

DSP HW2-2

Speech Analysis

教授：李琳山
助教：王君璇

Outline

1. Introduction
2. Praat
3. Homework Problems
4. Submission Requirements

Introduction

- Analyze speech signal from spectrogram
- Try to distinguish different initials(聲母) and finals(韻母) on spectrogram.
- Right-Context-Dependent Initial Final (RCDIF)

t_i for 去 followed by finals starting with 一

ex 1 : 去 l = $t_i i$

ex 2 : 去 𠂊 = $t_a a$

Introduction

- classification of consonants

Plosive/Stop	爆破音/塞音	ㄅ ㄆ ㄈ ㄉ ㄊ ㄋ ㄎ ㄏ
Fricative	擦音	ㄏ ㄏ ㄏ ㄏ ㄏ ㄏ ㄏ ㄏ
Affricate	塞擦音	ㄔ ㄕ ㄓ ㄔ ㄕ ㄔ ㄔ ㄕ
Nasal	鼻音	ㄇ ㄻ

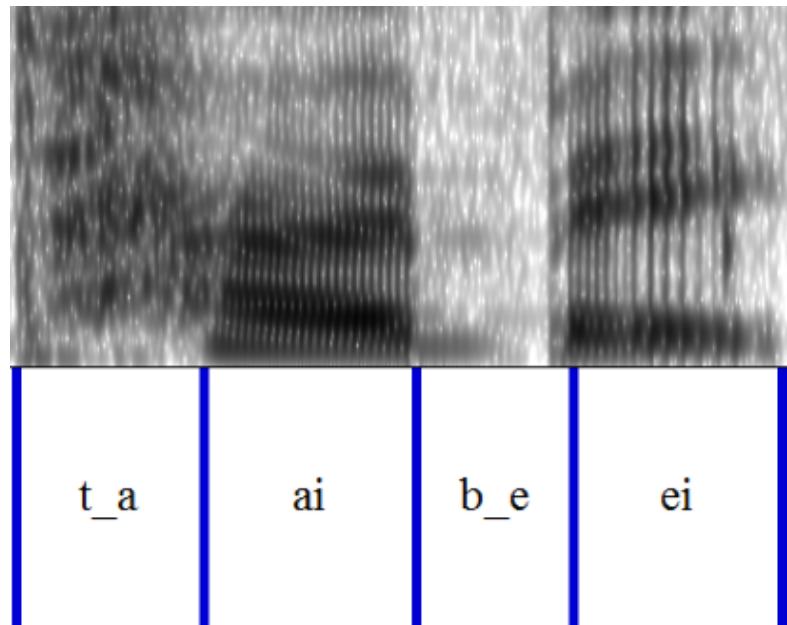
- classification of vowels

Monophthong	單母音	一メ口丫ㄛㄢㄦ
Diphthong	雙母音	ㄞㄟㄠㄡ

Introduction

Some useful information about labeling.

- “*sil*” for silence.
- “*sp*” for short pause.
- fricative/affricate initials do not contain voicing parts.
- plosive initials contain closure or aspiration period.



Some files you need

1. Phonetic class table (聲韻母表):

http://speech.ee.ntu.edu.tw/homework/DSP_HW2-2/phonetic_class.pdf

2. Syllable table (標註模式):

http://speech.ee.ntu.edu.tw/homework/DSP_HW2-2/syllable.txt

3. Audio data & FAQ:

http://speech.ee.ntu.edu.tw/homework/DSP_HW2-2/

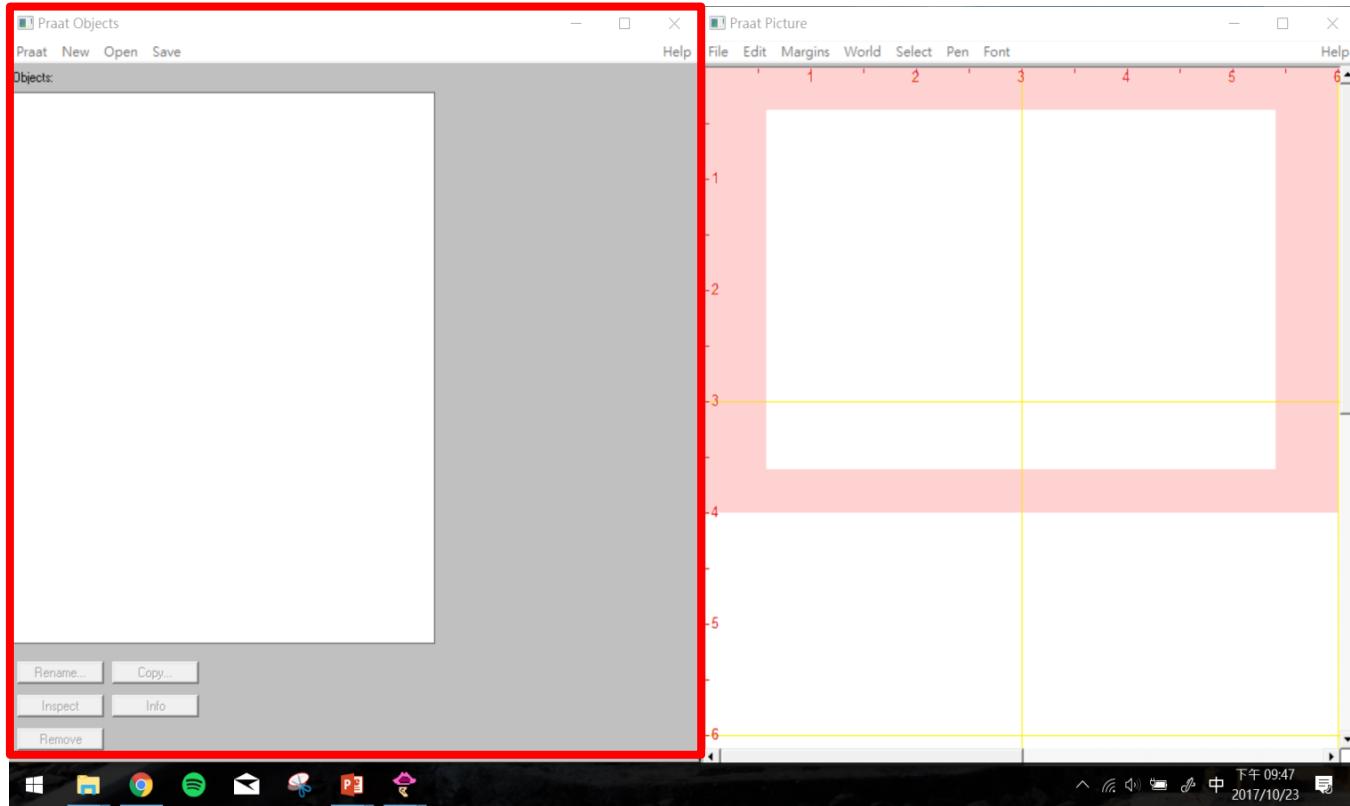
Praat

1. Download

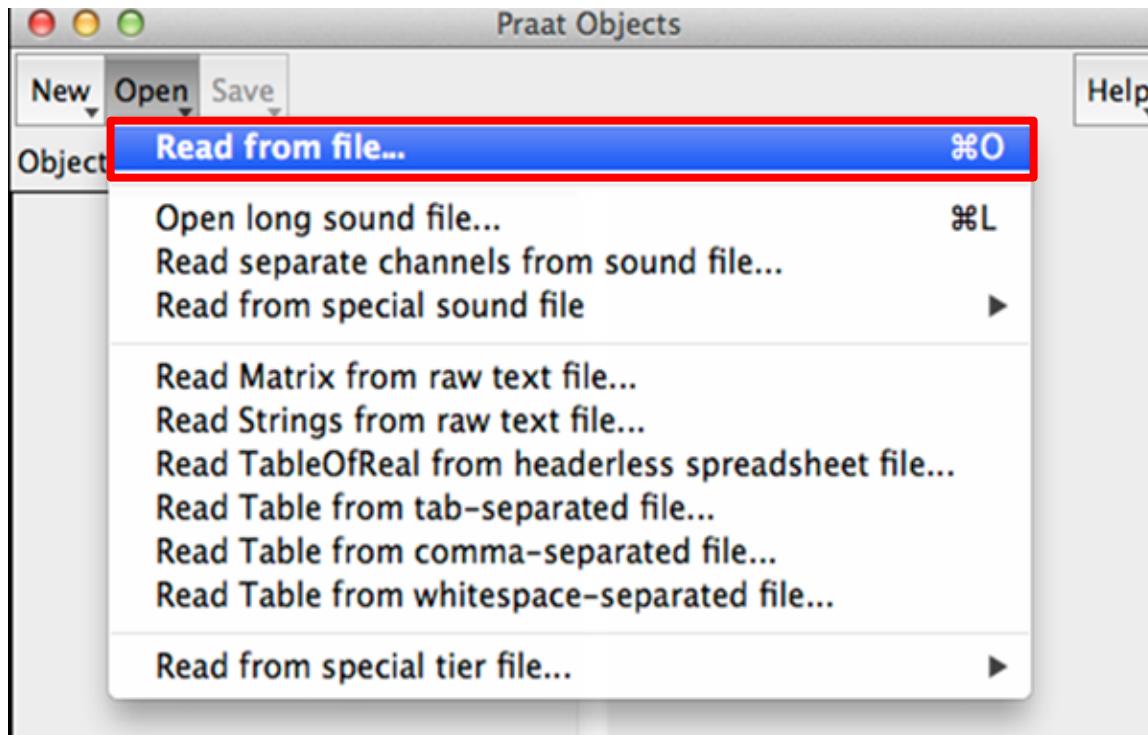
<http://www.fon.hum.uva.nl/praat/>

2. How to read a wave file
3. How to use it
4. How to label

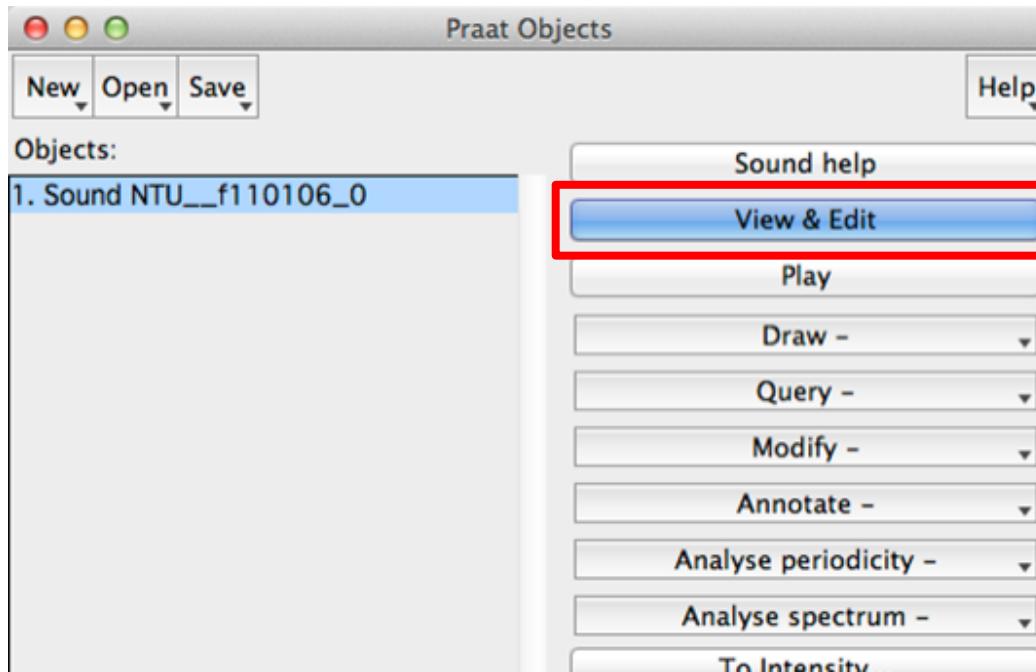
Praat



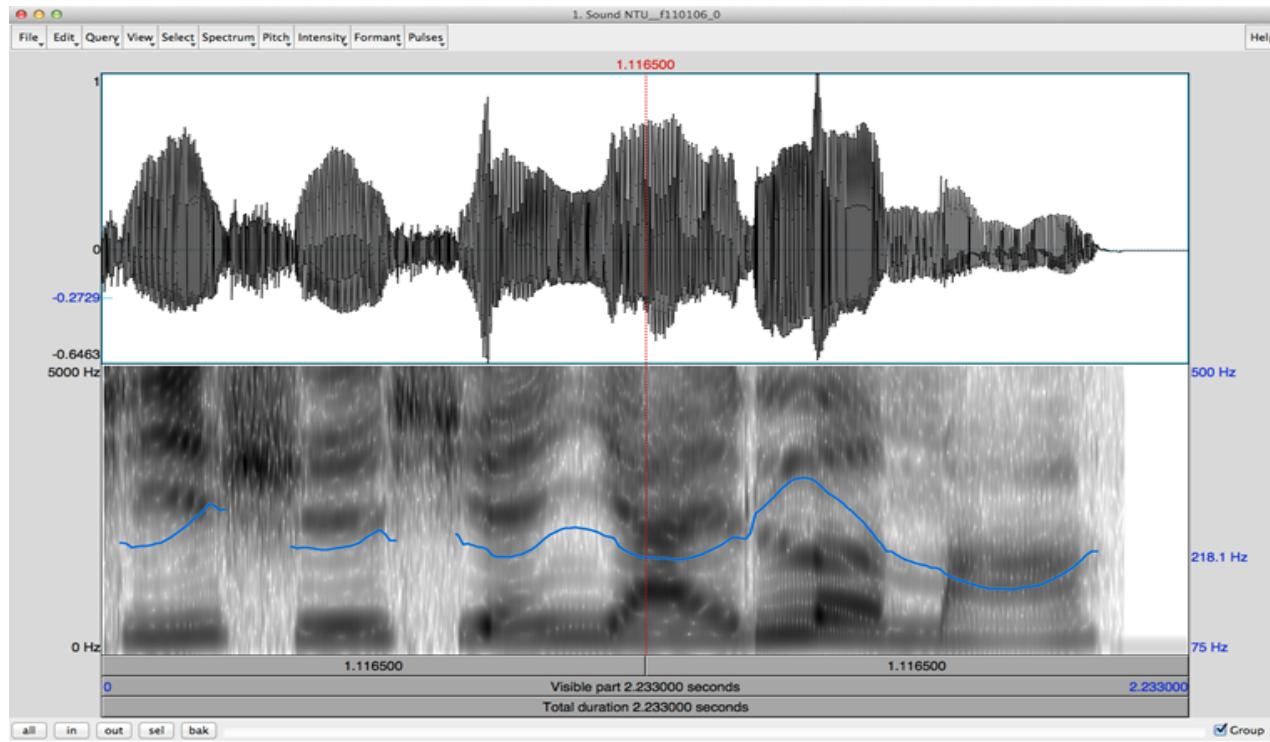
Praat - Read from file (.wav file)



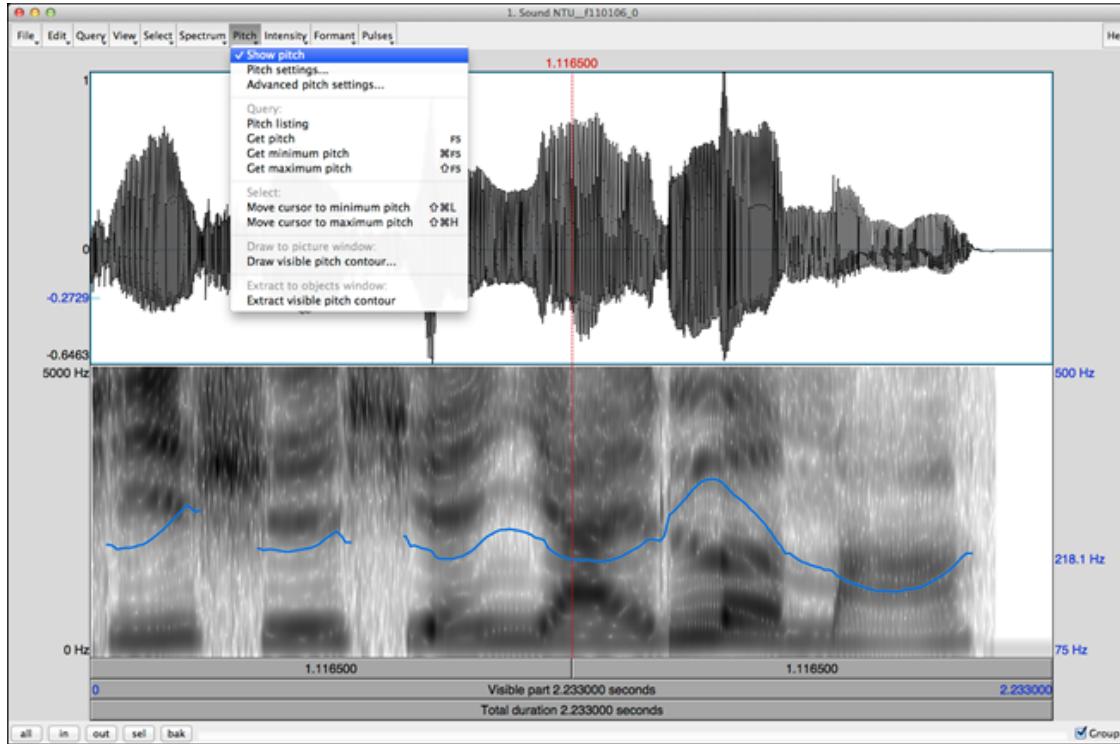
Praat - click *View & Edit*



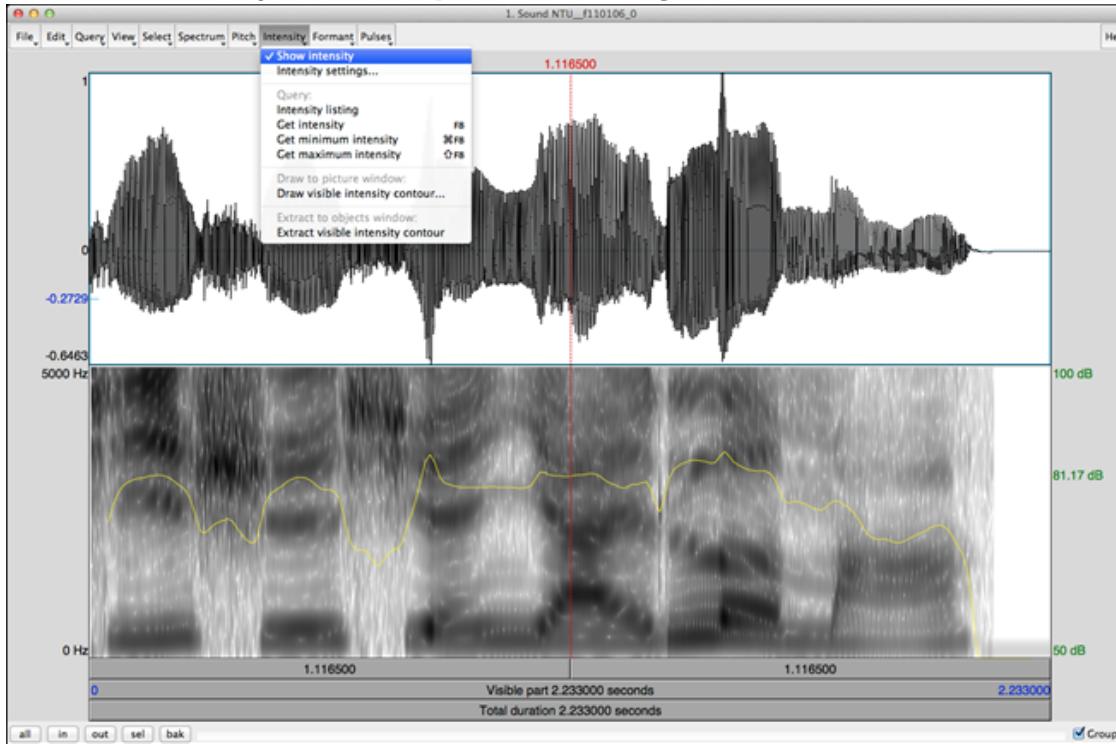
Praat - Time and Frequency Domain



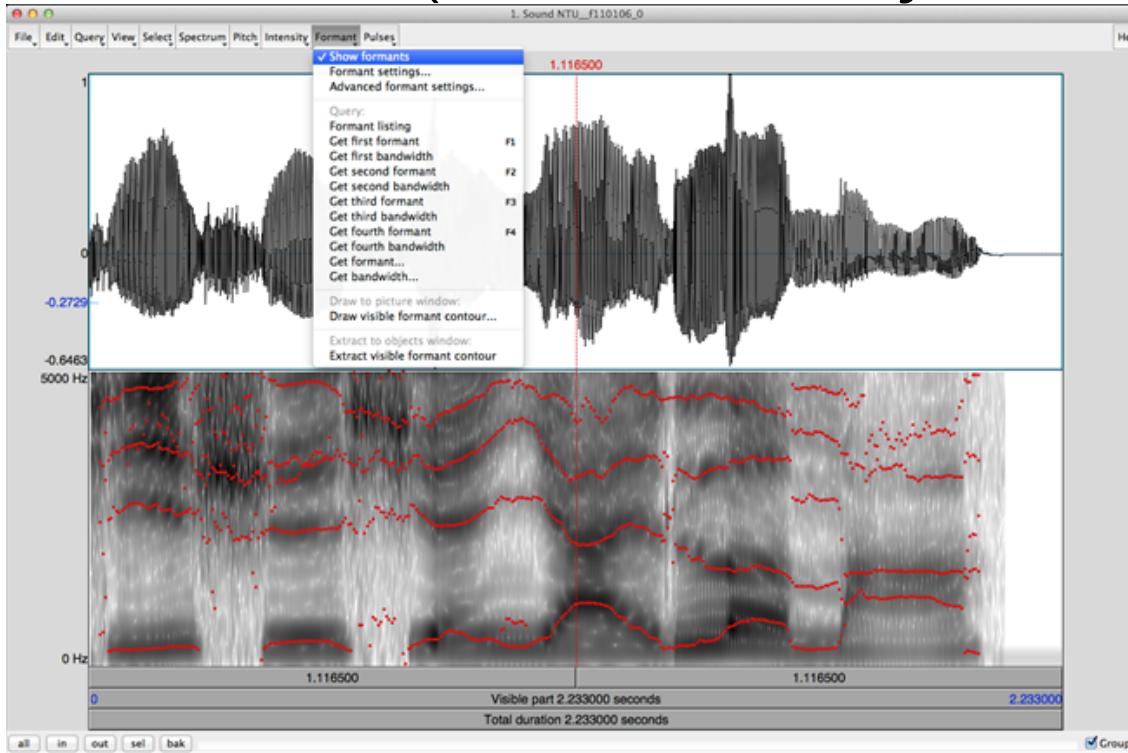
Praat - Pitch 音高 (*pitch* -> *Show pitch*)



Praat - Intensity 音量(*Intensity* -> *Show Intensity*)



Praat - Formant 共鳴 (*Formant* -> *Show formants*)



Praat - Reminder

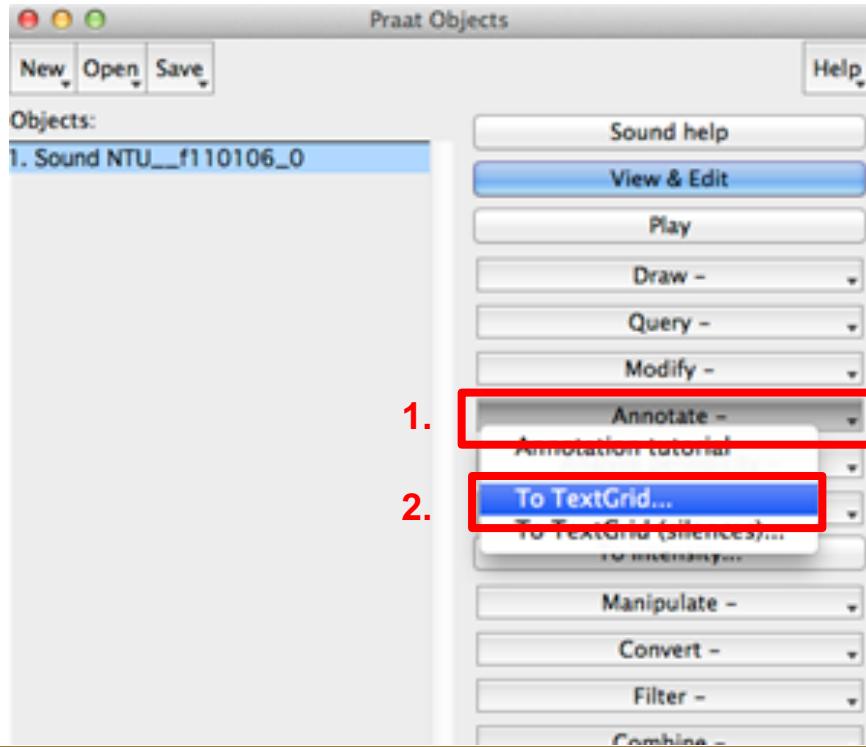
1. ***Intensity:*** power of all frequency components

Two acoustic signals may have the same intensity but different frequency components.

2. ***Formant:*** acoustic resonance, measured by the peak in the frequency spectrum

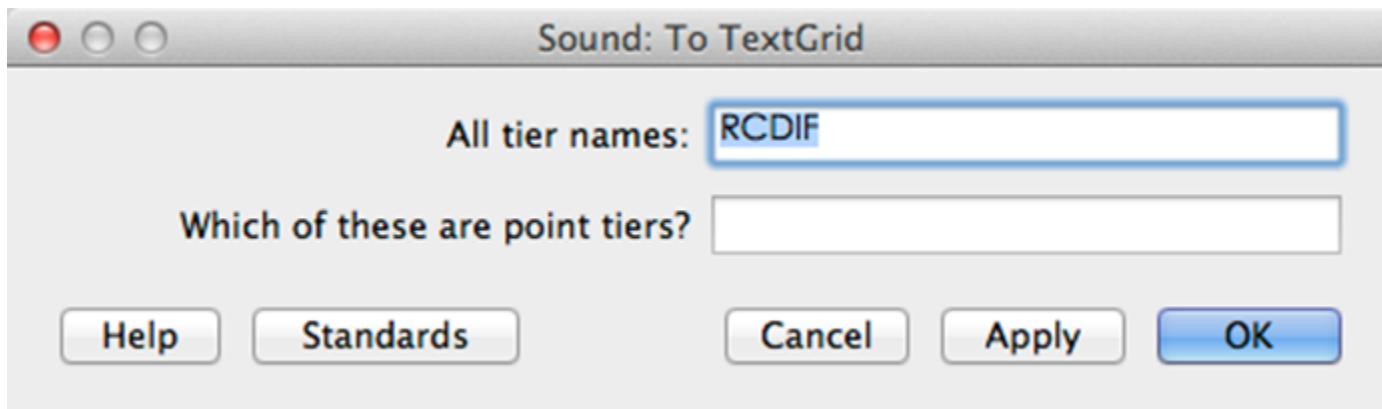
You should not trust the formant detection output for unvoiced initials.

Praat - Label a wave file (*Annotate* -> *To TextGrid*)



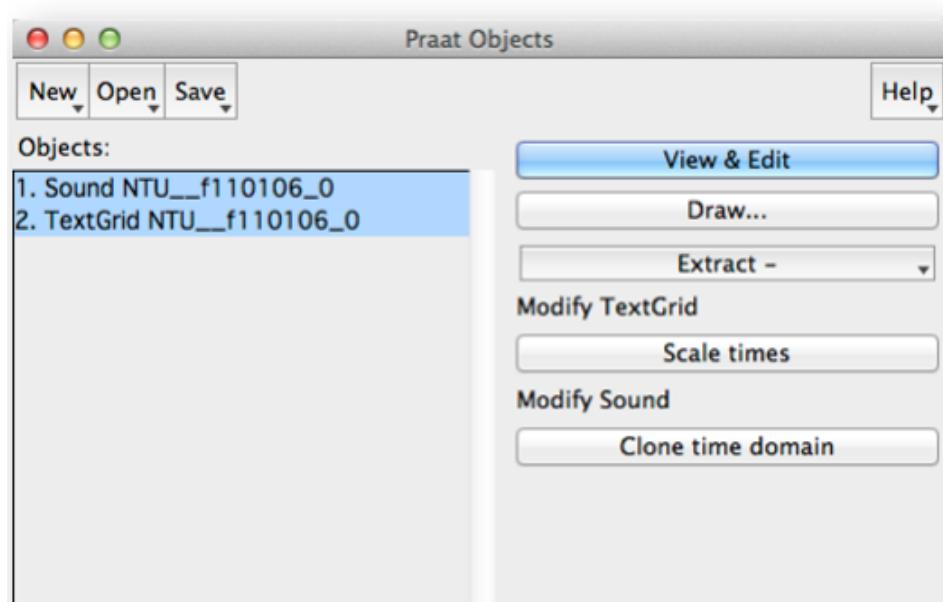
Praat - Label a wave file

- Create one interval tier named RCDIF
- No point tiers

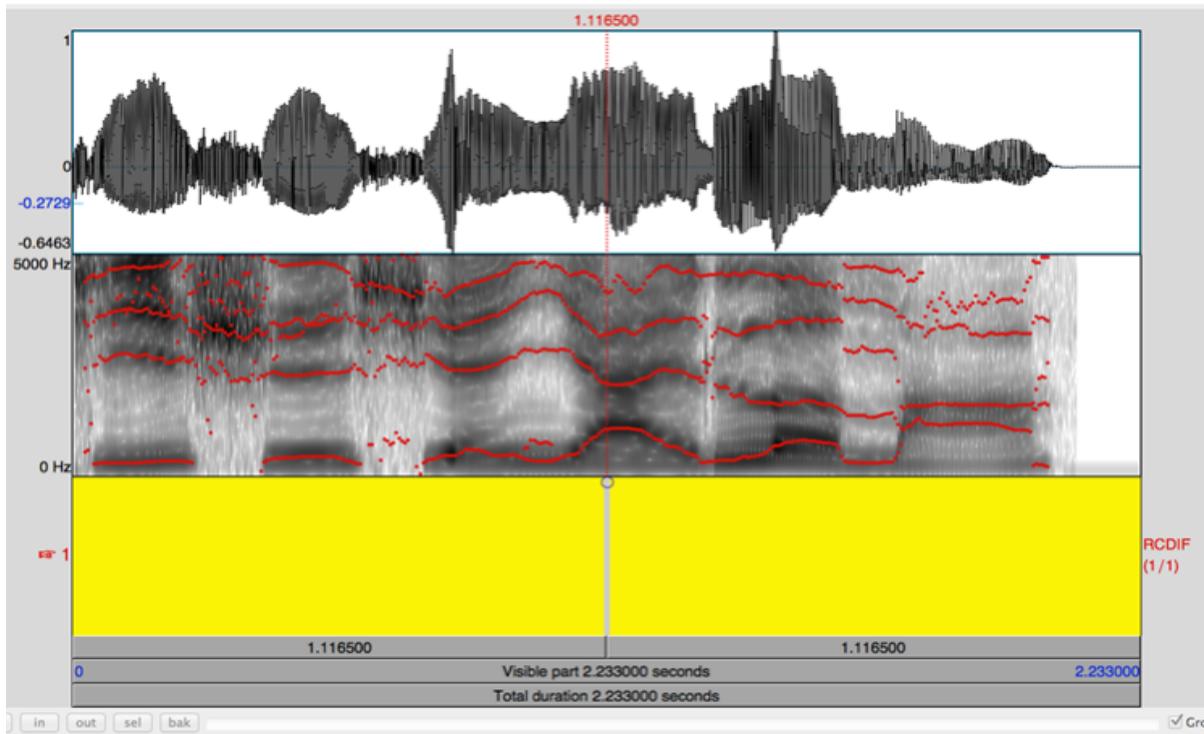


Praat - Label a wave file

- With **BOTH** objects selected
- click ***View & Edit***



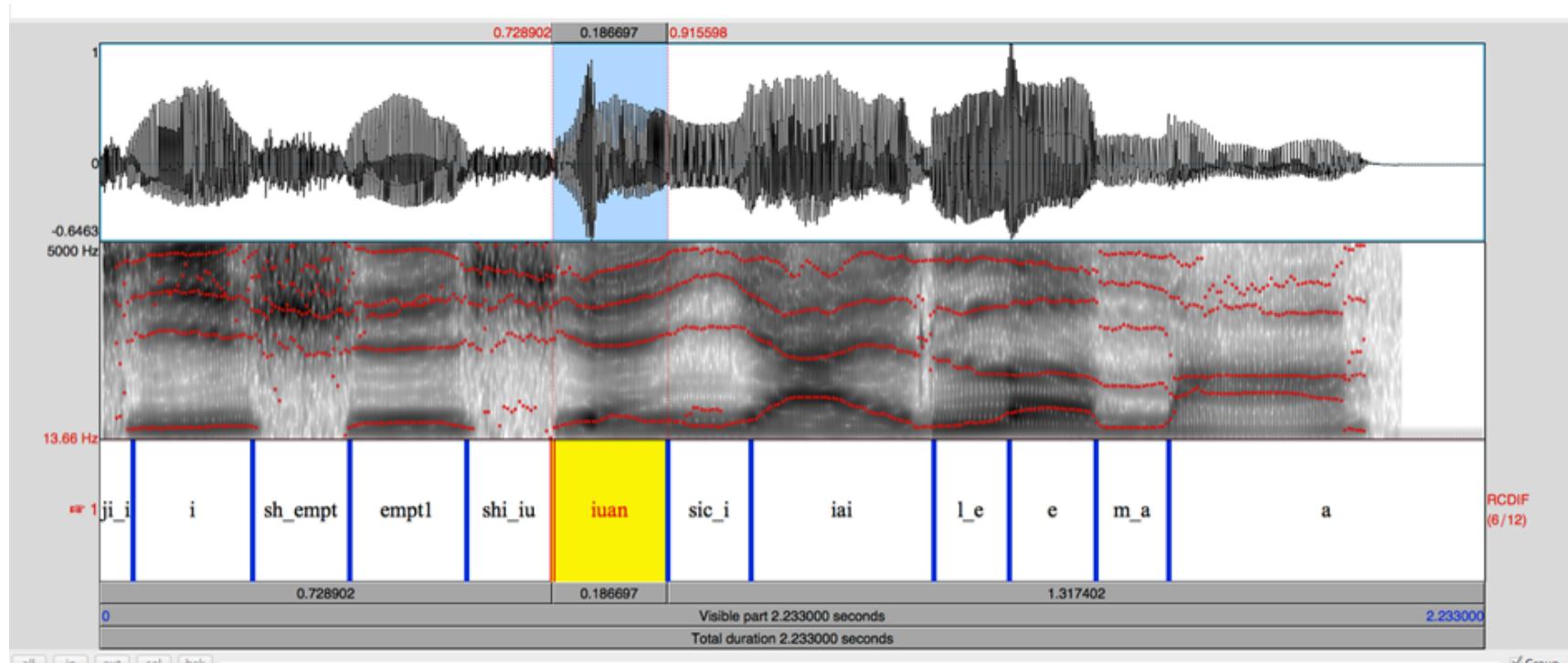
Praat - Label a wave file



Praat - Label a wave file

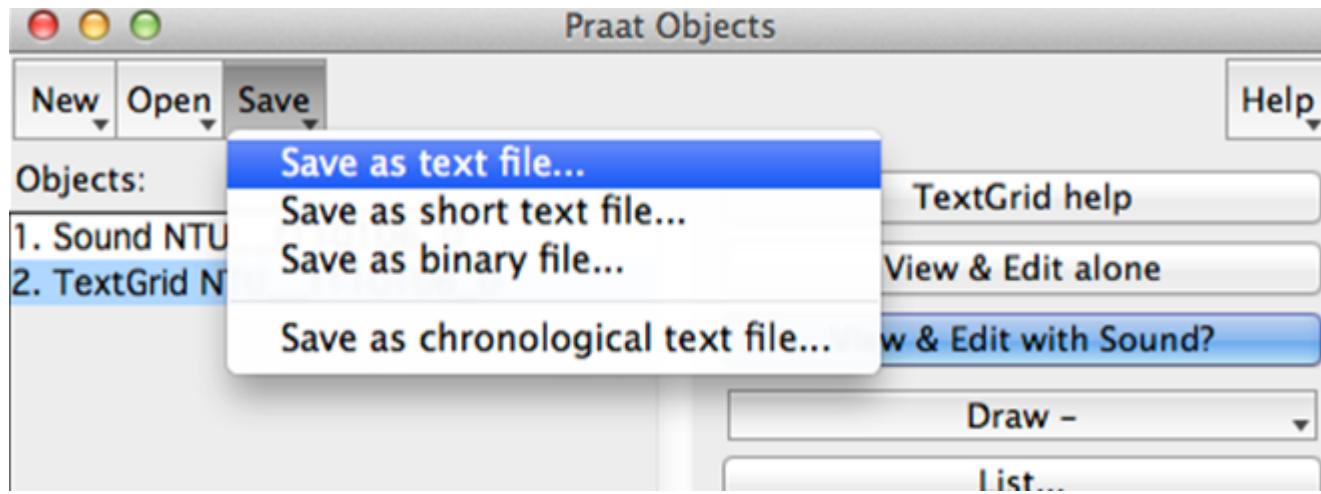
- Click on spectrogram for your boundary
- Add the boundary by clicking the small circle
Remove by choosing “Boundary/Remove”
- Drag your boundaries to be more accurate
- Click between your boundary and type in your label
(according to the “Syllable table”)
Listen to your label by clicking the number (interval time) below it

Praat - After labeling



Praat - Save your Label file

- Save your TextGrid object as short text file
File should be “.TextGrid” not “.Collection”



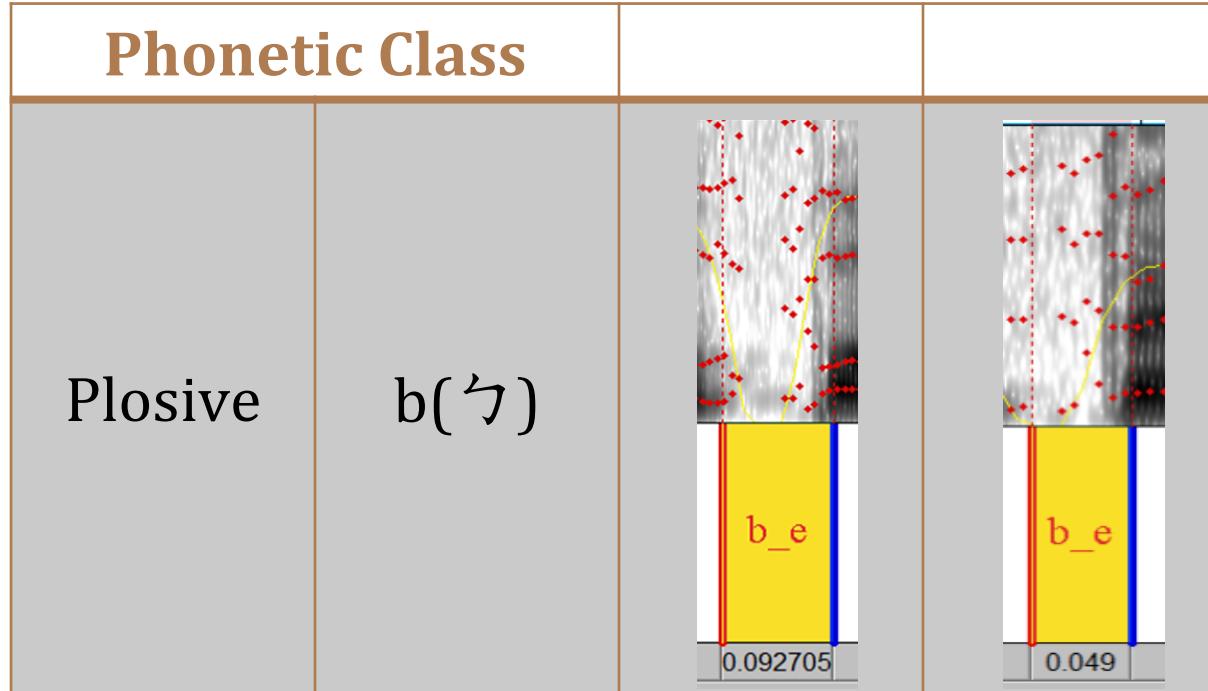
Report - Part 1 (20%)

- Choose your wave files from directories according to your student ID (<https://goo.gl/ero6Ka>).
- You must submit at least 5 fully labeled TextGrid files **(along with their wave files)**.
- These 5 files should contain the initial/final labels you use in part 2.

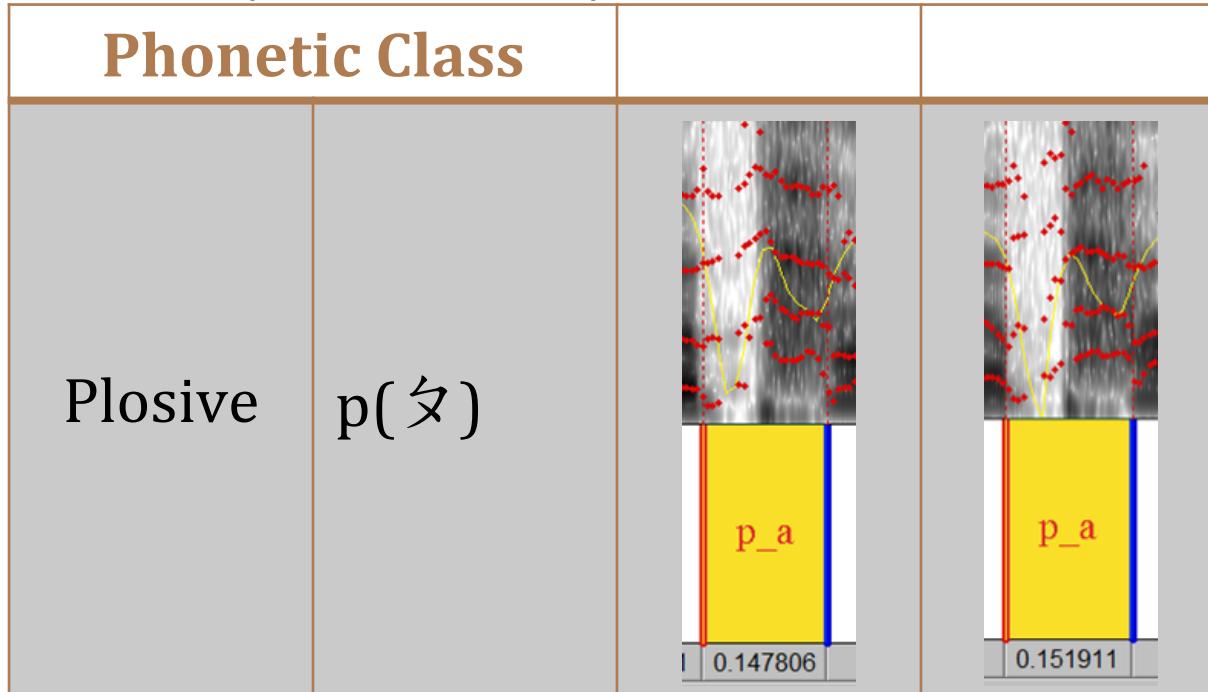
Report - Part 2 (30%)

- Choose at least 2 initials from the 4 classes (Plosive, Fricative, Affricate, Nasal)
- For each of these 8 initials, create a table that contains at least 2 screenshots of its label.
- Please show intensity and formant.

Part 2 - example : Plosive b (ㄅ)



Part 2 - example : Plosive p (প)



Part 2 - Useful tips

- Zoom in and Zoom out.
- show all or selection part in Praat by clicking the buttons on the lower-left corner of spectrograms.
- In your chosen directory.
“NTU_XXXXX_phn2file” lists all files containing each phone
“NTU_XXXXX_file2phn” lists all phones contained in each file

Report - Part 3 (50%)

1. (20%) What are the consistencies of the spectrogram in each phonetic class? (Plosive, Fricative, Affricate, Nasal)
2. (10%) Is the boundary between neighboring initial and final clear? What is the benefit of using “right-context dependent” initial model (ex: sh_a) instead of pure initial model (ex: sh) to model initials?

Report - Part 3 (50%)

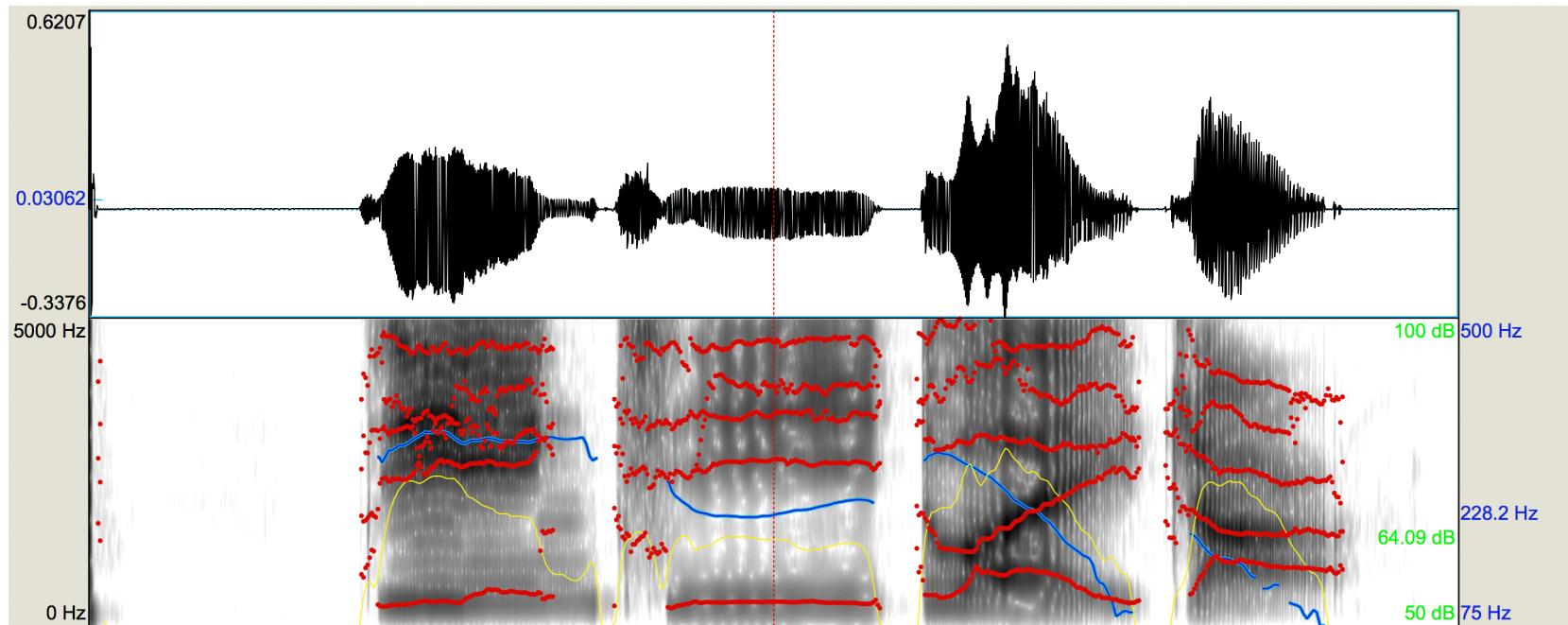
3. (10%) What are the differences when pronouncingㄉ & ㄉ? How can you tell the differences in spectrogram for ㄉ & ㄉ? (You may also want to compare ㄉ & ㄉ, ㄉ & ㄉ respectively)
4. (10%) Take a look at the spectrogram of finals. Is there any simple rules to discriminate initials from finals provided only spectrogram?

Report - Bonus (10%)

- The following is a speech analysis plot for a Chinese word composed of 4 characters. Each character is composed of an initial and a final.
- Guess what the word is and describe your reasoning.
(Score: reasoning 8%, correct answer 2%)
- If you cannot figure out the word, you can guess the phonetic class or initial/finals.
For example, your answer can be “l_i, i, sic_a, au” or “plosive, diphthong, plosive, monophthong”.

Report - Bonus (10%)

- Hint: it's a movie name which published in 2019 !



Submission Requirements

1. 5 TextGrid files or more (each along with its wave file).
the “.TextGrid” & “.wav” filenames should be the same.

2. hw2-2_bXXXXXXX.pdf
Answer the questions for part 2, 3 & bonus.

Submission Requirements

3. Put those **11 files in a folder**, compress the folder to 1 zip file and upload it to **CEIBA**.

- Folder name should be bXXXXXXXXX (e.g. b04901000)
- .zip only
- **20%** of the final score will be taken off for wrong format

If you have any problem...

- Look up the Praat introduction website.
<http://www.fon.hum.uva.nl/praat/manual/Intro.html>
- Check the FAQ

Contact TA

- email : ntudigitalspeechprocessingta@gmail.com
title: [HW2-2] Problem Description
- Office Hour: Monday 14:30-15:30 電二531 王君璇
(Please send an email before coming!)

Homework 2

- You can submit either
 - HW 2-1 (HMM Training and Testing)
 - HW 2-2 (Speech Analysis)
- You can also submit both
- The higher grade of the two will count as your final score for HW2

Homework 2

- **Deadline: 2019/5/3 23:59:59**
 - Late Penalty: 10% off every 24 hours after deadline
(less than 24 hours will be viewed as 24 hours).
 - Submission after 3 days will get zero point.