

Phonemic Tagging with the Unisyn lexicon

LaBB-CAT includes the *Unisyn layer manager*, which is designed for ingesting [Unisyn](#) accent-specific lexicons. Unisyn must be downloaded separately, and the included scripts executed to produce a lexicon for the desired variety. The resulting file can be added to LaBB-CAT, and then the layer manager can be configured to use it for tagging word tokens with their phonemic transcriptions.

Unisyn is a ‘master lexicon’ of English, which contains:

- orthography
- part-of-speech
- pronunciation, in an ‘accent neutral’ form
- ‘enriched orthography’ showing morphological information
- frequency, as derived from various sources, including the British National Corpus, Time articles, Gutenberg, etc.

The pronunciations in the lexicon can be converted into an accent-specific form using perl scripts that are included with the lexicon.

Getting Unisyn

Unisyn is available under a non-commercial license, and must be acquired separately from this layer manager. To acquire Unisyn, you must first register on the the Unisyn website and accept the terms of their license. The Unisyn website is here:

<http://www.cstr.ed.ac.uk/projects/unisyn/>

(This layer manager has been tested with version 1.3 of Unisyn)

Install the Layer Manager

First, the *Unisyn* layer manager module must be installed:

1. Select the *layer managers* menu option.
2. Follow the *List of layer managers that are not yet installed* link near the bottom.
3. Find “Unisyn” in the list, and press its *Install* button, then *Install* again.
4. Press *Configure* to install the default version of the dictionary.

You will see a progress bar while the layer manager loads the data from the dictionary file into the LaBB-CAT database. This will take a minute or so.

Using Unisyn with this layer manager

Once you've got Unisyn, you can use it to produce accent-specific lexicons, and provide these lexicons to the layer manager, which then uses them to annotate words in LaBB-CAT.

For example, if you want to annotate your transcripts with 'General American English' pronunciations:

1. Generate the General American English (*gam*) lexicon by running the following Unisyn commands:
 1. `get-exceptions.pl -a gam -f unilex > gam.1`
 2. `post-lex-rules.pl -a gam -f gam.1 > gam.2`
 3. `map-unique.pl -a gam -f gam.2 > gam.unisyn`. This gives you the file *gam.unisyn*, which is the lexicon file you need for the next step.
2. Upload the accent-specific lexicon into LaBB-CAT:
 1. select *layer managers* on the menu
 2. find the *Unisyn layer manager* in the list, and click the extensions button (the second-to-last button on the right)
 3. press *Choose File* and select the *gam.unisyn* file you generated above.
 4. press *Upload*.
3. Create the layer for your pronunciation annotations:
 1. select *word layers* on the menu
 2. add a new layer called something like "GAM Pronunciations", selecting *Unisyn* as the layer manager, and *Phonological* as the layer type.
 3. check the settings, but most likely the default options are correct, so press *Save*

Mapping Unisyn pronunciations to the DISC phoneme set

LaBB-CAT's processing of phonological layers assumes that the annotations use the DISC phoneme set designed for the CELEX phonemic transcriptions. This set is used because each phoneme is expressed by precisely one ASCII character, including phonemes usually expressed using a digraph - e.g. affricates like /tʃ/ (which is /J/ in DISC) and diphthongs like /aɪ/ (which is /2/ in DISC)

Unisyn transcriptions use a set of phones that is greater than the set of phones available in DISC, and the transcriptions are designed to be broadly phonetic, not phonemic.

This means that using the DISC representation of the transcripts is imperfect, as there is a certain amount of loss of information when mapping Unisyn phones to DISC phonemes. The mapping that is used is shown below.

| Unisyn | | DISC | IPA | Lexical set e.g. |
|--------|---|------|-----|--|
| Ah | → | # | ∅: | BATH |
| aa | → | Q | ɒ | PALM → LOT |
| ar | → | Q | ɒ | start → PALM → LOT |
| oa | → | { | æ | BANANA → TRAP |
| ao | → | # | ɑ: | MAZDA → BATH |
| e | → | E | ɛ | DRESS |
| er | → | E | ɛ | r-coloured DRESS in scots en |
| a | → | { | æ | TRAP |
| eh | → | { | æ | ann use TRAP |
| ou | → | 5 | əʊ | GOAT - but a monophthong for in some varieties |
| oul | → | 5 | əʊ | goal - post vocalic GOAT |
| ouw | → | 5 | əʊ | KNOW → GOAT (except for Abergave) |
| o | → | Q | ɒ | LOT |
| oou | → | Q | ɒ | adios → LOT |
| au | → | Q | ɒ | CLOTH → LOT (but a diphthong in some en-US) |
| oo | → | \$ | ɔ: | THOUGHT (but a diphthong in some varieties) |
| or | → | \$ | ɔ: | r-coloured THOUGHT |
| ii | → | i | i: | FLEECE |
| iy | → | i | i: | HAPPY - I for some varieties |
| ie | → | i | i: | HARRIET - Leeds only |
| ii; | → | i | i: | AGREED → FLEECE |
| ir | → | i | i: | NEARING - r-coloured NEAR → FLEECE |
| ir; | → | i | i: | near - scots-long NEAR → FLEECE |
| i | → | I | ɪ | KIT |
| @ | → | @ | ə | schwa |
| @r | → | @ | ə | r-coloured schwa |
| uh | → | V | ʌ | STRUT |
| u | → | U | ʊ | FOOT |
| uu | → | u | u: | GOOSE |
| iu | → | u | u: | BLEW → GOOSE |
| uu; | → | u | u: | brewed → GOOSE |
| uw | → | u | u: | louise → GOOSE |
| uul | → | u | u: | goul - post-vocalic GOOSE |
| ei | → | 1 | eɪ | FACE |
| ee | → | 1 | eɪ | WASTE → FACE (except for abercrave) |
| ai | → | 2 | aɪ | PRICE |
| ae | → | 2 | aɪ | TIED → PRICE (except Edi and Aberdeen) |
| ae | → | 2 | aɪ | TIED → PRICE (except Edi and Aberdeen) |
| aer | → | 2 | aɪ | FIRE - r-coloured PRICE |
| aai | → | 2 | aɪ | TIME → PRICE (except S. Carolina) |
| oir | → | 2 | aɪ | COIR - r-coloured PRICE |

| Unisyn | | DISC | IPA | Lexical set e.g. |
|--------|---|------|-----|--|
| @@r | → | 3 | ɜ: | NURSE |
| oi | → | 4 | ɔɪ | CHOICE |
| ow | → | 6 | aʊ | MOUTH |
| owr | → | 6 | aʊ | HOUR - r-coloured MOUTH |
| oow | → | 6 | aʊ | HOUR → MOUTH (exception S. Carolina) |
| i@ | → | 7 | ɪə | NEAR |
| iir | → | 7 | ɪə | beard → NEAR (except en-AU) |
| eir | → | 8 | ɛə | SQUARING (actually a monophthong in many varieties) |
| ur | → | 9 | ʊə | JURY |
| ur; | → | 9 | ʊə | CURE - scots-long JURY |
| iur | → | 9 | ʊə | curious - JURY exception in Cardiff & Abercrave |
| p | → | p | p | |
| t | → | t | t | |
| ? | → | ? | ʔ | (glottal stop) |
| t^ | → | L | r | butter/merry flap |
| k | → | k | k | |
| x | → | x | x | loch |
| b | → | b | b | |
| d | → | d | d | |
| g | → | g | g | |
| ch | → | J | tʃ | |
| jh | → | — | dʒ | |
| s | → | s | s | |
| z | → | z | z | |
| sh | → | S | ʃ | |
| zh | → | Z | ʒ | |
| f | → | f | f | |
| v | → | v | v | |
| th | → | T | θ | |
| dh | → | D | ð | |
| h | → | m | m | |
| m | → | m | m | |
| m! | → | F | ɱ | chasm |
| n | → | n | n | |
| n! | → | H | ɲ | mission |
| ng | → | N | ŋ | |
| l | → | l | l | |
| ll | → | l | l | llandudno (for Cardiff and Abercrave, this is different) |
| lw | → | l | l | feel - dark l |
| r | → | r | r | |
| y | → | j | j | |

| Unisyn | | DISC | IPA | Lexical set e.g. |
|--------|---|------|-----|------------------|
| w | → | w | w | which |
| hw | → | w | w | which |

If having the original transcriptions precisely as defined in the Unisyn lexicon is very important, you can instead create a layer that uses the original transcription as contained in the file you uploaded. This has the advantage that the transcriptions are not filtered through the above mapping, and the disadvantage that LaBB-CAT won't be able to display the transcriptions using IPA symbols, nor help you when creating search patterns for the layer.

If you decide to do this, Unisyn offers you two possible representations:

- Unisyn transcriptions - e.g. { p r @ . n ~ u h n s \$ } . > i i . * e i . s h n ! > - these are already present in the file that you generated if you followed the instructions above (i.e. gam.unisyn)
- SAM-PA transcriptions - e.g. pr\@%nVns\$i"e\$Sn=\$@5 - these can be obtained by running an extra Unisyn command, and uploading the resulting gam.sampa file:
output-sam.pl -a gam -f gam.unisyn > gam.sampa

(Unisyn has a third script called output-ipa.pl which produces transcriptions for displaying in HTML - e.g. p??nns.i.e.n - which are not suitable for search, analysis, or forced-alignment)

In order to prevent the DISC mapping from applying on your layer:

- When creating the layer, set the layer type to *Text* rather than *Phonological*.
- When configuring the layer, set the field to *Phonemes (original file)* rather than *Phonemes (DISC)*.

Creating a Phonemes Layer

To create a new layer with CMUdict annotations:

1. Select the *word layers* option on the menu - this will display a list of all the word layers you already have in the database.
2. At the top of the list, there's a blank form for creating a new layer - fill this form in:
 - ID - enter a one- or two-word description - e.g. phonemes
 - layer type - select *Phonological*
 - layer manager - select *Unisyn*
 - alignment - select *None* (as these are simply tags on the orthographic words)
 - generate - select *Always*
3. Press the *New* button to create the layer. You will see the layer configuration page. Check the online help for explanations of all options, but at least:
4. Ensure the Source Layer is *orthography*

5. Select the desired Lexicon from the list (these relate to the file or files you generated and uploaded above)
6. Tick the *Strip syllabification/stress* if you will use this layer for forced alignment with HTK.

Source Layer: orthography ▾

Language: en

Lexicon: gam.unisyn ▾

Field: Phonemes (DISC) ▾

Strip syllabification/stress: ☒

First variant only: ☐

Recover Syllables: ☐

Save

7. Press *Save*
8. Press *Regenerate*. You will see a progress bar while the layer manager annotates all the transcripts that have already been uploaded.

LaBB-CAT will then generate annotations for all the transcripts you already have in your database. If you have a lot of data, this may take a while.

From now on, when you upload a new transcript, the Unisyn annotations will automatically be generated for it.