the sound as actually produced [X]
A Review of Where We Are

- The phonology of a language includes rules that affect individual phones.
  - In English, [t]/[p]/[k] are aspirated at the beginning of onsets.

- Because of such rules, we must distinguish between
  - Phoneme: the sound as represented in memory /X/
  - Allophone: the sound as actually produced [X]

- [X] is an allophone of /Y/ if [X] is one way that speakers pronounce the sound memorized as /Y/
  - [tʰ] is an allophone of /t/ in English.
  - [t] is an allophone of /t/ in English.

- [tʰ] and [t] are allophones of the same phoneme in English.
A Review of Where We Are

- Languages differ in whether phones are allophones of the same (or different) phonemes.

Example (Thai and English):
In Thai, [t] and [th] are allophones of different phonemes.
In English, [t] and [th] are allophones of the same phoneme.
A Review of Where We Are

- Languages differ in whether phones are allophones of the same (or different) phonemes.

Example (Thai and English):
In Thai, [t] and [tʰ] are allophones of different phonemes.
In English, [t] and [tʰ] are allophones of the same phoneme.

- If there’s a minimal pair for two phones, then they’re allophones of different phonemes.

Example (Thai):
[tam] ‘to pound’  [tʰam] ‘to do’
A Review of Where We Are

- Languages differ in whether phones are allophones of the same (or different) phonemes.

**Example (Thai and English):**

In Thai, [t] and [tʰ] are allophones of different phonemes.
In English, [t] and [tʰ] are allophones of the same phoneme.

- If there’s a minimal pair for two phones, then they’re allophones of different phonemes.

**Example (Thai):**

[tam] ‘to pound’  [tʰam] ‘to do’

- If there aren’t minimal pairs for them, then they might be allophones of the same phoneme.

**Example:**

In English, there are no minimal pairs for [t] and [tʰ]...
An Important Point of Logic

Two phones might be in complementary distribution, but *still* be allophones of *different* phonemes.

**Example: [ŋ] and [h] in English**
- In English, [ŋ] is never in onsets ([bæŋ], *[ŋæb]*)
- In English, [h] is never in codas. ([hæt], *[tæh]*)
- ... So there’s no minimal pairs for [ŋ] and [h] in English...
- ...But they are still allophones of *different* phonemes!

...*Let’s see why!*
An Important Point of Logic

If [ŋ] and [h] were really allophones of the same phoneme, then...

- There would be some phoneme /X/
- There would be a rule R which requires:
  - /X/ to be pronounced as [h] in onsets
  - /X/ to be pronounced as [ŋ] in codas

▶ But what's /X/? (Impossible to say!)
▶ But this rule R looks crazy. (Trust me.)

Conclusion:
▶ There is no sensible rule that would derive [ŋ] and [h] from the same phoneme /X/.
▶ And so, linguists conclude that they are allophones of different phonemes.
An Important Point of Logic

If [ŋ] and [h] were really allophones of the same phoneme, then...

- There would be some phoneme /X/
- There would be a rule R which requires:
  - /X/ to be pronounced as [h] in onsets
  - /X/ to be pronounced as [ŋ] in codas
- But what’s /X/? (Impossible to say!)
- But this rule R looks crazy. (Trust me.)
An Important Point of Logic

If [ŋ] and [h] were really allophones of the same phoneme, then...

- There would be some phoneme /X/
- There would be a rule R which requires:
  - /X/ to be pronounced as [h] in onsets
  - /X/ to be pronounced as [ŋ] in codas
- But what’s /X/? (Impossible to say!)
- But this rule R looks crazy. (Trust me.)

Conclusion:

- There is no sensible rule that would derive [ŋ] and [h] from the same phoneme /X/.
- And so, linguists conclude that they are allophones of different phonemes.
The Centrality of Rules

To really show that [X] and [Y] are allophones of the *same* phoneme, you have to:

- Say what phoneme they are allophones of.
- **State the rule** that determines whether that phoneme is pronounced as [X] or [Y].
The Centrality of Rules

To really show that [X] and [Y] are allophones of the same phoneme, you have to:

- Say what phoneme they are allophones of.
- **State the rule** that determines whether that phoneme is pronounced as [X] or [Y].

Illustration: Aspiration in English

How we proved that [t] and [tʰ] are allophones of the same phoneme:

- We discovered the following rule:
  - /p/, /t/, /k/ are aspirated at the beginning of onsets.
- This rule does two things:
  - States the phoneme that [t] / [tʰ] are allophones of
  - States when that phoneme is pronounced as [t] / [tʰ]
Deducing Allophonic Rules

To show that [X] and [Y] are allophones of different phonemes, you have to:

▶ Find a **minimal pair** for [X] and [Y].

To really show that [X] and [Y] are allophones of the same phoneme, you have to:

▶ Say what phoneme they are allophones of.
▶ **State the rule** that determines whether that phoneme is pronounced as [X] or [Y].
Deducing Allophonic Rules

To show that [X] and [Y] are allophones of different phonemes, you have to:

- Find a **minimal pair** for [X] and [Y].

To really show that [X] and [Y] are allophones of the same phoneme, you have to:

- Say what phoneme they are allophones of.
- **State the rule** that determines whether that phoneme is pronounced as [X] or [Y].

**Burning Question:**

*How*, exactly, do we go about looking for these rules?

- The whole process can be broken down into manageable sub-tasks...
How to Solve ‘Phonology Problems’

The General Task: Determine whether \([X]\) and \([Y]\) are allophones of the same phoneme.

The Procedure:

1. First Main Sub-Task: Determine if there are minimal pairs for \([X]\) and \([Y]\).
   - If there are, STOP!
     - \([X]\) and \([Y]\) are allophones of different phonemes.
   - If there aren’t, move on to Second Main Sub-Task.

2. Second Main Sub-Task: Determine if there is a rule deriving \([X]\) and \([Y]\) from the same phoneme.
Vowel Length in Kikuyu

- In Kikuyu, some vowels are ‘long’ (in duration) and others are ‘short’ (in duration).
- In IPA, \([V:]\) = the vowel V is ‘long’

Vowel Length in Kikuyu

- [kera] ‘cross over’
- [ďaka] ‘beautiful’
- [kua] ‘die’
- [ďura] ‘spit’
- [kɔra] ‘find’
- [keːra] ‘realize’
- [ďaːka] ‘play’
- [kuːa] ‘carry’
- [ďuːra] ‘stay’
- [kɔːra] ‘little frog’

Question:
In Kikuyu, are the long vowels and short vowels allophones of the same phoneme?
Vowel Length in Kikuyu

- In Kikuyu, some vowels are ‘long’ (in duration) and others are ‘short’ (in duration).
- In IPA, [V:] = the vowel V is ‘long’

Vowel Length in Kikuyu

<table>
<thead>
<tr>
<th>Kikuyu Word</th>
<th>IPA</th>
<th>English Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>[kera]</td>
<td>[keːra]</td>
<td>'cross over'</td>
</tr>
<tr>
<td>[daka]</td>
<td>[daːka]</td>
<td>'beautiful'</td>
</tr>
<tr>
<td>[kua]</td>
<td>[kuːa]</td>
<td>'die'</td>
</tr>
<tr>
<td>[dura]</td>
<td>[duːra]</td>
<td>'spit'</td>
</tr>
<tr>
<td>[kɔra]</td>
<td>[kɔːra]</td>
<td>'find'</td>
</tr>
</tbody>
</table>

First Main Sub-Task:
Are there minimal pairs for the long vowels and the short vowels?
Vowel Length in Kikuyu

- In Kikuyu, some vowels are ‘long’ (in duration) and others are ‘short’ (in duration).
- In IPA, \([V:]\) = the vowel \(V\) is ‘long’

<table>
<thead>
<tr>
<th>Vowel Length in Kikuyu</th>
<th>IPA</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>[kera] ‘cross over’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ŋaka] ‘beautiful’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[kua] ‘die’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ŋura] ‘spit’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[kɔra] ‘find’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[keːra] ‘realize’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ŋaːka] ‘play’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[kuːa] ‘carry’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ŋuːra] ‘stay’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[kɔːra] ‘little frog’</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Result:
There are! So we stop.
Vowel Length in Kikuyu

- In Kikuyu, some vowels are ‘long’ (in duration) and others are ‘short’ (in duration).
- In IPA, [V:] = the vowel V is ‘long’

Vowel Length in Kikuyu

| [kera] | ‘cross over’             | [keːra] | ‘realize’            |
| [dąaka] | ‘beautiful’             | [dąaːka] | ‘play’              |
| [kua] | ‘die’                   | [kuːa] | ‘carry’             |
| [dʊura] | ‘spit’                  | [dʊuːra] | ‘stay’              |
| [kɔra] | ‘find’                  | [kɔːra] | ‘little frog’        |

Conclusion:
In Kikuyu, long vowels and short vowels are allophones of different phonemes.
Vowel Length in English

In English, too, some vowels are ‘long’ and others are ‘short’.

Vowel Length in English

<table>
<thead>
<tr>
<th>Word</th>
<th>Pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘ride’</td>
<td>[ɪəːd]</td>
</tr>
<tr>
<td>‘aid’</td>
<td>[eːd]</td>
</tr>
<tr>
<td>‘lobe’</td>
<td>[loːb]</td>
</tr>
<tr>
<td>‘teethe’</td>
<td>[θiːd]</td>
</tr>
<tr>
<td>‘save’</td>
<td>[ˈseːv]</td>
</tr>
<tr>
<td>‘right’</td>
<td>[ɪət]</td>
</tr>
<tr>
<td>‘ate’</td>
<td>[eɪt]</td>
</tr>
<tr>
<td>‘lope’</td>
<td>[lɒp]</td>
</tr>
<tr>
<td>‘teeth’</td>
<td>[θiːθ]</td>
</tr>
<tr>
<td>‘safe’</td>
<td>[ˈseɪv]</td>
</tr>
<tr>
<td>‘rye’</td>
<td>[ɪə]</td>
</tr>
<tr>
<td>‘bay’</td>
<td>[beɪ]</td>
</tr>
<tr>
<td>‘low’</td>
<td>[lɔʊ]</td>
</tr>
<tr>
<td>‘tea’</td>
<td>[tiː]</td>
</tr>
<tr>
<td>‘say’</td>
<td>[seɪ]</td>
</tr>
<tr>
<td>‘ridge’</td>
<td>[ɪɡd]</td>
</tr>
<tr>
<td>‘right’</td>
<td>[ɪət]</td>
</tr>
<tr>
<td>‘rye’</td>
<td>[ɪə]</td>
</tr>
<tr>
<td>‘bay’</td>
<td>[beɪ]</td>
</tr>
<tr>
<td>‘low’</td>
<td>[lɔʊ]</td>
</tr>
<tr>
<td>‘tea’</td>
<td>[tiː]</td>
</tr>
<tr>
<td>‘say’</td>
<td>[seɪ]</td>
</tr>
</tbody>
</table>

Question:
In English, are the long vowels and short vowels allophones of the same phoneme?
Vowel Length in English

In English, too, some vowels are 'long' and others are 'short'.

Vowel Length in English

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>'ride'</td>
<td>[uəːd]</td>
</tr>
<tr>
<td>'aid'</td>
<td>[eːd]</td>
</tr>
<tr>
<td>'lobe'</td>
<td>[loːwb]</td>
</tr>
<tr>
<td>'teethe'</td>
<td>[θiːd]</td>
</tr>
<tr>
<td>'save'</td>
<td>[seːv]</td>
</tr>
<tr>
<td>'right'</td>
<td>[uəjt]</td>
</tr>
<tr>
<td>'ate'</td>
<td>[ejt]</td>
</tr>
<tr>
<td>'lope'</td>
<td>[lowp]</td>
</tr>
<tr>
<td>'teeth'</td>
<td>[θiθ]</td>
</tr>
<tr>
<td>'safe'</td>
<td>[sejf]</td>
</tr>
<tr>
<td>'rye'</td>
<td>[uaj]</td>
</tr>
<tr>
<td>'bay'</td>
<td>[bej]</td>
</tr>
<tr>
<td>'low'</td>
<td>[low]</td>
</tr>
<tr>
<td>'tea'</td>
<td>[ti]</td>
</tr>
<tr>
<td>'say'</td>
<td>[sej]</td>
</tr>
</tbody>
</table>

First Main Sub-Task:
Are there minimal pairs for the long vowels and the short vowels?
In English, too, some vowels are ‘long’ and others are ‘short’.

**Vowel Length in English**

<table>
<thead>
<tr>
<th>Word</th>
<th>Pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘ride’</td>
<td>[ʌaːjd]</td>
</tr>
<tr>
<td>‘aid’</td>
<td>[eːjd]</td>
</tr>
<tr>
<td>‘lobe’</td>
<td>[loːwb]</td>
</tr>
<tr>
<td>‘teethe’</td>
<td>[θiːd]</td>
</tr>
<tr>
<td>‘save’</td>
<td>[seːdv]</td>
</tr>
<tr>
<td>‘right’</td>
<td>[ʌajt]</td>
</tr>
<tr>
<td>‘ate’</td>
<td>[eɪjt]</td>
</tr>
<tr>
<td>‘lope’</td>
<td>[lʌop]</td>
</tr>
<tr>
<td>‘teeth’</td>
<td>[θiːθ]</td>
</tr>
<tr>
<td>‘safe’</td>
<td>[seʃf]</td>
</tr>
<tr>
<td>‘rye’</td>
<td>[ʌaj]</td>
</tr>
<tr>
<td>‘bay’</td>
<td>[bej]</td>
</tr>
<tr>
<td>‘low’</td>
<td>[lɔw]</td>
</tr>
<tr>
<td>‘tea’</td>
<td>[θi]</td>
</tr>
<tr>
<td>‘say’</td>
<td>[sej]</td>
</tr>
</tbody>
</table>

Result:

- There aren’t any minimal pairs for short and long vowels.
- So, on to Second Main Sub-Task...
Vowel Length in English

In English, too, some vowels are ‘long’ and others are ‘short’.

### Vowel Length in English

<table>
<thead>
<tr>
<th>Word</th>
<th>Long Vowel</th>
<th>Short Vowel</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘ride’</td>
<td>[ɹaːːd]</td>
<td></td>
</tr>
<tr>
<td>‘aid’</td>
<td>[ɛːd]</td>
<td></td>
</tr>
<tr>
<td>‘lobe’</td>
<td>[loːb]</td>
<td></td>
</tr>
<tr>
<td>‘teethe’</td>
<td>[tʰiːd]</td>
<td></td>
</tr>
<tr>
<td>‘save’</td>
<td>[səːv]</td>
<td></td>
</tr>
<tr>
<td>‘right’</td>
<td>[ɹaːt]</td>
<td></td>
</tr>
<tr>
<td>‘ate’</td>
<td>[ɛt]</td>
<td></td>
</tr>
<tr>
<td>‘lope’</td>
<td>[lɔːp]</td>
<td></td>
</tr>
<tr>
<td>‘teeth’</td>
<td>[tʰiːθ]</td>
<td></td>
</tr>
<tr>
<td>‘safe’</td>
<td>[səːf]</td>
<td></td>
</tr>
<tr>
<td>‘rye’</td>
<td>[ɹai]</td>
<td></td>
</tr>
<tr>
<td>‘bay’</td>
<td>[bej]</td>
<td></td>
</tr>
<tr>
<td>‘low’</td>
<td>[lɔː]</td>
<td></td>
</tr>
<tr>
<td>‘tea’</td>
<td>[tə]</td>
<td></td>
</tr>
<tr>
<td>‘say’</td>
<td>[səj]</td>
<td></td>
</tr>
</tbody>
</table>

**Second Main Sub-Task:**
Determine if there is a rule deriving the long and short vowels from the same phoneme.
Question:
But, now how do we find out if there is such a rule?
Breaking Down Second Main Sub-Task

Question:
But, now how do we find out if there is such a rule?

Answer:
We will break down this sub-task into (four) smaller sub-steps.

Vocabulary:
The environment of a phone [X] in some word W =
The phones that immediately precede and follow [X] in W.
Breaking Down Second Main Sub-Task

The Logic of Our Search:
We want to figure out which is true (if any):

1. There’s a rule that turns long vowels into short vowels in some environment.

2. There’s a rule that turns short vowels into long vowels in some environment.
Breaking Down Second Main Sub-Task

The Logic of Our Search:
We want to figure out which is true (if any):

1. There’s a rule that turns long vowels into short vowels in some environment.

2. There’s a rule that turns short vowels into long vowels in some environment.

Some Reasoning:
▶ If (1) were true, then...
   ▶ there’d be an environment where only short vowels show up (no long vowels).
Breaking Down Second Main Sub-Task

The Logic of Our Search:

We want to figure out which is true (if any):

1. There’s a rule that turns long vowels into short vowels in some environment.
2. There’s a rule that turns short vowels into long vowels in some environment.

Some Reasoning:

- If (1) were true, then...
  - there’d be an environment where only short vowels show up (no long vowels).
- If (2) were true, then...
  - there’d be an environment where only long vowels show up (no short vowels).
Summary:
We now want to figure out which is true (if any):

1. There's an environment where you only find short vowels.
   ▶ If so, then there's a rule turning long vowels into short ones there.

2. There's an environment where you only find long vowels.
   ▶ If so, then there's a rule turning short vowels into long ones there.

There are four steps to figuring out which of these is true.
Step 1: Get the Environments

Determine the environments of the two phones.

- Write up four lists:
  1. The phones that precede a long vowel.
  2. The phones that follow a long vowel.
  3. The phones that precede a short vowel.
  4. The phones that follow a short vowel.

Notation: ‘#’ = the edge of a word
Step 1: Get the Environments

Step 1: Determine the environments of the long and short vowels.

‘ride’ [ɹaːjd]  ‘right’ [ɹajt]  ‘rye’ [ɹaj]
‘aid’ [eːjd]  ‘ate’ [ejt]  ‘bay’ [bej]
‘lobe’ [loːwb]  ‘lope’ [lowp]  ‘low’ [low]
‘teethe’ [θiːð]  ‘teeth’ [θiθ]  ‘tea’ [ti]
‘save’ [seːjv]  ‘safe’ [sejf]  ‘say’ [sej]
Step 1: Get the Environments

Step 1:
Determine the environments of the long and short vowels.

- ‘ride’ [ɪəd] ‘right’ [aɪt] ‘rye’ [æj]
- ‘aid’ [eɪd] ‘ate’ [eɪt] ‘bay’ [bej]
- ‘lobe’ [loʊb] ‘lope’ [loʊp] ‘low’ [low]
- ‘save’ [sæv] ‘safe’ [sef] ‘say’ [sej]

▶ The phones that precede a long vowel.
Step 1: Get the Environments

Step 1: Determine the environments of the long and short vowels.

'ride' [ɹa:jd]
'aid' [eːjd]
'lobe' [loːwb]
'teethe' [tʰiːð]
'save' [seːjv]

'right' [ɹajt]
'ate' [eːjt]
'lope' [lɔwbp]
'teeth' [tʰiθ]
'safe' [sejʃ]

'rye' [ɹəj]
'bay' [bɛj]
'low' [lɔw]
'tea' [ti]
'say' [sej]

▶ The phones that precede a long vowel.
  ▶ [ɹ]
Step 1: Get the Environments

Step 1: Determine the environments of the long and short vowels.

<table>
<thead>
<tr>
<th>Long Vowel</th>
<th>Short Vowel</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘ride’</td>
<td>[ɹaːjd]</td>
</tr>
<tr>
<td>‘aid’</td>
<td>[eːjd]</td>
</tr>
<tr>
<td>‘lobe’</td>
<td>[loːwb]</td>
</tr>
<tr>
<td>‘teethe’</td>
<td>[tʰiːð]</td>
</tr>
<tr>
<td>‘save’</td>
<td>[seːjv]</td>
</tr>
</tbody>
</table>

- The phones that precede a long vowel.
  - [ɹ] #
Step 1: Get the Environments

Step 1: Determine the environments of the long and short vowels.

- ‘ride’ [raːjd]  ‘right’ [rajt]  ‘rye’ [raj]
- ‘aid’ [eːjd]  ‘ate’ [ejt]  ‘bay’ [bej]
- ‘teethe’ [tʰiːð]  ‘teeth’ [tʰiθ]  ‘tea’ [ti]
- ‘save’ [seːjv]  ‘safe’ [sejf]  ‘say’ [sej]

▶ The phones that precede a long vowel.
  ▶ [ɹ] # [l]
Step 1: Get the Environments

Step 1:
Determine the environments of the long and short vowels.

‘ride’  [ɹaːjd]  ‘right’  [ɹajt]  ‘rye’  [ɹaj]
‘aid’  [eːjd]  ‘ate’  [ejt]  ‘bay’  [bej]
‘lobe’  [loːwb]  ‘lope’  [lowp]  ‘low’  [low]
‘teethe’  [tʰiːð]  ‘teeth’  [tʰiθ]  ‘tea’  [ti]
‘save’  [seːjv]  ‘safe’  [sejf]  ‘say’  [sej]

▶ The phones that precede a long vowel.

▶  [ɹ]  #  [l]  [tʰ]
Step 1: Get the Environments

Step 1: Determine the environments of the long and short vowels.

- ‘ride’ [ɹaːjd]   ‘right’ [ɹajt]   ‘rye’ [ɹaj]
- ‘aid’ [eːjd]   ‘ate’ [ejt]   ‘bay’ [bej]
- ‘teethe’ [tʰiːð]   ‘teeth’ [tʰiθ]   ‘tea’ [ti]
- ‘save’ [seːv]   ‘safe’ [seʃf]   ‘say’ [sej]

- The phones that precede a long vowel.
- [ɹ] # [l] [tʰ] [s]
Step 1: Get the Environments

Step 1:
Determine the environments of the long and short vowels.

- **‘ride’** [ɹaːjd]  
- **‘aid’** [eːjd]  
- **‘lobe’** [loːwb]  
- **‘teethe’** [tʰiːð]  
- **‘save’** [seːjd]  
- **‘right’** [ɹajt]  
- **‘ate’** [eʃt]  
- **‘lope’** [lɔwp]  
- **‘teeth’** [tʰiθ]  
- **‘safe’** [seʃf]  
- **‘rye’** [ɹaj]  
- **‘bay’** [beʃ]  
- **‘low’** [lɔw]  
- **‘tea’** [ti]  
- **‘say’** [seʃ]

- The phones that precede a long vowel.
  - [ɹ] # [l] [tʰ] [s]

- The phones that follow a long vowel.
Step 1: Get the Environments

Step 1: Determine the environments of the long and short vowels.

- ‘ride’ [rʌːd]  ‘right’ [raɪt]  ‘rye’ [raɪ]
- ‘aid’ [eːd]   ‘ate’ [eɪt]   ‘bay’ [beɪ]
- ‘lobe’ [loːb] ‘lope’ [loʊp] ‘low’ [laʊ]
- ‘teethe’ [tʰiː] ‘teeth’ [tʰiθ] ‘tea’ [tiː]
- ‘save’ [seːv] ‘safe’ [seɪf] ‘say’ [seɪ]

▶ The phones that precede a long vowel.
  ▶ [ʌ] # [l] [tʰ] [s]
▶ The phones that follow a long vowel.
  ▶ [d]
Step 1: Get the Environments

Step 1:
Determine the environments of the long and short vowels.

'ride' [ɹaːjd]  'right' [ɹajt]  'rye' [ɹaj]
'aid' [eːjd]  'ate' [ejt]  'bay' [bej]
'lobe' [loːwb]  'lope' [lowp]  'low' [low]
'teethe' [θiːð]  'teeth' [θiθ]  'tea' [ti]
'save' [seːjv]  'safe' [sejʃ]  'say' [sej]

▶ The phones that precede a long vowel.
  ▶ [ɹ] # [l] [θ] [s]

▶ The phones that follow a long vowel.
  ▶ [d] [b]
Step 1: Get the Environments

Determine the environments of the long and short vowels.

- ‘ride’ [ɹaːd]  ‘right’ [ɹaɪt]  ‘rye’ [ɹai]
- ‘aid’ [eːd]  ‘ate’ [eɪt]  ‘bay’ [beɪ]
- ‘lobe’ [loːb]  ‘lope’ [lɔʊp]  ‘low’ [lɔʊ]
- ‘teethe’ [tʰiː]  ‘teeth’ [tʰiθ]  ‘tea’ [ti]
- ‘save’ [səːv]  ‘safe’ [səf]  ‘say’ [sə]

▶ The phones that precede a long vowel.
  ▶ [ɹ] # [l] [tʰ] [s]
▶ The phones that follow a long vowel.
  ▶ [d] [b] [ð]
Step 1: Get the Environments

Step 1: Determine the environments of the long and short vowels.

- ‘ride’ [ɾaːjd]  ‘right’ [ɾajt]  ‘rye’ [ɾaj]
- ‘aid’ [eid]  ‘ate’ [ejt]  ‘bay’ [bej]
- ‘save’ [seːjav]  ‘safe’ [sejʃ]  ‘say’ [sej]

- The phones that precede a long vowel.
  - [ɾ] # [l] [θ] [s]

- The phones that follow a long vowel.
  - [d] [b] [ð] [v]
Step 1: Get the Environments

Determine the environments of the long and short vowels.

<table>
<thead>
<tr>
<th>English</th>
<th>Kikuyu V Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘ride’</td>
<td>‘rye’</td>
</tr>
<tr>
<td>‘aid’</td>
<td>‘bay’</td>
</tr>
<tr>
<td>‘lobe’</td>
<td>‘low’</td>
</tr>
<tr>
<td>‘teethe’</td>
<td>‘tea’</td>
</tr>
<tr>
<td>‘save’</td>
<td>‘say’</td>
</tr>
</tbody>
</table>

- The phones that precede a long vowel.
  - [ʌ] # [l] [tʰ] [s]
- The phones that follow a long vowel.
  - [d] [b] [ð] [v]
- The phones that precede a short vowel
Step 1: Get the Environments

Step 1:
Determine the environments of the long and short vowels.

'ride' [ɹaɪd] 'right' [ɹaɪt] 'rye' [ɹaj]
'aid' [eɪd] 'ate' [eɪt] 'bay' [beɪ]
'lobe' [loʊb] 'lope' [ləʊp] 'low' [laʊ]
'teethe' [θiː] 'teeth' [θi] 'tea' [ti]
'save' [seɪv] 'safe' [seɪf] 'say' [seɪ]

► The phones that precede a long vowel.
  ► [a] # [l] [θ] [s]

► The phones that follow a long vowel.
  ► [d] [b] [ð] [v]

► The phones that precede a short vowel
  ► [a]
Step 1: Get the Environments

Determine the environments of the long and short vowels.

- ‘aid’ [e:jd]  ‘ate’ [ejt]  ‘bay’ [bej]
- ‘save’ [sə:ʒv]  ‘safe’ [səjʃ]  ‘say’ [səj]

- The phones that precede a long vowel.
  - [ʌ] # [l] [tʰ] [s]
- The phones that follow a long vowel.
  - [d] [b] [ð] [v]
- The phones that precede a short vowel
  - [ʌ] #
Step 1: Get the Environments

Determine the environments of the long and short vowels.

‘ride’ [ɹaːjd] ‘right’ [ɹaɪt] ‘rye’ [ɹaj]
‘aid’ [eːjd] ‘ate’ [eɪt] ‘bay’ [bej]
‘lobe’ [loːwb] ‘lope’ [loʊp] ‘low’ [lɔʊ]
‘teethe’ [tʰiːð] ‘teeth’ [tʰiθ] ‘tea’ [tɪ]
‘save’ [seːdʒ] ‘safe’ [sejf] ‘say’ [sej]

▶ The phones that precede a long vowel.
  ▶ [ʌ] # [l] [tʰ] [s]

▶ The phones that follow a long vowel.
  ▶ [d] [b] [ð] [v]

▶ The phones that precede a short vowel
  ▶ [ʌ] # [l]
Step 1: Get the Environments

Step 1:
Determine the environments of the long and short vowels.

<table>
<thead>
<tr>
<th>Word</th>
<th>Long Vowel</th>
<th>Short Vowel</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘ride’</td>
<td>[rʌːd]</td>
<td></td>
</tr>
<tr>
<td>‘aid’</td>
<td>[ɛːd]</td>
<td></td>
</tr>
<tr>
<td>‘lobe’</td>
<td>[loːb]</td>
<td></td>
</tr>
<tr>
<td>‘teethe’</td>
<td>[θɪː]</td>
<td></td>
</tr>
<tr>
<td>‘save’</td>
<td>[sɛːv]</td>
<td></td>
</tr>
<tr>
<td>‘right’</td>
<td>[rʌːt]</td>
<td></td>
</tr>
<tr>
<td>‘ate’</td>
<td>[ɛt]</td>
<td></td>
</tr>
<tr>
<td>‘lope’</td>
<td>[lɔːp]</td>
<td></td>
</tr>
<tr>
<td>‘teeth’</td>
<td>[θɪ]</td>
<td></td>
</tr>
<tr>
<td>‘safe’</td>
<td>[sɛf]</td>
<td></td>
</tr>
<tr>
<td>‘rye’</td>
<td>[ræ]</td>
<td></td>
</tr>
<tr>
<td>‘bay’</td>
<td>[bej]</td>
<td></td>
</tr>
<tr>
<td>‘low’</td>
<td>[lɔː]</td>
<td></td>
</tr>
<tr>
<td>‘tea’</td>
<td>[teɪ]</td>
<td></td>
</tr>
<tr>
<td>‘say’</td>
<td>[seɪ]</td>
<td></td>
</tr>
</tbody>
</table>

▶ The phones that precede a long vowel.
  ▶ [ɹ] # [l] [θ] [s]

▶ The phones that follow a long vowel.
  ▶ [d] [b] [ð] [v]

▶ The phones that precede a short vowel
  ▶ [ɹ] # [l] [θ]
Step 1: Get the Environments

Step 1: Determine the environments of the long and short vowels.

| ‘ride’   | [ɹaːjd] | ‘right’  | [ɹajt] | ‘rye’   | [ɹaj]  |
|‘aid’     | [aːjd]  | ‘ate’    | [ɛjt]  | ‘bay’   | [bej]  |
|‘lobe’    | [loːwb] | ‘lope’   | [lawp] | ‘low’   | [law]  |
|‘teethe’  | [tʰiːθ] | ‘teeth’  | [tʰiθ] | ‘tea’   | [ti]   |
|‘save’    | [seːjv] | ‘safe’   | [sejf] | ‘say’   | [sej]  |

▶ The phones that precede a long vowel.
  ▶ [ɹ] # [l] [tʰ] [s]

▶ The phones that follow a long vowel.
  ▶ [d] [b] [ð] [v]

▶ The phones that precede a short vowel
  ▶ [ɹ] # [l] [tʰ] [s]
Step 1: Get the Environments

Step 1:
Determine the environments of the long and short vowels.

‘ride’       [ɹaːjd]       ‘right’     [ɹaːjt]       ‘rye’       [ɹaj]
‘aid’        [eːjd]        ‘ate’       [eːjt]        ‘bay’       [bej]
‘lobe’       [loːwb]       ‘lope’      [lowp]       ‘low’       [low]
‘teethe’     [tʰiːð]       ‘teeth’     [tʰiθ]       ‘tea’       [ti]
‘save’       [seːjv]       ‘safe’      [sejʃ]       ‘say’       [sej]

▶ The phones that precede a long vowel.
  ▶ [ɹ] # [l] [tʰ] [s]

▶ The phones that follow a long vowel.
  ▶ [d] [b] [ð] [v]

▶ The phones that precede a short vowel
  ▶ [ɹ] # [l] [tʰ] [s]

▶ The phones that follow a short vowel
Step 1: Get the Environments

Step 1: Determine the environments of the long and short vowels.

'ride'       [ɹaːjd]     'right'       [ɹajt]     'rye'       [ɹaj]  
'aid'        [eːjd]      'ate'        [ɛjt]      'bay'       [bej]   
'lobe'       [loːwb]     'lope'       [ləw]      'low'       [lə]    
'teethe'     [tʰiːð]     'teeth'      [tʰiθ]     'tea'       [ti]     
'save'       [seːjv]     'safe'       [sej]      'say'       [sej]  

▶ The phones that precede a long vowel.
  ▶ [ɹ] # [l] [tʰ] [s]

▶ The phones that follow a long vowel.
  ▶ [d] [b] [ð] [v]

▶ The phones that precede a short vowel
  ▶ [ɹ] # [l] [tʰ] [s]

▶ The phones that follow a short vowel
  ▶ [t]
Step 1: Get the Environments

Determine the environments of the long and short vowels.

- ‘ride’ [ɹaːjd] 'right’ [ɹajt] 'rye’ [ɹaj]
- ‘aid’ [eːjd] 'ate’ [ejt] 'bay’ [bɛj]
- ‘lobe’ [loːwb] 'lope’ [lowp] ‘low’ [low]
- ‘teethe’ [tʰiːð] ‘teeth’ [tʰiθ] ‘tea’ [ti]
- ‘save’ [seːjv] ‘safe’ [sejʃ] ‘say’ [sej]

▶ The phones that precede a long vowel.
  ▶ [ɹ] # [l] [tʰ] [s]

▶ The phones that follow a long vowel.
  ▶ [d] [b] [ð] [v]

▶ The phones that precede a short vowel
  ▶ [ɹ] # [l] [tʰ] [s]

▶ The phones that follow a short vowel
  ▶ [t] [p]
### Step 1: Get the Environments

**Step 1:**
Determine the environments of the long and short vowels.

<table>
<thead>
<tr>
<th>Word</th>
<th>Pronunciation</th>
<th>Word</th>
<th>Pronunciation</th>
<th>Word</th>
<th>Pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘ride’</td>
<td>[əːjd]</td>
<td>‘right’</td>
<td>[əajt]</td>
<td>‘rye’</td>
<td>[əaj]</td>
</tr>
<tr>
<td>‘aid’</td>
<td>[eːjd]</td>
<td>‘ate’</td>
<td>[ejt]</td>
<td>‘bay’</td>
<td>[bej]</td>
</tr>
<tr>
<td>‘lobe’</td>
<td>[loːwb]</td>
<td>‘lope’</td>
<td>[lowp]</td>
<td>‘low’</td>
<td>[low]</td>
</tr>
<tr>
<td>‘teethe’</td>
<td>[tʰiːð]</td>
<td>‘teeth’</td>
<td>[tʰiθ]</td>
<td>‘tea’</td>
<td>[ti]</td>
</tr>
<tr>
<td>‘save’</td>
<td>[seːjv]</td>
<td>‘safe’</td>
<td>[sejf]</td>
<td>‘say’</td>
<td>[sej]</td>
</tr>
</tbody>
</table>

- The phones that precede a long vowel.
  - [ə] # [l] [tʰ] [s]

- The phones that follow a long vowel.
  - [d] [b] [ð] [v]

- The phones that precede a short vowel.
  - [ə] # [l] [tʰ] [s]

- The phones that follow a short vowel.
  - [t] [p] [θ]
Step 1: Get the Environments

Determine the environments of the long and short vowels.

‘ride’ [ɹaːjd]  ‘right’ [ɹajt]  ‘rye’ [ɹaj]
‘aid’ [eːjd]  ‘ate’ [ejt]  ‘bay’ [bej]
‘lobe’ [lɔːwb]  ‘lope’ [lowp]  ‘low’ [low]
‘teethe’ [tʰiːð]  ‘teeth’ [tʰiθ]  ‘tea’ [ti]
‘save’ [seːjv]  ‘safe’ [sejf]  ‘say’ [sej]

▶ The phones that precede a long vowel.
  ▶ [ɹ] # [l] [tʰ] [s]

▶ The phones that follow a long vowel.
  ▶ [d] [b] [ð] [v]

▶ The phones that precede a short vowel
  ▶ [ɹ] # [l] [tʰ] [s]

▶ The phones that follow a short vowel
  ▶ [t] [p] [θ] [f]
Step 1: Get the Environments

Determine the environments of the long and short vowels.

<table>
<thead>
<tr>
<th>Word</th>
<th>Long Vowel</th>
<th>Short Vowel</th>
</tr>
</thead>
<tbody>
<tr>
<td>ride'</td>
<td>[ɹaɹd]</td>
<td></td>
</tr>
<tr>
<td>‘aid’</td>
<td>[eɹd]</td>
<td></td>
</tr>
<tr>
<td>‘lobe’</td>
<td>[lɔɹwb]</td>
<td></td>
</tr>
<tr>
<td>‘teethe’</td>
<td>[tʰɪɹ]</td>
<td></td>
</tr>
<tr>
<td>‘save’</td>
<td>[sɛɹv]</td>
<td></td>
</tr>
<tr>
<td>‘right’</td>
<td>[ɹaɹt]</td>
<td></td>
</tr>
<tr>
<td>‘ate’</td>
<td>[eɹt]</td>
<td></td>
</tr>
<tr>
<td>‘lope’</td>
<td>[lɔɹp]</td>
<td></td>
</tr>
<tr>
<td>‘teeth’</td>
<td>[tʰɪθ]</td>
<td></td>
</tr>
<tr>
<td>‘safe’</td>
<td>[sɛɹf]</td>
<td></td>
</tr>
<tr>
<td>‘rye’</td>
<td>[ɹaɹ]</td>
<td></td>
</tr>
<tr>
<td>‘bay’</td>
<td>[bɛɹ]</td>
<td></td>
</tr>
<tr>
<td>‘low’</td>
<td>[lɔɹ]</td>
<td></td>
</tr>
<tr>
<td>‘tea’</td>
<td>[tɛɹ]</td>
<td></td>
</tr>
<tr>
<td>‘say’</td>
<td>[sɛɹ]</td>
<td></td>
</tr>
</tbody>
</table>

- The phones that precede a long vowel.
  - [ɹ] # [l] [tʰ] [s]
- The phones that follow a long vowel.
  - [d] [b] [ð] [n]
- The phones that precede a short vowel
  - [ɹ] # [l] [tʰ] [s]
- The phones that follow a short vowel
  - [t] [p] [θ] [f] #
Step 2: Look for Similarities

For each environment, look for similarities between the sounds.

- Write up four lists:
  1. Similarities between phones preceding a long vowel
  2. Similarities between phones following a long vowel
  3. Similarities between phones preceding a short vowel
  4. Similarities between phones following a short vowel

Note: No phones share anything in common with ‘#’
Step 2: Look for Similarities

Step 2:
For each environment, look for any commonalities between the sounds in question.

- ‘aid’ [e:jd]  ‘ate’ [ejt]  ‘bay’ [bej]
- ‘save’ [se:jd]  ‘safe’ [sejf]  ‘say’ [sej]

▶ The phones that precede a long vowel.
  ▶ [ɪ] [l] [θ] [s]
Step 2: Look for Similarities

Step 2: For each environment, look for any commonalities between the sounds in question.

- ‘ride’     [ɹaːɹd]      ‘right’       [ɹaːɹt]      ‘rye’        [ɹaːɹ]
- ‘aid’      [eːɹd]       ‘ate’        [eɹt]       ‘bay’        [beɹ]
- ‘teethe’   [θiːɹ]       ‘teeth’      [θiɹ]       ‘tea’        [ti]
- ‘save’     [sɛɹv]       ‘safe’       [sɛɹf]      ‘say’        [sɛɹ]

▶ The phones that precede a long vowel.
  ▶ [ɹ] # [l] [θ] [s] Nothing in common
Step 2: Look for Similarities

For each environment, look for any commonalities between the sounds in question.

- ‘aid’  [e:jd]  ‘ate’  [ejt]  ‘bay’  [bej]
- ‘save’  [se:jv]  ‘safe’  [sejf]  ‘say’  [sej]

▶ The phones that precede a long vowel.
  ▶ [ɪ] # [l] [θ] [s]  **Nothing in common**

▶ The phones that follow a long vowel.
  ▶ [d] [b] [ð] [v]
Step 2: Look for Similarities

Step 2:
For each environment, look for any commonalities between the sounds in question.

- ‘ride’ [ɪəːd] ‘right’ [ɪəjt] ‘rye’ [ɪəj]
- ‘aid’ [eːd] ‘ate’ [eɪt] ‘bay’ [bej]
- ‘lobe’ [ləʊwb] ‘lope’ [ləʊp] ‘low’ [ləʊ]
- ‘teethe’ [tʰiːð] ‘teeth’ [tʰiθ] ‘tea’ [ti]

- The phones that precede a long vowel.
  - [ɪ] # [l] [tʰ] [s] Nothing in common
- The phones that follow a long vowel.
  - [d] [b] [ð] [v] All are voiced!
Step 2: Look for Similarities

Step 2:
For each environment, look for any commonalities between the sounds in question.

- ‘ride’ [ɹaːjd]  ‘right’ [ɹajt]  ‘rye’ [ɹaj]
- ‘aid’ [eːjd]  ‘ate’ [eɪjt]  ‘bay’ [bej]
- ‘save’ [seːv]  ‘safe’ [sejf]  ‘say’ [sej]

▶ The phones that precede a long vowel.
  - [ɹ] # [l] [θ] [s]  Nothing in common

▶ The phones that follow a long vowel.
  - [d] [b] [ð] [v]  All are voiced!

▶ The phones that precede a short vowel
  - [ɹ] # [l] [θ] [s]
### Step 2: Look for Similarities

For each environment, look for any commonalities between the sounds in question.

<table>
<thead>
<tr>
<th>Word</th>
<th>Pronunciation</th>
<th>Word</th>
<th>Pronunciation</th>
<th>Word</th>
<th>Pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘ride’</td>
<td>[uːa:jd]</td>
<td>‘right’</td>
<td>[uajt]</td>
<td>‘rye’</td>
<td>[uaj]</td>
</tr>
<tr>
<td>‘aid’</td>
<td>[eːjd]</td>
<td>‘ate’</td>
<td>[ejt]</td>
<td>‘bay’</td>
<td>[bej]</td>
</tr>
<tr>
<td>‘lobe’</td>
<td>[loːwb]</td>
<td>‘lope’</td>
<td>[lowp]</td>
<td>‘low’</td>
<td>[low]</td>
</tr>
<tr>
<td>‘teethe’</td>
<td>[tʰiːðə]</td>
<td>‘teeth’</td>
<td>[tʰiθ]</td>
<td>‘tea’</td>
<td>[ti]</td>
</tr>
<tr>
<td>‘save’</td>
<td>[seːjv]</td>
<td>‘safe’</td>
<td>[sejf]</td>
<td>‘say’</td>
<td>[sej]</td>
</tr>
</tbody>
</table>

- **The phones that precede a long vowel.**
  - [ʌ] # [l] [tʰ] [s] **Nothing in common**
  - [d] [b] [ð] [v] **All are voiced!**
- **The phones that follow a long vowel.**
  - [ɹ] # [l] [tʰ] [s] **Nothing in common**
Step 2: Look for Similarities

Step 2:
For each environment, look for any commonalities between the sounds in question.

- ‘ride’  [uːaːd]    ‘right’  [uːaɪt]    ‘rye’   [uːaɪ]
- ‘aid’   [eːd]      ‘ate’    [eɪt]      ‘bay’   [beɪ]
- ‘lobe’  [loːb]     ‘lope’   [lʌp]      ‘low’   [lɔʊ]
- ‘teethe’ [tʰiːð]   ‘teeth’  [tʰiː]     ‘tea’   [tiː]
- ‘save’  [sɛːv]     ‘safe’   [sɛf]      ‘say’   [seɪ]

▶ The phones that precede a long vowel.
  ▶ [ə] # [l] [tʰ] [s]  Nothing in common
▶ The phones that follow a long vowel.
  ▶ [d] [b] [ð] [v]   All are voiced!
▶ The phones that precede a short vowel
  ▶ [ə] # [l] [tʰ] [s]  Nothing in common
▶ The phones that follow a short vowel
  ▶ [t] [p] [θ] [f] #

Step 2: Look for Similarities

Step 2:
For each environment, look for any commonalities between the sounds in question.

- ‘ride’  [uːaːd]    ‘right’  [uːaɪt]    ‘rye’   [uːaɪ]
- ‘aid’   [eːd]      ‘ate’    [eɪt]      ‘bay’   [beɪ]
- ‘lobe’  [loːb]     ‘lope’   [lʌp]      ‘low’   [lɔʊ]
- ‘teethe’ [tʰiːð]   ‘teeth’  [tʰiː]     ‘tea’   [tiː]
- ‘save’  [sɛːv]     ‘safe’   [sɛf]      ‘say’   [seɪ]

▶ The phones that precede a long vowel.
  ▶ [ə] # [l] [tʰ] [s]  Nothing in common
▶ The phones that follow a long vowel.
  ▶ [d] [b] [ð] [v]   All are voiced!
▶ The phones that precede a short vowel
  ▶ [ə] # [l] [tʰ] [s]  Nothing in common
▶ The phones that follow a short vowel
  ▶ [t] [p] [θ] [f] #
Deducing Allophonic Rules

Part 1

Course Readings
Introduction and Review
The Logic of Phonemic Analysis
The Procedure for Finding Rules
The Main Sub-Tasks
Example: Kikuyu V Length
Task 1
Example: English V Length
Task 1
Task 2
Breaking Down Task 2
The Steps
The Notation for Rules
Summary

Step 2: Look for Similarities

Step 2:
For each environment, look for any commonalities between the sounds in question.

- ‘ride’ [ʌaːjd] ‘right’ [ʌajt] ‘rye’ [ʌaj]
- ‘aid’ [eːjd] ‘ate’ [ejt] ‘bay’ [bej]
- ‘teethe’ [tʰiːɵ] ‘teeth’ [tʰiθ] ‘tea’ [ti]
- ‘save’ [seːjv] ‘safe’ [sejf] ‘say’ [sej]

▶ The phones that precede a long vowel.
  ▶ [ʌ] [l] [tʰ] [s] Nothing in common
  ▶ [d] [b] [ʊ] [v] All are voiced!
▶ The phones that follow a long vowel.
  ▶ [ʌ] [l] [tʰ] [s] Nothing in common
  ▶ [t] [p] [θ] [f] # Nothing in common
Step 3: Look for Unique Environment

See if any of the environments are unique to a particular allophone.

- For each allophone [X]...
  - Look at environments for [X] where the sounds share a feature in common.
  - Check whether the corresponding environment for [Y] can have that feature.
  - If not, then that environment is unique to [X]!
Step 3: Look for Unique Environment

Step 3:
See if any environments are unique to a particular allophone.

<table>
<thead>
<tr>
<th>Word</th>
<th>Pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>'ride'</td>
<td>[ɹaːjd]</td>
</tr>
<tr>
<td>'aid'</td>
<td>[eːjd]</td>
</tr>
<tr>
<td>'lobe'</td>
<td>[loːwb]</td>
</tr>
<tr>
<td>'teethe'</td>
<td>[tʰiːð]</td>
</tr>
<tr>
<td>'save'</td>
<td>[seːjv]</td>
</tr>
<tr>
<td>'right'</td>
<td>[ɹajt]</td>
</tr>
<tr>
<td>'ate'</td>
<td>[ejt]</td>
</tr>
<tr>
<td>'lope'</td>
<td>[lowp]</td>
</tr>
<tr>
<td>'teeth'</td>
<td>[tʰiθ]</td>
</tr>
<tr>
<td>'safe'</td>
<td>[sejf]</td>
</tr>
<tr>
<td>'rye'</td>
<td>[ɹaj]</td>
</tr>
<tr>
<td>'bay'</td>
<td>[bej]</td>
</tr>
<tr>
<td>'low'</td>
<td>[low]</td>
</tr>
<tr>
<td>'tea'</td>
<td>[ti]</td>
</tr>
<tr>
<td>'say'</td>
<td>[sej]</td>
</tr>
</tbody>
</table>

Step 3: Look for Unique Environment
See if any environments are unique to a particular allophone.

- 'ride' [ɹaːjd]  'right' [ɹajt]  'rye' [ɹaj]
- 'aid' [eːjd]    'ate' [ejt]    'bay' [bej]
- 'lobe' [loːwb]  'lope' [lowp]  'low' [low]
- 'teethe' [tʰiːð] 'teeth' [tʰiθ]  'tea' [ti]
- 'save' [seːjv]  'safe' [sejf]   'say' [sej]

- The phones that precede a long vowel.
  - [ɹ] # [l] [t] [s]
  - Nothing in common
- The phones that follow a long vowel.
  - [d] [b] [D] [v]
  - All are voiced!
- The phones that precede a short vowel.
  - [ɹ] # [l] [t] [s]
  - Nothing in common
- The phones that follow a short vowel.
  - [t] [p] [T] [f] #
  - Nothing in common
Step 3: Look for Unique Environment

See if any environments are unique to a particular allophone.

- 'ride' [ʌ:a:jd]
- 'aid' [eːjd]
- 'lobe' [loːwb]
- 'teethe' [tʰiːð]
- 'save' [seːjv]
- 'right' [ʌajt]
- 'ate' [ejt]
- 'lope' [lowp]
- 'teeth' [tʰiθ]
- 'safe' [sejʃ]
- 'rye' [ʌaj]
- 'bay' [bej]
- 'low' [low]
- 'tea' [ti]
- 'say' [sej]

- The phones that precede a long vowel.
  - [ʌ] # [l] [tʰ] [s] Nothing in common
- The phones that follow a long vowel.
  - [d] [b] [ð] [v] All are voiced!
- The phones that precede a short vowel
  - [ʌ] # [l] [tʰ] [s] Nothing in common
- The phones that follow a short vowel
  - [t] [p] [θ] [f] # Nothing in common
Step 3: Look for Unique Environment

See if any environments are unique to a particular allophone.

- Look at the environments where the phones share a feature in common.

- The phones that precede a long vowel:
  - [ɹ] [ɻ] [θ] [ɹ] Nothing in common

- The phones that follow a long vowel:
  - [d] [b] [ð] [ɹ] All are voiced!

- The phones that precede a short vowel:
  - [ɹ] [ɻ] [θ] [ɹ] Nothing in common

- The phones that follow a short vowel:
  - [t] [p] [θ] [f] # Nothing in common
Step 3: Look for Unique Environment

Step 3:
See if any environments are unique to a particular allophone.

- Look at the environments where the phones share a feature in common.

- ‘ride’ [rɑːd] ‘right’ [rɑːt] ‘rye’ [rɑː]
- ‘aid’ [eːd] ‘ate’ [eɪt] ‘bay’ [beɪ]
- ‘lobe’ [loʊb] ‘lope’ [loʊp] ‘low’ [lɔʊ]
- ‘teethe’ [tʰiːð] ‘teeth’ [tʰiθ] ‘tea’ [ti]
- ‘save’ [seːv] ‘safe’ [seɪf] ‘say’ [seɪ]

- The phones that follow a long vowel.
  - [d] [b] [ð] [v] All are voiced!
Step 3: Look for Unique Environment

Step 3:
See if any environments are unique to a particular allophone.

- Look at the corresponding environment for the other phone.

- See if they can share that feature too.

<table>
<thead>
<tr>
<th>'ride'</th>
<th>[ˈaːjd]</th>
<th>'right'</th>
<th>[ˈaːjt]</th>
<th>'rye'</th>
<th>[ˈaːj]</th>
</tr>
</thead>
<tbody>
<tr>
<td>'aid'</td>
<td>[ɛːjd]</td>
<td>'ate'</td>
<td>[ɛjt]</td>
<td>'bay'</td>
<td>[bej]</td>
</tr>
<tr>
<td>'lobe'</td>
<td>[loːwb]</td>
<td>'lope'</td>
<td>[lowp]</td>
<td>'low'</td>
<td>[low]</td>
</tr>
<tr>
<td>'teethe'</td>
<td>[tʰiːt]</td>
<td>'teeth'</td>
<td>[tʰiθ]</td>
<td>'tea'</td>
<td>[ti]</td>
</tr>
<tr>
<td>'save'</td>
<td>[seːjv]</td>
<td>'safe'</td>
<td>[sejf]</td>
<td>'say'</td>
<td>[sej]</td>
</tr>
</tbody>
</table>

▶ The phones that follow a long vowel.
  ▶ [d] [b] [ð] [v]  All are voiced!
Step 3: Look for Unique Environment

Step 3:
See if any environments are unique to a particular allophone.

- Look at the corresponding environment for the other phone.
- See if they can share that feature too.

<table>
<thead>
<tr>
<th>Word</th>
<th>Pronunciation</th>
<th>Word</th>
<th>Pronunciation</th>
<th>Word</th>
<th>Pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ride’</td>
<td>[əaːjd]</td>
<td>right’</td>
<td>[əajt]</td>
<td>rye’</td>
<td>[əaj]</td>
</tr>
<tr>
<td>aid’</td>
<td>[eːjd]</td>
<td>ate’</td>
<td>[eʃt]</td>
<td>bay’</td>
<td>[bej]</td>
</tr>
<tr>
<td>lobe’</td>
<td>[loːwb]</td>
<td>lope’</td>
<td>[lowp]</td>
<td>low’</td>
<td>[low]</td>
</tr>
<tr>
<td>teethe’</td>
<td>[tʰiːð]</td>
<td>teeth’</td>
<td>[tʰiθ]</td>
<td>tea’</td>
<td>[ti]</td>
</tr>
<tr>
<td>save’</td>
<td>[seːjv]</td>
<td>safe’</td>
<td>[seʃf]</td>
<td>say’</td>
<td>[sej]</td>
</tr>
</tbody>
</table>

- The phones that follow a long vowel.
  - [d] [b] [ð] [v]  All are voiced!

- The phones that follow a short vowel
  - [t] [p] [θ] [f]  None are voiced!
Step 3: Look for Unique Environment

See if any environments are unique to a particular allophone.

- Look at the corresponding environment for the other phone.
- See if they can share that feature too.

<table>
<thead>
<tr>
<th>Word</th>
<th>Pronunciation</th>
<th>Word</th>
<th>Pronunciation</th>
<th>Word</th>
<th>Pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ride</td>
<td>[ɹaːjd]</td>
<td>right</td>
<td>[ɾaajt]</td>
<td>rye</td>
<td>[ɾaːj]</td>
</tr>
<tr>
<td>aid</td>
<td>[eːjd]</td>
<td>ate</td>
<td>[ejt]</td>
<td>bay</td>
<td>[bej]</td>
</tr>
<tr>
<td>lobe</td>
<td>[loːwb]</td>
<td>lope</td>
<td>[lowp]</td>
<td>low</td>
<td>[low]</td>
</tr>
<tr>
<td>'teethe'</td>
<td>[tʰiːd]</td>
<td>teeth</td>
<td>[tʰiθ]</td>
<td>tea</td>
<td>[ti]</td>
</tr>
<tr>
<td>'save'</td>
<td>[seːjv]</td>
<td>'safe'</td>
<td>[sejʃ]</td>
<td>'say'</td>
<td>[sej]</td>
</tr>
</tbody>
</table>

- The phones that follow a long vowel.
  - [d] [b] [ð] [ɹ] **All are voiced!**
- The phones that follow a short vowel
  - [t] [p] [θ] [f] # **None are voiced!**

Only long vowels can precede voiced Cs!
Step 4: Write the Rule

Step 4:
If there’s an environment unique to one allophone, write the rule deriving that allophone in that environment.

Remember our logic from earlier:
▶ If there’s an environment where you only find short vowels...
▶ ...then there’s a rule turning long vowels into short ones there.
▶ If there’s an environment where you only find long vowels...
▶ ...then there’s a rule turning short vowels into long ones there.

Rule of Thumb:
If there are two allophones \[X\] and \[Y\], and only \[X\] appears in environment \(Z\), the rule is:

\[/Y/ \text{ is pronounced as } [X] \text{ in } Z\]
Step 4: Write the Rule

Step 4:
If there’s an environment unique to one allophone, write the rule deriving that allophone in that environment.

Remember our logic from earlier:

▶ If there’s an environment where you only find short vowels...
  ▶ ...then there’s a rule turning long vowels into short ones there.
▶ If there’s an environment where you only find long vowels...
  ▶ ...then there’s a rule turning short vowels into long ones there.
Step 4: Write the Rule

Step 4:
If there’s an environment unique to one allophone, write the rule deriving that allophone in that environment.

Remember our logic from earlier:

- If there’s an environment where you only find short vowels...
  - ...then there’s a rule turning long vowels into short ones there.
- If there’s an environment where you only find long vowels...
  - ...then there’s a rule turning short vowels into long ones there.

Rule of Thumb:
If there are two allophones [X] and [Y], and only [X] appears in environment Z, the rule is: “/Y/ is pronounced as [X] in Z”
Deducing Allophonic Rules

Part 1

Course Readings
Introduction and Review
The Logic of Phonemic Analysis
The Procedure for Finding Rules
The Main Sub-Tasks
Example: Kikuyu V Length
Task 1
Example: English V Length
Task 1
Task 2
Breaking Down Task 2
The Steps
The Notation for Rules
Summary

Step 4: Write the Rule

Step 4:
If there’s an environment unique to one allophone, write the rule deriving that allophone in that environment.

<table>
<thead>
<tr>
<th>Word</th>
<th>Allophone</th>
<th>Word</th>
<th>Allophone</th>
<th>Word</th>
<th>Allophone</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘ride’</td>
<td>[uajd]</td>
<td>‘right’</td>
<td>[uajt]</td>
<td>‘rye’</td>
<td>[uaj]</td>
</tr>
<tr>
<td>‘aid’</td>
<td>[e:jd]</td>
<td>‘ate’</td>
<td>[ejt]</td>
<td>‘bay’</td>
<td>[bej]</td>
</tr>
<tr>
<td>‘save’</td>
<td>[se:jv]</td>
<td>‘safe’</td>
<td>[sejf]</td>
<td>‘say’</td>
<td>[sej]</td>
</tr>
</tbody>
</table>

Only long vowels can precede voiced Cs!
Step 4: Write the Rule

Step 4: If there’s an environment unique to one allophone, write the rule deriving that allophone in that environment.

<table>
<thead>
<tr>
<th>Word</th>
<th>Allophone 1</th>
<th>Allophone 2</th>
<th>Allophone 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘ride’</td>
<td>[u:a:jd]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘aid’</td>
<td>[ej:jd]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘lobe’</td>
<td>[lo:wb]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘teethe’</td>
<td>[thi:dia]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘save’</td>
<td>[se:jv]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘right’</td>
<td>[u:ajt]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘ate’</td>
<td>[ejt]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘lope’</td>
<td>[lowp]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘teeth’</td>
<td>[thi:0]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘safe’</td>
<td>[sejf]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Only long vowels can precede voiced Cs!

Rule of Thumb: If there are two allophones [X] and [Y], and only [X] appears in environment Z, the rule is: “/Y/ is pronounced as [X] in Z”
Step 4: Write the Rule

If there’s an environment unique to one allophone, write the rule deriving that allophone in that environment.

| ‘ride’   | [ua:jd] | ‘right’    | [uajt] | ‘rye’     | [uaj]  |
| ‘aid’    | [e:jd]  | ‘ate’      | [ejt]  | ‘bay’     | [bej]  |
| ‘teethe’ | [tʰi:ð] | ‘teeth’    | [tʰiθ] | ‘tea’     | [t̪i]  |
| ‘save’   | [se:jv] | ‘safe’     | [sejf] | ‘say’     | [sej]  |

Only long vowels can precede voiced Cs!

Rule of Thumb:
If there are two allophones [X] and [Y], and only [X] appears in environment Z, the rule is: “/Y/ is pronounced as [X] in Z”

The Rule:
A short vowel is pronounced as a long vowel when preceding a voiced C.
Conclusions

The Question:
In English, are the long vowels and short vowels allophones of the same phoneme?

The Answer:
- They are allophones of the **same** phoneme (namely, short vowels)
- The phonological rule that relates them is the following: “In English, a short vowel is pronounced as a long vowel when preceding a voiced C.”
Conclusions

The Question:
In English, are the long vowels and short vowels allophones of the same phoneme?

The Answer:
- They are allophones of the same phoneme (namely, short vowels)
- The phonological rule that relates them is the following: “In English, a short vowel is pronounced as a long vowel when preceding a voiced C.”

If all this went by quickly for you, don’t worry. We’ll do several more examples together...
A Notation for Phonological Rules

There’s a handy notation linguists use to write phonological rules.
A Notation for Phonological Rules

There’s a handy notation linguists use to write phonological rules.

First Rule Template: / X / → [ Y ] / ___ A

“/X/ is pronounced as [Y] when preceding A”.

Example:

/ V / → [ V ] / C

“/V/ is pronounced as /V/ when preceding /C/”.

The Logic of Phonemic Analysis

The Procedure for Finding Rules

The Notation for Rules

Summary
A Notation for Phonological Rules

There’s a handy notation linguists use to write phonological rules.

First Rule Template: 

\[
/X/ \rightarrow [Y]/ \quad \text{A}
\]

"/X/ is pronounced as [Y] when preceding A".

Second Rule Template: 

\[
/X/ \rightarrow [Y]/ \quad A
\]

"/X/ is pronounced as [Y] when following A".

Example:

\[
/V/ \rightarrow [V]/ \quad \text{Voiced-C}
\]

"A short V is pronounced as a long V when preceding a voiced C"
A Notation for Phonological Rules

There’s a handy notation linguists use to write phonological rules.

First Rule Template: / X / → [ Y ] / ___ A
“/X/ is pronounced as [Y] when preceding A”.

Second Rule Template: / X / → [ Y ] / A ___
“/X/ is pronounced as [Y] when following A”.

Third Rule Template: / X / → [ Y ] / A ___ B
“/X/ is pronounced as [Y] when following A and preceding B.”
A Notation for Phonological Rules

There’s a handy notation linguists use to write phonological rules.

First Rule Template: / X / → [ Y ] / ___ A
“/X/ is pronounced as [Y] when preceding A”.

Second Rule Template: / X / → [ Y ] / A ___
“/X/ is pronounced as [Y] when following A”.

Third Rule Template: / X / → [ Y ] / A ___ B
“/X/ is pronounced as [Y] when following A and preceding B.”

Example: / V / → [ Vː ] / ___ Voiced-C
“A short V is pronounced as a long V when preceding a voiced C”
Summary

General Question:
Are \([X]\) and \([Y]\) allophones of the same phoneme?
Summary

General Question:
Are [X] and [Y] allophones of the same phoneme?

- First Main Sub-Task:
Determine if there are minimal pairs for [X] and [Y].
  - If there are, STOP!
    - [X] and [Y] are allophones of different phonemes.
  - If there aren’t, move on to Second Main Sub-Task.
Summary

General Question:
Are [X] and [Y] allophones of the same phoneme?

- Second Main Subtask:
  Determine if there is a rule deriving [X] and [Y] from the same phoneme.
Summary

General Question:
Are [X] and [Y] allophones of the same phoneme?

- **Second Main Subtask:**
  Determine if there is a rule deriving [X] and [Y] from the same phoneme.

  - **Step 1:**
    Determine the environments of the two phones.
Summary

General Question:
Are [X] and [Y] allophones of the same phoneme?

▶ Second Main Subtask:
Determine if there is a rule deriving [X] and [Y] from the same phoneme.

▶ Step 1:
Determine the environments of the two phones.

▶ Step 2:
For each environment, look for similarities between the sounds.
Summary

General Question:
Are [X] and [Y] allophones of the same phoneme?

▶ Second Main Subtask:
Determine if there is a rule deriving [X] and [Y] from the same phoneme.

▶ Step 1:
Determine the environments of the two phones.

▶ Step 2:
For each environment, look for similarities between the sounds.

▶ Step 3:
See if any environments are unique to a particular allophone.
Summary

General Question:
Are [X] and [Y] allophones of the same phoneme?

- **Second Main Subtask:** Determine if there is a rule deriving [X] and [Y] from the same phoneme.
  - **Step 1:** Determine the environments of the two phones.
  - **Step 2:** For each environment, look for similarities between the sounds.
  - **Step 3:** See if any environments are unique to a particular allophone.
  - **Step 4:** If there’s an environment unique to one allophone, write the rule deriving that allophone in that environment.