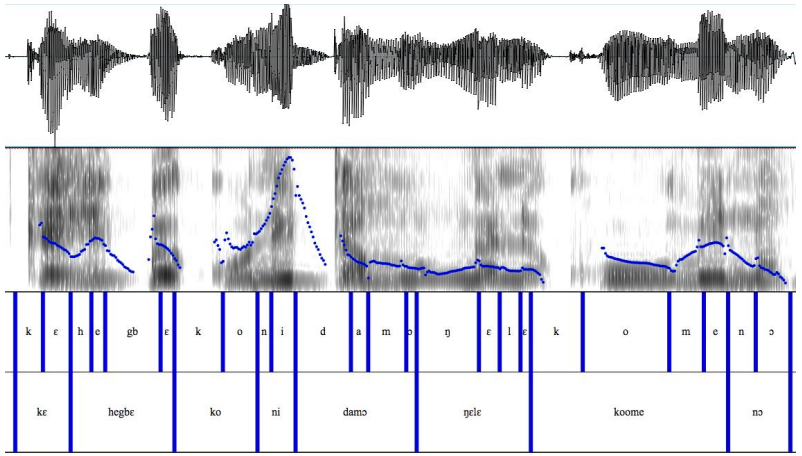
GlobalTIMIT: Progress and Prospects



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Outline:

1. What?
2. Why?
3. How?
4. Examples
5. Plans

WHAT is TIMIT?

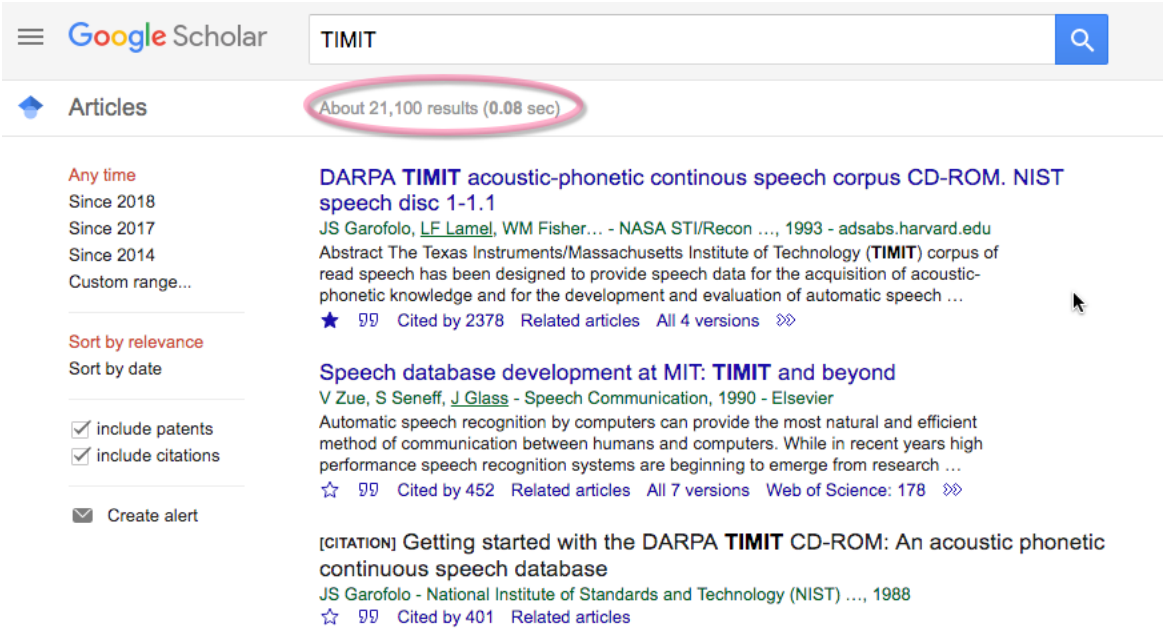
TIMIT is an acoustic-phonetic dataset,
collected and annotated between 1987 and 1990
at Texas Instruments (TI) and the Massachusetts Institute of Technology (MIT),
with help from SRI and NIST.

630 speakers read 10 sentences each – thus 6300 sentences in all –
comprising 54,217 word tokens and 5:23:59.7 of audio.

There were 2 sentences that all speakers read,
450 sentences read by 7 speakers each,
1890 sentences read by just one speaker —

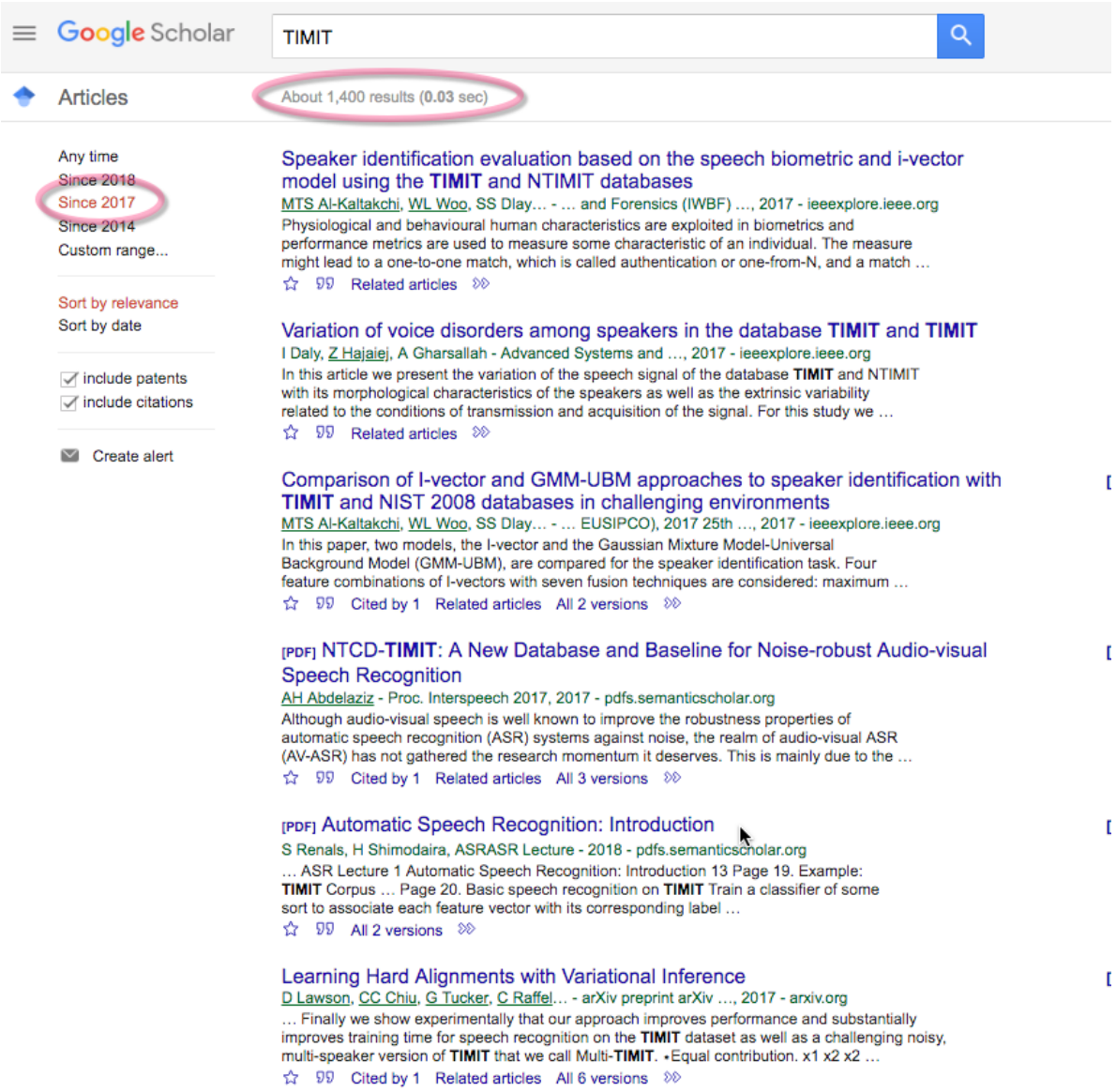
Overall, TIMIT contains 2342 distinct sentences and 6099 distinct words.

TIMIT is probably the single most widely-used speech database:



And TIMIT usage continues –

although by modern standards it's a small dataset:



WHY has TIMIT been so popular?

It's

1. easily available,
2. compact,
3. phonetically, lexically, and syntactically representative,
4. phonetically transcribed and aligned.

Then WHY aren't there TIMIT-like datasets for other languages?

1. Creating TIMIT was a lot of work (and expense):
   At least 15 person-years of work at four institutions,
   budget estimated at $1.5 million.
2. Today's focus is (properly) on conversational speech,
   meeting speech, broadcast news, etc.

BUT . . .

TIMIT's continued popularity
suggests that TIMIT versions in other languages
would be still be useful

- for phonetics research
- for teaching and student projects in speech technology
- for documentation of languages and varieties

AND . . .

With today's technology,
a redesigned TIMIT-equivalent dataset for a new language
can be planned and created with two or three person-months of work

. . . most of which can be done by an interested student.

(With planned toolkit design, this may become even easier.)

HOW can this be done?

1. Streamlined dataset design
2. Modern software and/or data sources for
    a. Selecting sentences
    b. Recording speakers
    c. Creating pronouncing dictionary and grapheme-to-phoneme rules
    d. Implementing forced alignment

(. . . And note that the forced aligner can be distributed with the dataset!)

Dataset design:

630 speakers is

1. A hard recruiting and scheduling problem
   (Reading 10 sentences takes only about 90 seconds)
2. Not necessary
3. Not optimal for most purposes

Instead, suppose we ask each speaker to read for 20 minutes –

TIMIT sentences are about 3 seconds long,
so if the inter-sentence interval is 10 seconds,
20 minutes gives us 20*60/10 = 120 sentences per speaker.

Then 50 speakers will give us 6000 sentences,
a round number comparable to TIMIT's 6300.

And if we can schedule 5 speakers per day,
recording can be finished in 10 days.

(Or a much shorter time using distributed recording methods…)

How about repeating sentences across speakers?

Remember that each TIMIT speaker reads

- 2 sentences that everyone reads
- 5 sentences that 6 other speakers read
- 3 sentences that only they read

We adjusted the proportions a bit, so that each speaker reads

- 20 sentences that everyone reads
- 40 sentences that 9 other speakers read
- 60 sentences that only they read

So we need 20 + 40*5 +60*50 = 3220 distinct sentences

And we end up with 5 groups of 10 speakers each who share 100 sentences, making for easy train/test divisions if desired.

*(Note that we can add additional groups of 10 speakers given 40 + 60*10 = 640 additional sentences per group.)*

How can we select sentences efficiently?

1. Start with a text collection, such as
    a. a Wikipedia snapshot,
    b. a Wikiquote snapshot,
    c. newswire or magazine text,
    d. e-novels, web forums, bible translations, whatever.

a. Divide it into sentences

1. Reject sentences that are too short, too long, have proper names or etc.
2. Pick ~10000 at random
3. Have a human judge select 3220 from this set

For example, the LDC's Spanish Gigaword newswire collection contains

- 35,822,282 sentences
- 8,188,987 sentences between 8 and 20 words long
- 2,637,151 sentences between 8 and 20 words long
  with no non-initial capital letters

Selecting 10 at random from the list of 2,637,151 we get:

Yo no propongo, propugno, ni acepto brotes de violencia.

La brutalidad contra las mujeres es mala sin excepción.

Afirmó que ella trotó a través del apartamento con el niño sobre su hombro.

La ley antimaras tuvo ayer su primera victoria en tribunales.

Láminas de roble francés cuelgan dentro de algunos de los tanques.

Este sábado había varios miles de personas presentes para aclamar a los vencedores.

Un calamar de 8 metros mordió el anzuelo y pudo ser filmado mientras luchaba por liberarse..

Un hombre de 51 años de edad murió al derrumbarse su casa.

Segundo, presta importancia a la "diplomacia de naciones grandes".

A continuación ofrecemos las posiciones en el inicio de la cuarta fecha.

Another obvious source would be Spanish proverbs from Wikiquote – there are 278 of them, of which 108 are 8 words or longer.

10 of these chosen at random are:

A caballo regalado no se le mira el diente.

Ara bien y hondo, cogerás pan en abando.

Mucha paya y poco grano; es por vicio del verano.

El que no oye consejo no llega a viejo.

Con el agua de la bañadera echar también al niño.

Agua blanda en piedra dura, tanto cavadura continua gotera cava la piedra.

Quien bien quiere a Pedro, no hace mal a su perro.

Quien no oye consejo, no llega a viejo.

El favo es dulce, mas pica la abeja.

El hilo siempre se rompe por lo más delgado.

Someone who knows the language
and has good judgment
needs to check the candidates from such sources –

but generally we can get 3,220 good sentences
from 5,000-10,000 candidates.

(Obviously this is harder
for a language with little or no digital text…)

How can we recruit speakers efficiently?

We have used

1. University departments (Standard Chinese, L2 English, L2 Chinese)
2. High school students (Guanzhong Chinese)
3. Religious organizations (Thai and Ga)
4. Cultural groups (Swedish)

A small payment may be made directly to the speaker,
or to the sponsoring organization on their behalf.

How can we record speakers efficiently?

1. Make up 50 sentence lists, one for each speaker.
2. Feed the lists to a program like SpeechRecorder (from BAS), which
    a. presents the items one at a time,
    b. records the response,
    c. Endpoints the recording and stores it in a file as instructed.
3. Use a noise-cancelling head-mounted USB microphone, connected to a laptop in a quiet room.

How can we create a forced alignment program efficiently?

1. Find or create a pronouncing dictionary
   (unless orthography is quasi phonetic):
   1. Existing digital dictionary
   2. Wiktionary
   3. e-book
   4. …other more painful options
2. Train a grapheme-to-phoneme system (e.g. Phonetisaurus)
3. Use a speech recognition toolkit (e.g. HTK or Kaldi)
   trained on the collected speech

(We have done this for ~six GlobalTIMIT collections now,
and it goes very quickly once the dictionary is in place.)

Experience so far:

Completed:

1. Standard Thai -- “THAIMIT”
   (graduate student doing other summer research in Bangkok)
2. Standard Mandarin Chinese -- “CHIMIT”
   (faculty and students at Shanghai Jiao Tong University)
3. Chinese learners L2 English
   (also Shanghai Jiao Tong University)
4. Guanzhong dialect of Mandarin Chinese
   (high school students in Xi’an)
5. Ga -- language of Ghana
   (undergraduate student during summer vacation)

In process:

1. Swedish -- recording has started
2. American learners L2 Chinese – recording has started
3. Italian – sentence selection done
4. French – planned
5. Spanish?

Plans:

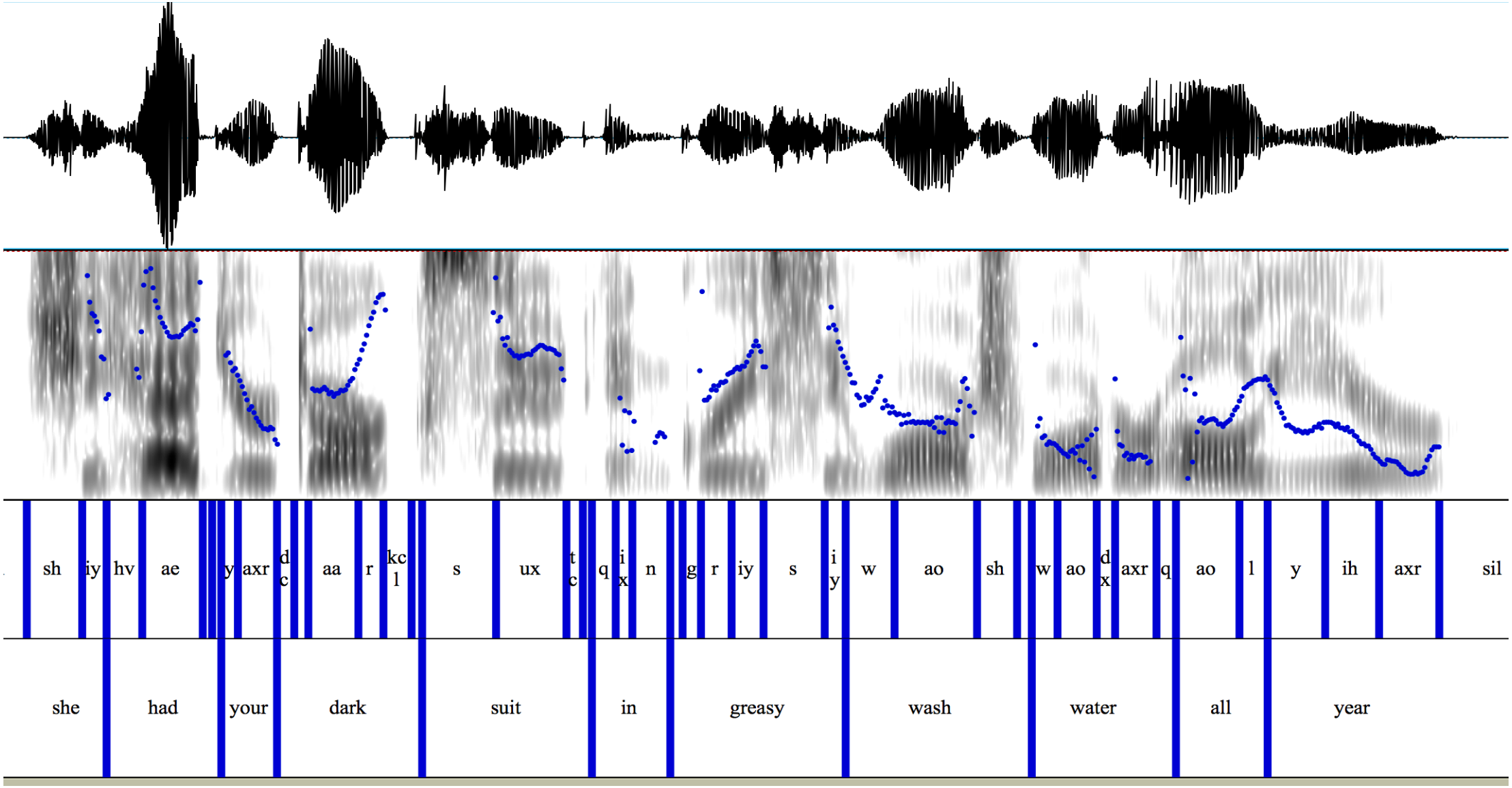
1. Do more languages and varieties
2. Create a toolkit and instructions
   to make it easy for othersto make their own versions.

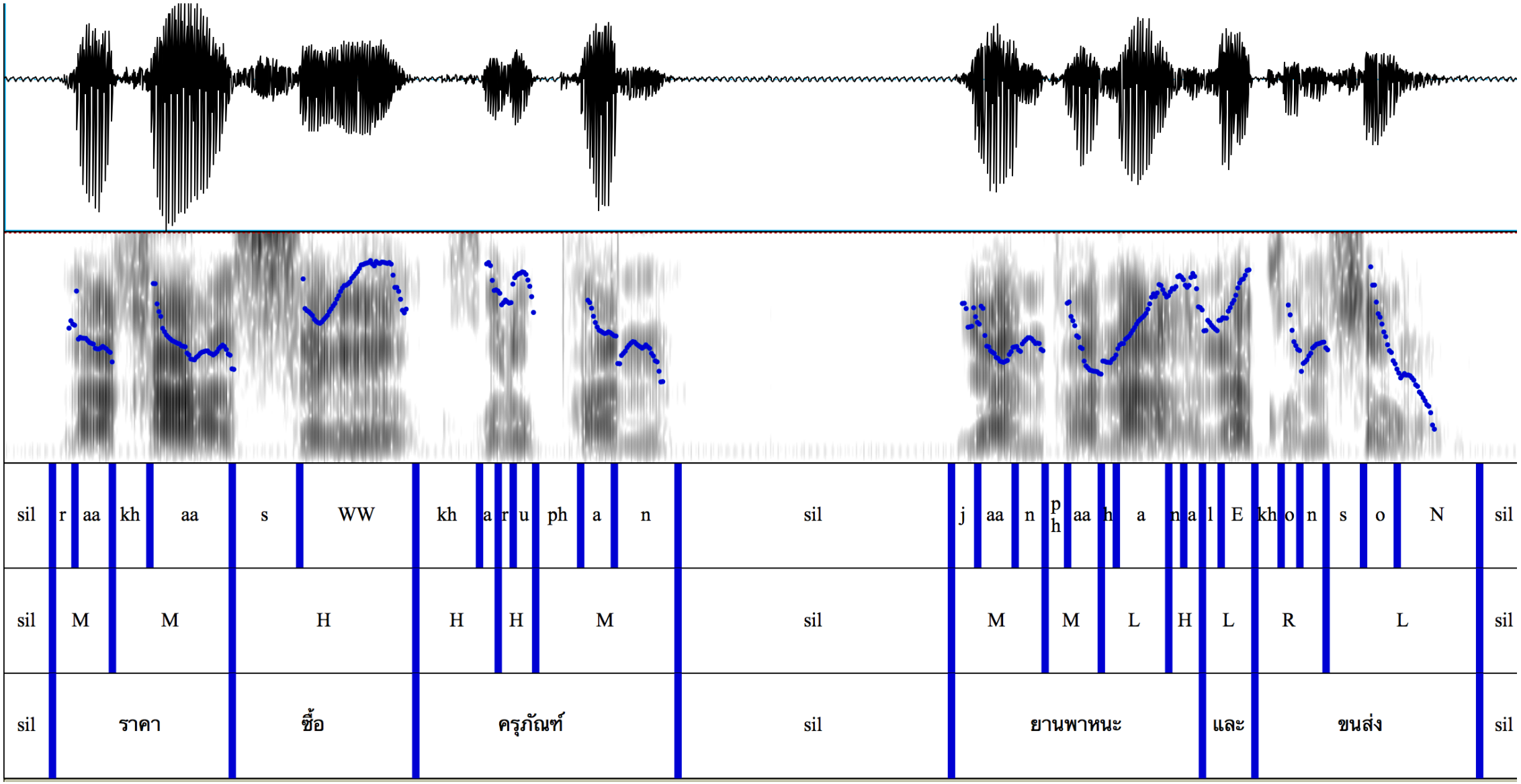
Options:

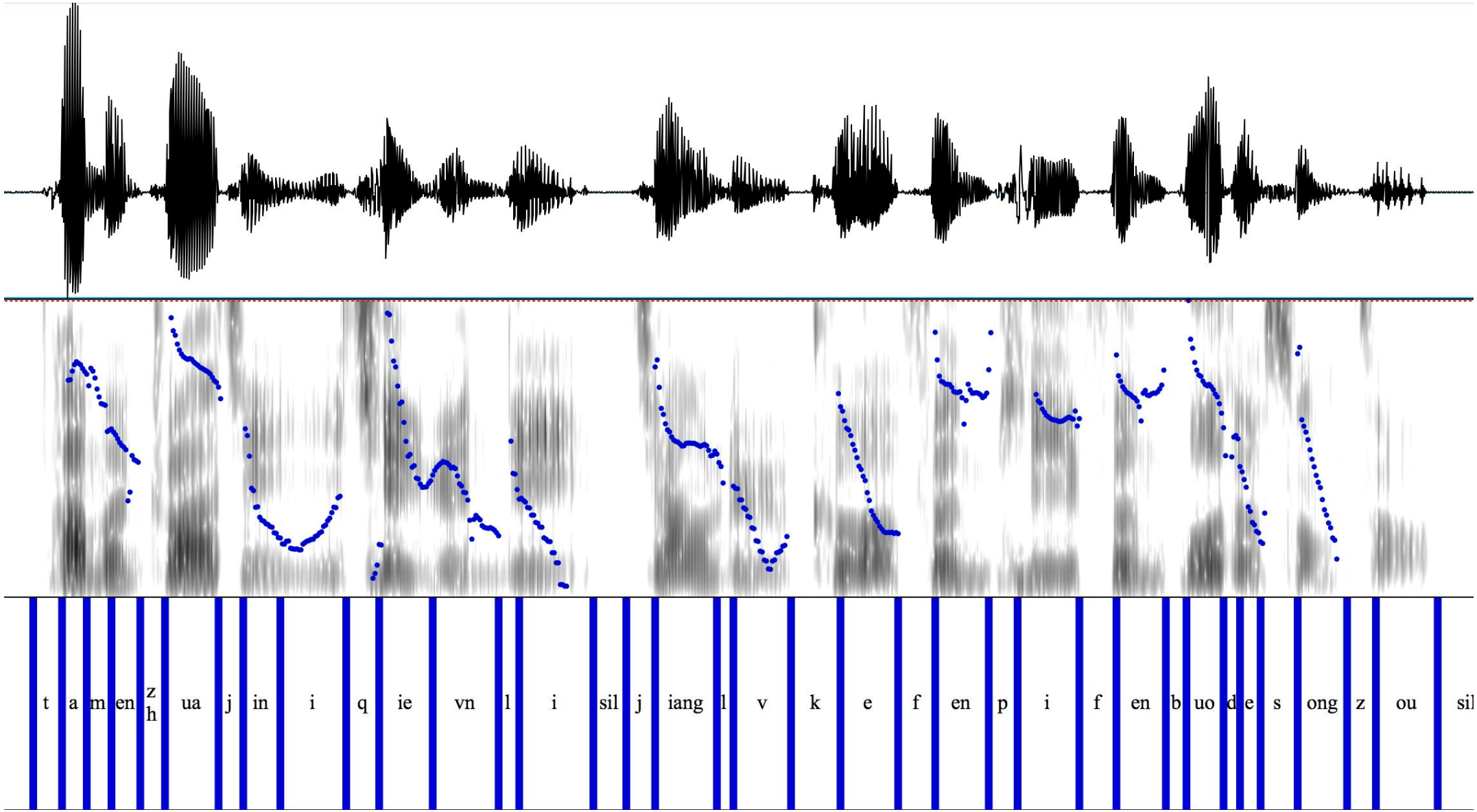
1. Add brief spontaneous conversation,
   picture description, etc. to the recording protocol
2. Use audio prompts for speakers who are not
3. ???

Some examples

from collections that are complete or underway:


sh iy hv ae y axr d c aa r kc l s ux t c q i x n g r iy s i y w ao sh w ao d x axr q ao l y ih axr sil
she had your dark suit in greasy wash water all year


sil r aa kh aa s WW kh a r u ph a n sil j aa n ph aa h a n a l E kh o n s o N sil
sil M M H H H M sil M M L H L R L sil
sil ราคา ซื้อ ครุภัณฑ์ sil ยานพาหนะ และ ขนส่ง sil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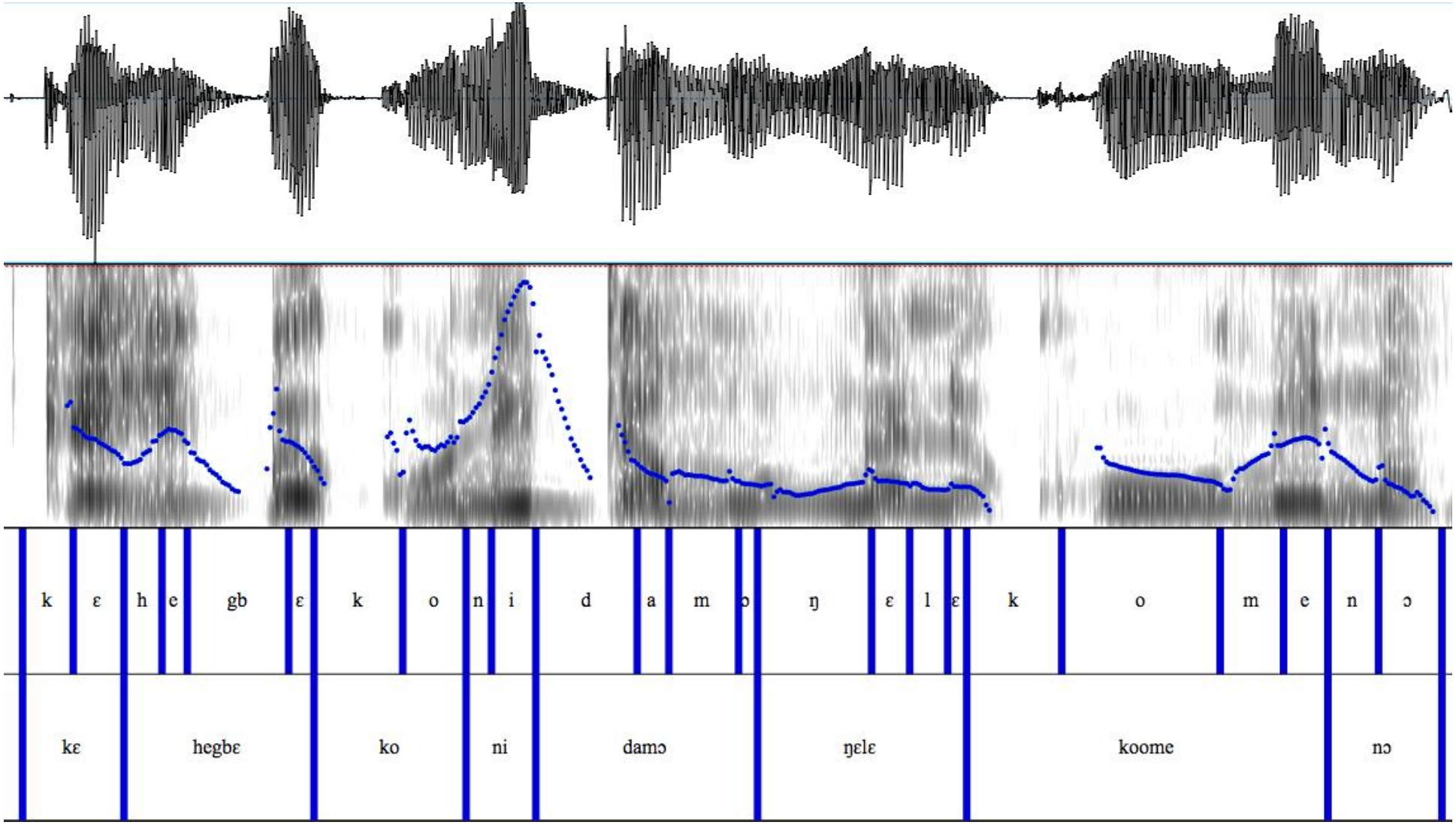
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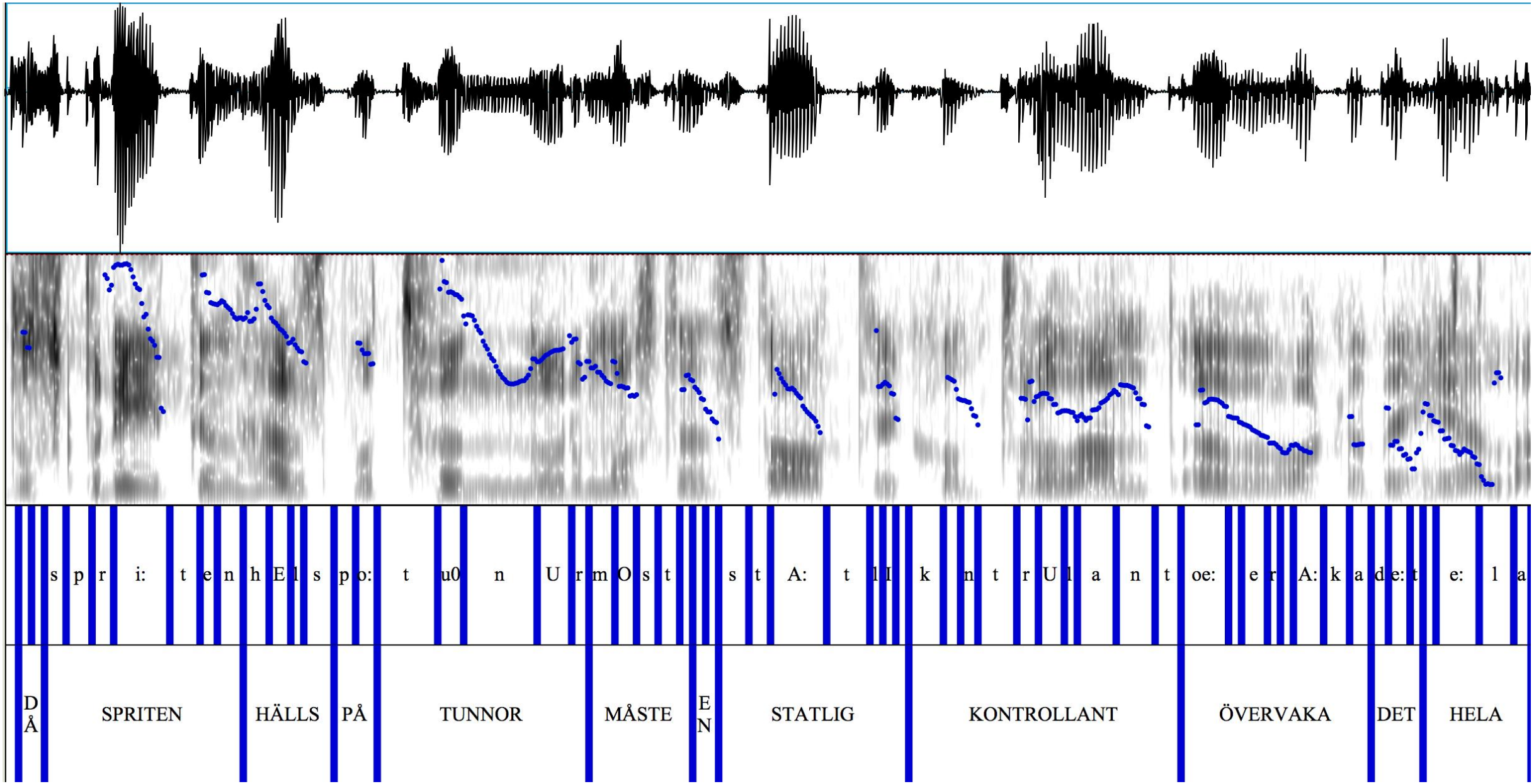
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D Å
SPRITEN
HÄLLS
PÅ
TUNNOR
MÅSTE
E N
STATLIG
KONTROLLANT
ÖVERVAKA
DET
HELA

References:

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Jiahong Yuan, Hongwei Ding, Sishi Liao, Yuqing Zhan, and Mark Liberman. “Chinese TIMIT: A TIMIT-like Corpus of Standard Chinese”, OCOCOSDA 2017.

Nattanun Chanchaochai, Christopher Cieri, Japhet Debrah, Hongwei Ding, Yue Jiang, Sishi Liao, Jonathan Wright, Jiahong Yuan, Juhong Zhan, Yuqing Zhan. "GlobalTIMIT: Acoustic-Phonetic Datasets for the World’s Languages”, InterSpeech 2018.