Document Overview

- This is a documentation overview of how to use Batchalign2 to do syntactic and morphological parsing

Batchalign2 Overview

- Batchalign2 is a command-line pipeline developed under the TalkBank project for automatic morphological tagging and Universal Dependencies (UD) syntactic parsing across multiple languages, including Italian.
- It takes linguistic transcripts in the CHAT (.cha) format and produces two key annotation layers:
    - %mor: morphological analysis (lemmas, parts of speech, and inflectional features)
    - %gra: syntactic analysis following the Universal Dependencies (UD) standard.
- Batchalign2 integrates the **Stanza** NLP models and the **UD framework** into the TalkBank/CLAN ecosystem, enabling consistent morphosyntactic annotation of multilingual corpora.
- It automates tokenization, morphological tagging, lemmatization, and dependency parsing, storing all results back in CHAT format—making the output directly usable with CLAN tools for further linguistic or developmental analysis.
- Functions and Commands:
    - asr: ASR!
    - morphosyntax: PoS and dependency analysis
    - fa: Forced Alignment (requires utterance-level timings already)

Universal Dependencies Overview

- **Universal Dependencies** (UD) is an international framework for the consistent annotation of grammar—covering parts of speech, morphological features, and syntactic dependencies—across human languages.
- UD is an open, collaborative project involving over 600 contributors, maintaining more than 200 treebanks in 150+ languages.
- Its goal is to create a cross-linguistically consistent representation of grammatical relations, allowing comparable syntactic analysis across languages like Italian, Mandarin, English, and many others.

What we need to do in terms of using CLAN and Batchalign2 to do morphological and syntactic analysis and parsing:

1. **Download CLAN (MacBook or Windows)**
   https://dali.talkbank.org/clan/

2. **Download Batchalign/Environment Setup (Open MacBook Terminal and paste the following)**

```
# Install UV (a lightweight Python environment manager)
curl -LsSf https://astral.sh/uv/install.sh | sh

# Install Batchalign2 for Python 3.11
UV_PYTHON=3.11 uv tool install batchalign

# Ensure ~/.local/bin is in your PATH
echo 'export PATH="$HOME/.local/bin:$PATH"' >> ~/.zshrc
source ~/.zshrc

# Check installation
batchalign --help
```

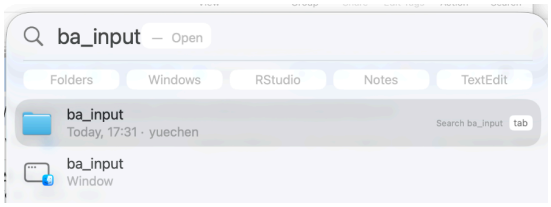
3. **Data Preprocessing (R Studio) → also see [txt-to-cha.R]**
   Aim data cleaning: Txt file → cha file
   - A valid .cha file must follow CHAT conventions: every utterance on its own line and starting with a speaker code (e.g., *ADU: ,*CHI: , *MOT:).

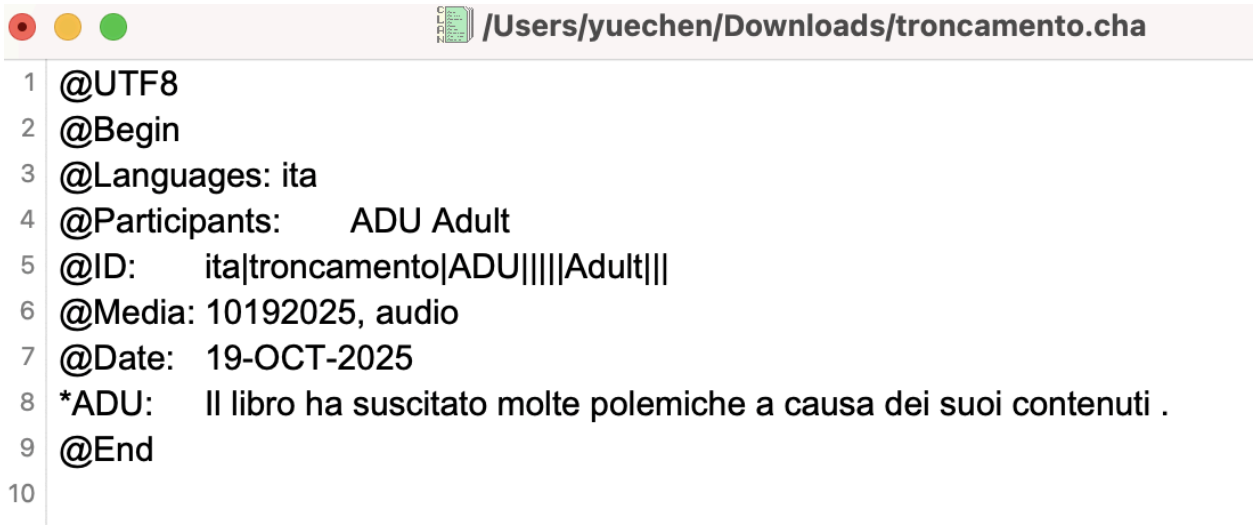
   Tips:
   - A Cha file can be automatically converted to a txt file and vice versa
   - @Languages: must include the language code (e.g., ita, zho, eng, spa).
     - The Italian model will be loaded automatically from Stanza/UD based on @Languages: ita.
   - Sentences must end with a space and punctuation (., !, or ?).
   - Delete empty or malformed tokens like <>, which cause lexer errors.

   Things we need to do for the VoxCommunis dataset:
   1. Add speaker tier at the beginning of each sentence (e.g., *ADU:)
   2. Remove all other symbols (e.g., @, *, % or <>:)
   3. Ensure a space before punctuations (e.g., . ! or ?)
   4. Add a final period if missing
   5. Make sure to add the following at the beginning of the cha file
      @UTF8
      @Begin
      @Languages: ita
      @Participants: ADU Adult
      @ID: ita|troncamento|ADU|||||Adult|||
   6. Make sure to add the following at the end of the cha file
      @End

Successful Example:
@UTF8 → Must
@Begin → Must
@Languages: ita → Must
@Participants: ADU Adult → Must
@ID: ita|troncamento|ADU|||||Adult||| → Must
@Media: 10192025, audio → optional
@Date: 19-OCT-2025 → optional
*ADU:Il libro ha suscitato molte polemiche a causa dei suoi contenuti . → Must
@End → Must

Sample Input file (where you should put it? Search ba_input!):



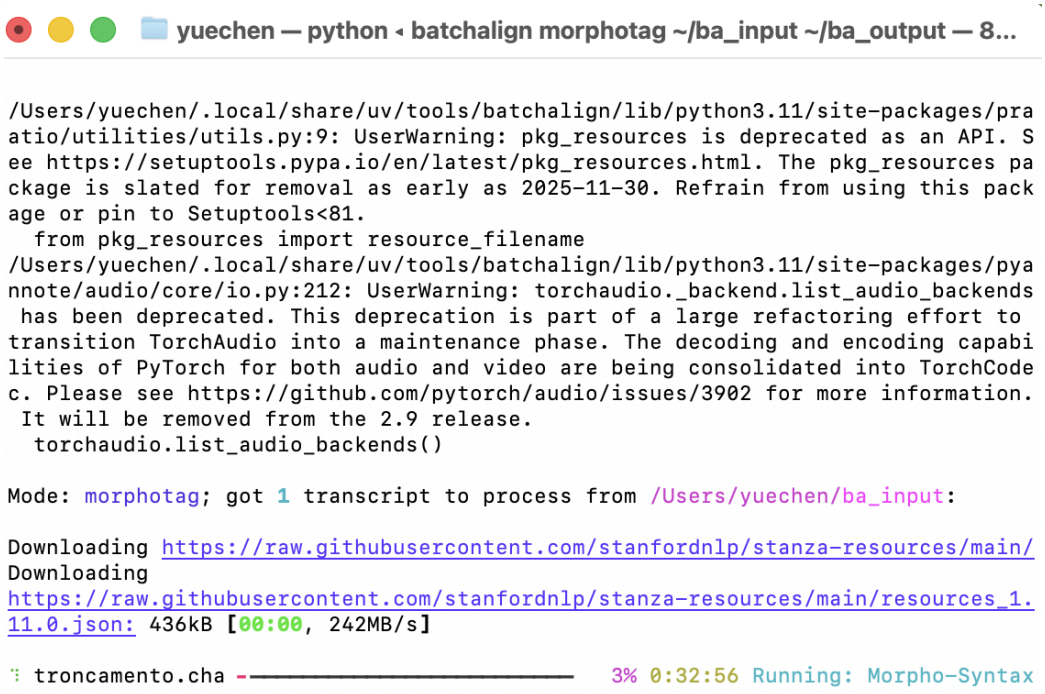


4. Parsing: Commands used for Batchalign2 (MacBook Terminal)

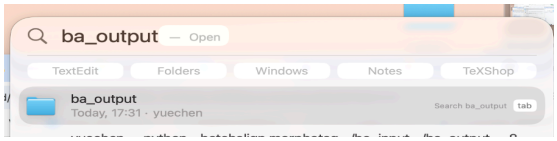
```
# check input file
sed -n '1,25p' ~/ba_input/troncamento.cha

# run batch aligner
batchalign morphotag ~/ba_input ~/ba_output

# check output file %mor / %gra
```

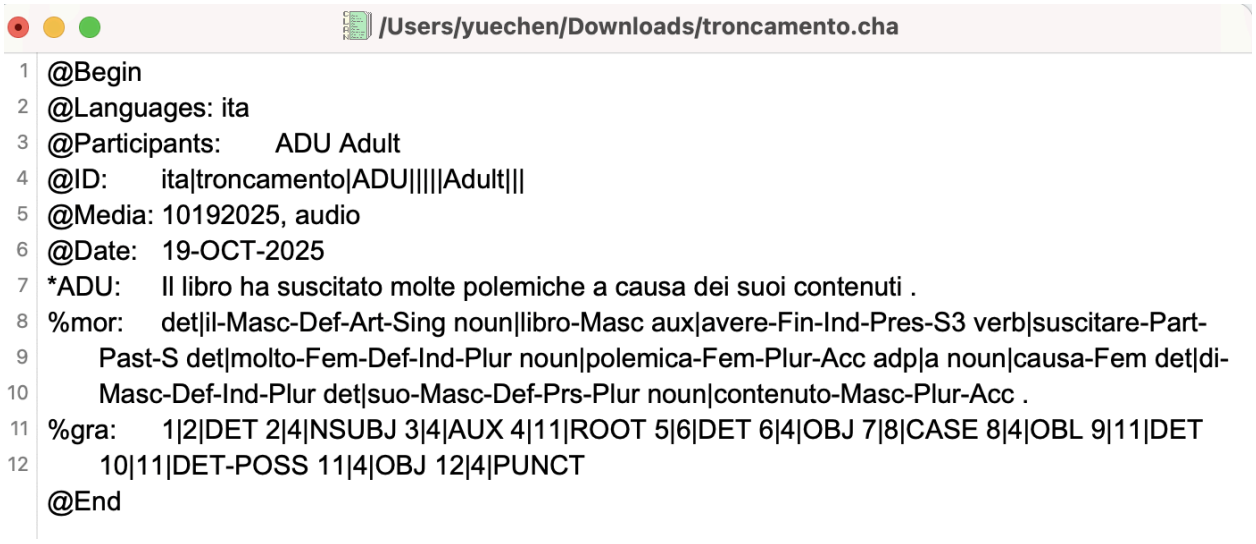
grep -n "^%mor:\|^%gra:" ~/ba_output/troncamento.cha | head

What you will see if it's successfully running:



Sample Output file (where you can find it? Search ba_output!):





5. Understanding the Output:

Sample sentence: Il libro ha suscitato molte polemiche a causa dei suoi contenuti .

Morphological layer (%mor):

%mor: det|il-Masc-Def-Art-Sing noun|libro-Masc aux|avere-Fin-Ind-Pres-S3 verb|suscitare-Part-Past-S det|molto-Fem-Def-Ind-Plur noun|polemica-Fem-Plur-Acc adp|a noun|causa-Fem det|di-Masc-Def-Ind-Plur det|suo-Masc-Def-Prs-Plur noun|contenuto-Masc-Plur-Acc .

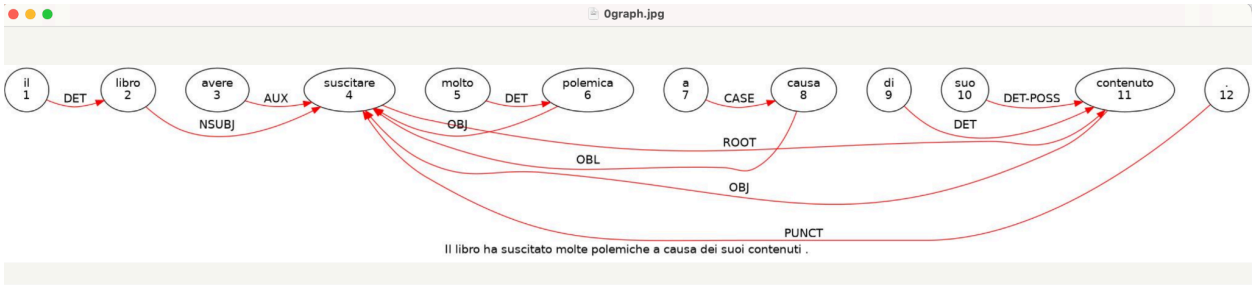
- Breaks the sentence down word-by-word and encodes part of speech + grammatical features (gender, number, tense, etc.).
  - Lemma (dictionary form): e.g. libro, suscitare
  - Part of speech: noun, verb, det, adp, etc.
  - Morphosyntactic features: Gender: Masc/Fem, Number: Sing/Plur, Tense: Pres, Past, Fut, Mood: Ind (indicative), Subj (subjunctive), Person: S1, S2, S3 (subject 1st, 2nd, 3rd person), Case: Nom (nominative), Acc (accusative), etc.

Syntactic layer (%gra):

%gra: 1|2|DET 2|4|NSUBJ 3|4|AUX 4|11|ROOT 5|6|DET 6|4|OBJ 7|8|CASE 8|4|OBL 9|11|DET 10|11|DET-POSS 11|4|OBJ 12|4|PUNCT

- These lines show token IDs (word order, such as word 1, word 2, word 3), dependency heads, and UD relations (e.g., NSUBJ = subject, OBL = oblique).

Universal Dependencies (UD) dependency tree:



What this shows:

- Each oval = a token (word), labeled with
  - its lemma (dictionary form), and
  - its index (1–12 here).
- Each red arrow = a dependency relation between two words:

- The arrow points from the head (governing word) to its dependent (modified word).
- The label on the arrow (e.g., NSUBJ, AUX, OBJ, OBL, etc.) indicates the syntactic relation type.

6. Some CLAN Post-processing (optional, if you want to look at a different analysis)

- Once %mor and %gra tiers exist, you can analyze the Italian corpus with CLAN tools:
  - kwal +t%mor ~/ba_output/troncamento.cha # view morphology
  - kwal +t%gra +s"OBL" ~/ba_output/troncamento.cha # search dependencies
  - freq +t%mor -t* ~/ba_output/troncamento.cha # POS frequency

7. Citation and Documentation

- Batchalign2: https://talkbank.github.io/batchalign2/
- CLAN Manual, section on Batchalign and role conversion
- **Reference article**: Liu, H. & MacWhinney, B. (2024). Morphosyntactic Analysis for CHILDES. Language Development Research, 4(1), 233–258.