

Rapidly building the missing infrastructure for language science: A case study with Formosan languages

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Introduction

Goal:

Facilitate psycholinguistic and acquisition studies of the world's languages while it's still possible, starting with the 16 endangered Formosan languages of Taiwan.

Background:

- The vast majority of psycholinguistic and language acquisition studies focus a small number of languages (Collart, 2023; Kidd & Garcia, 2022).
- Major roadblock: Lack of corpora (for computational analysis, word frequencies, surprisal, etc.)
- ~50% of languages are already gone and as many as 90% would be by the end of the century

Why Formosan Languages?

- Cover every major branch of Austronesian family, one of largest in world.
- Formosan languages challenge existing theory (voice system, no clear parts of speech, etc.)
- Preexisting standardized written form, reference grammars, dictionaries, large "latent" corpus.

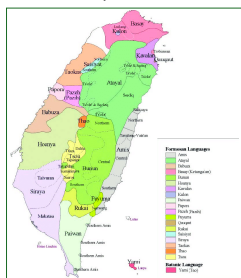


Fig 1: Historical distribution of Formosan languages

Language	Dialects	Status	Speakers
Amis (ami)	5	6b (Threatened)	108,000
Atayal (tay)	6	7 (Shifting)	10,000
Bunun (bun)	5	5 (Developing)	38,000
Kanakanavu (knb)	1	8b (Nearly Extinct)	4
Kavalan (kvr)	1	8b (Nearly Extinct)	70
Paiwan (pwn)	4	6b (Threatened)	15,000
Puyuma (pyu)	4	8a (Moribund)	1,000
Rukai (dru)	6	6b (Threatened)	2,000
Saaroa (srx)	1	8b (Nearly Extinct)	25
Saisiyat (sxy)	1	7 (Shifting)	2,000
Sakizaya (szy)	1	7 (Shifting)	590
Seediq (trv)	2	8a (Moribund)	650
Thao (tsf)	1	8b (Nearly Extinct)	4
Truku (trv)	1	8a (Moribund)	650
Tsou (tsu)	1	6b (Threatened)	4,000
Yami/Tao (tsf)	1	6b (Threatened)	3,800

Table 1: Language status and speaker population, based on Ethnologue (Eberhard et al., 2022). NOTE: Yami/Tao is not "linguistically" Formosan.

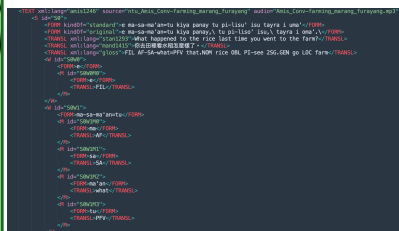
Method

Data Collection:

- Leveraging partnerships with researchers, indigenous groups, and government agencies
- Processing & reformatting latent corpus:
 - Published corpora
 - Indigenous YouTube
 - Dictionaries (with example sentences)
 - Instructional materials
 - Wikipedias
 - Radio & TV transcripts
- Obtaining permission for republication

Data Processing and QC:

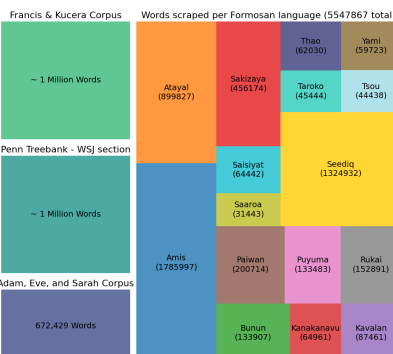
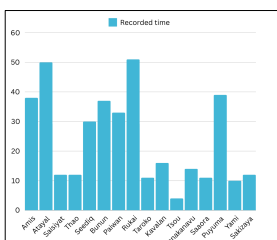
- Initial processing:** Hand-verified OCR if necessary; Remove extraneous text; Alignment of translations, audio, if any; Convert to modified Pangloss format.



- Automated Validation:** XML, orthography, frequent words, translations, etc.
- Manual Quality Control:** Manually review flagged segments and random samples.

Current Status

Text & Audio processed & permission obtained. NOTE: Quality Control is ongoing...



Next Steps

Data Priorities:

- Finish automating Quality Control
- Incorporate more glossed corpora
- Obtain rights for
 - Indigenous YouTube
 - Radio & TV
- Obtain rights for more glossed corpora

Publish v.1

Bootstrapping the Corpora:

- Automatic Speech Recognition for transcription (Prud'hommeaux et al., 2021)
- Apply to ongoing Paiwan data collection

Use the Corpora!

- Machine Translation (requested by indigenous partners)
- Classifiers for finding unusual syntactic patterns (requested by colleague)
- Comparison of voice system across languages (using parallel corpora)

Next Next Steps

- Design psycholinguistic studies
- Collect child-directed speech (limited # of languages)

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