Tutorial on VoiceSauce - A program for voice analysis

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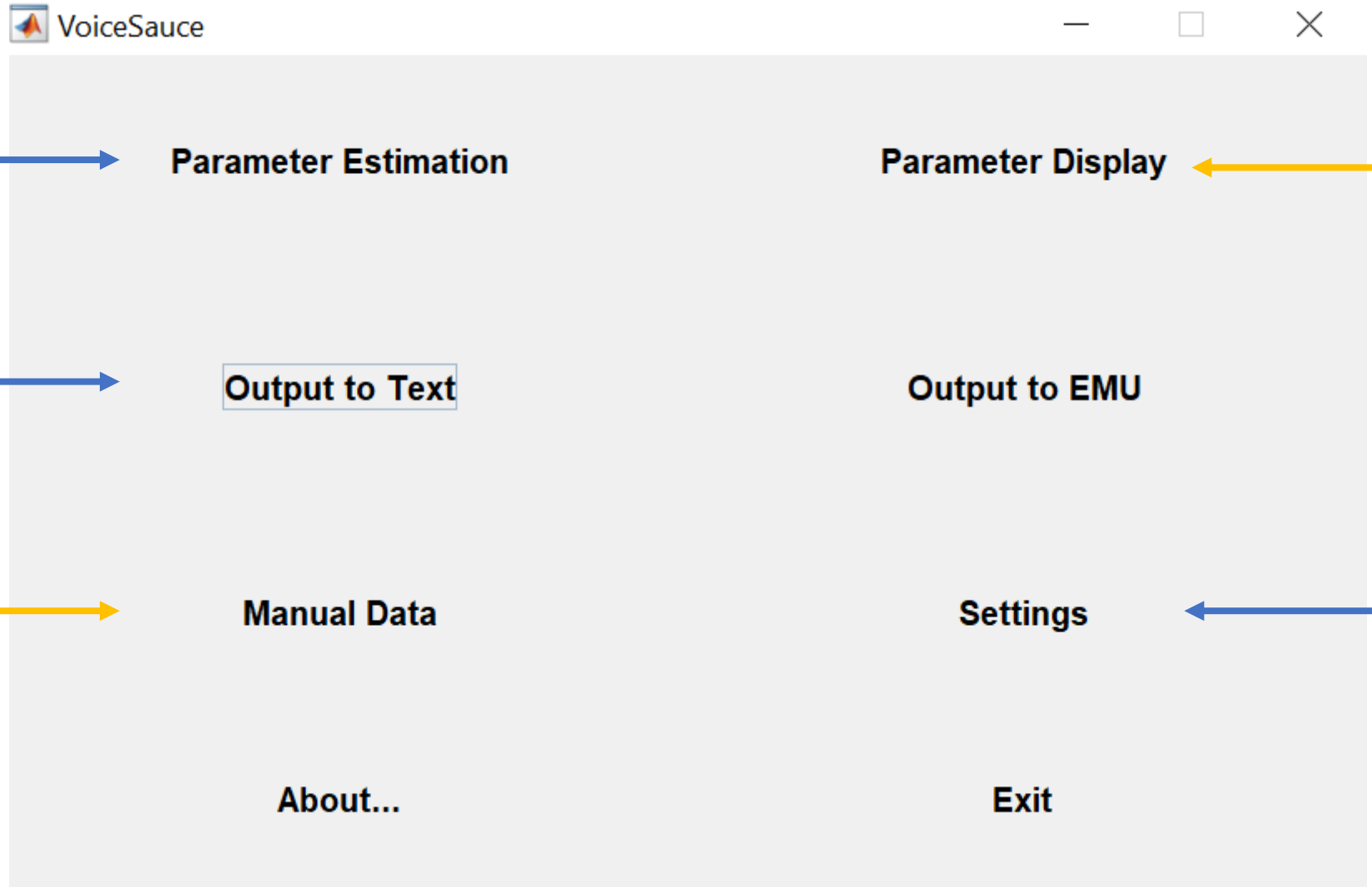
Goal of the workshop

- Have a basic understanding of the rationale and usage of VoiceSauce;
- Get hands-on experience of using VoiceSauce to process audio files;
- Visualize and interpret data in Excel
- (Try some visualization using R code!)

What is VoiceSauce

- VoiceSauce is a software that can be used to analyze acoustic measurements related to **voicing**.
- Compared to Praat, VoiceSauce specializes in measuring parameters related to **voice quality**:
  - **Spectral tilt** (H1-H2, H2-H4), **noise** (HNR), **voicing amplitude** (SoE). Those measures indicate whether there is glottal constriction or F0 irregularity in the voicing.
- VoiceSauce can also calculate measures that Praat can calculate:
  - Pitch (F0), vowel formant, duration, intensity (RMS Energy)

What does VoiceSauce look like



Step 2

Step 3

If you spot errors in the output and want to manually add data

If you want to visualize the data in VoiceSauce

Step 1

Output from VoiceSauce

- VoiceSauce output one datapoint every 1 millisecond.
- You can choose to either output all the datapoints, or only the mean.
  - VoiceSauce can divide a sound file into several intervals and calculate a mean for each interval.

All data points:

Filename	Label	seg_Start	seg_End	t_ms	H1c	H2c	H4c	A1c	A2c
Gai.mat	1-a-short-	154.993	241.778	155	NaN	NaN	NaN	NaN	NaN
Gai.mat	1-a-short-	154.993	241.778	156	NaN	NaN	NaN	NaN	NaN
Gai.mat	1-a-short-	154.993	241.778	157	11.07	5.879	-7.695	-26.586	-25.205
Gai.mat	1-a-short-	154.993	241.778	158	12.481	7.54	-6.098	-23.711	-22.406
Gai.mat	1-a-short-	154.993	241.778	159	13.906	9.01	-4.08	-21.1	-19.914
Gai.mat	1-a-short-	154.993	241.778	160	15.442	10.657	-2.1	-18.369	-17.362
Gai.mat	1-a-short-	154.993	241.778	161	17.096	12.307	0.13	-15.384	-14.507
Gai.mat	1-a-short-	154.993	241.778	162	18.805	14.063	2.319	-12.217	-11.768
Gai.mat	1-a-short-	154.993	241.778	163	20.362	15.38	3.559	-10.39	-10.283
Gai.mat	1-a-short-	154.993	241.778	164	21.752	16.67	4.531	-8.742	-9.111
Gai.mat	1-a-short-	154.993	241.778	165	22.642	17.403	5.192	-7.341	-8.114
Gai.mat	1-a-short-	154.993	241.778	166	23.054	17.767	5.711	-6.216	-7.292
Gai.mat	1-a-short-	154.993	241.778	167	23.415	17.92	6.016	-5.299	-6.53
Gai.mat	1-a-short-	154.993	241.778	168	23.648	18.216	6.227	-4.607	-6.111
Gai.mat	1-a-short-	154.993	241.778	169	23.86	18.556	6.455	-4.022	-5.6
Gai.mat	1-a-short-	154.993	241.778	170	24.064	18.842	6.813	-3.511	-5.181
Gai.mat	1-a-short-	154.993	241.778	171	24.169	19.034	7.078	-2.989	-4.792
Gai.mat	1-a-short-	154.993	241.778	172	24.248	19.223	7.149	-2.445	-4.473
Gai.mat	1-a-short-	154.993	241.778	173	24.349	19.363	7.138	-1.952	-4.186
Gai.mat	1-a-short-	154.993	241.778	174	24.385	19.488	7.194	-1.543	-4.028

Just the mean

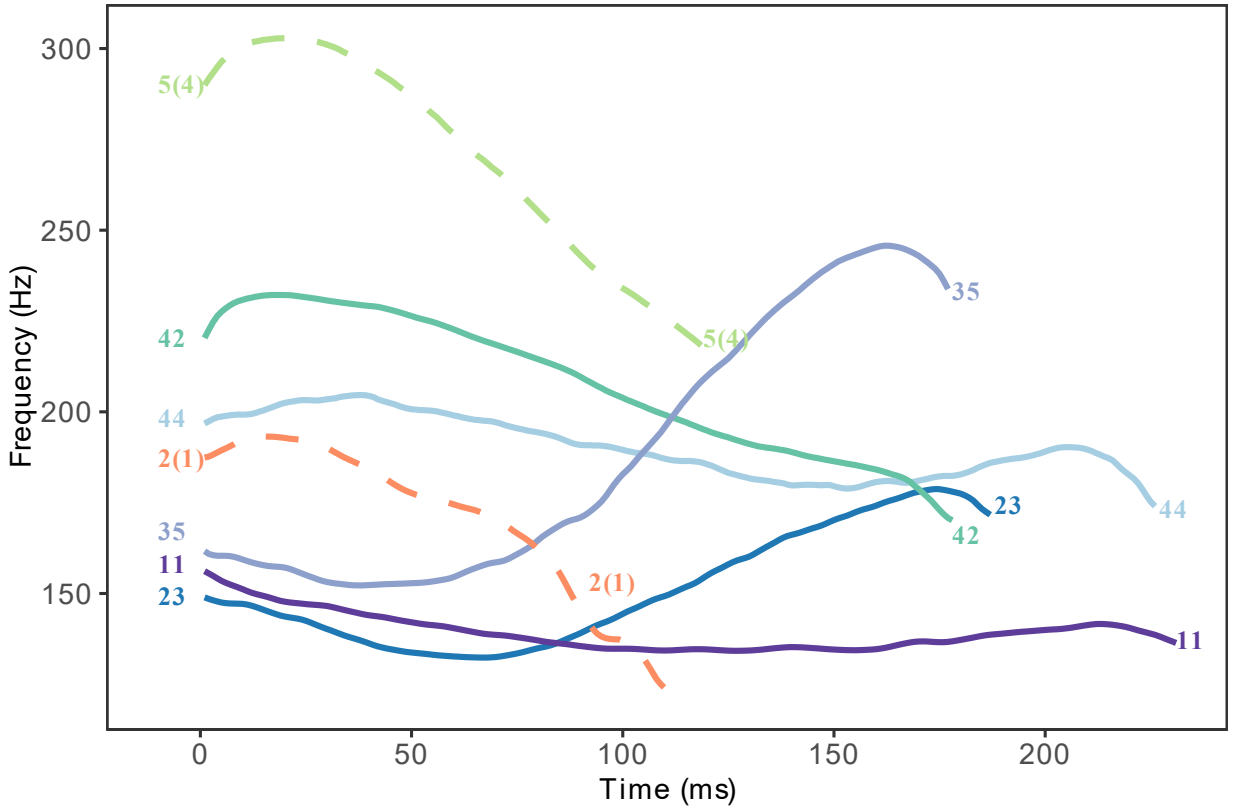
Filename	positi	vowel	length	phonation	seg_Start	seg_End	H1c_mean	H1H2c_mean	CPP_mean	Energy_mean
aGa.mat	1	a	short	glottal	127.354	215.402	15.279	1.946	17.511	3
aGa.mat	2	a	short	glottal	242.999	353.387	8.207	-3.91	16.243	0.973
aka.mat	1	a	short	modal	327.73	381.61	9.135	-0.786	16.362	0.477
aka.mat	2	a	short	modal	514.339	637.869	7.967	-2.142	16.766	0.365
kaGa.mat	1	a	short	glottal	110.185	174.578	16.543	8.428	17.414	1.696
kaGa.mat	2	a	short	glottal	235.029	323.077	11.401	-0.247	16.171	1.09
koGu.mat	1	o	short	glottal	167.14	223.641	15.259	8.602	16.71	8.866
koGu.mat	2	u	short	glottal	284.793	396.801	17.068	3.731	15.888	3.101
kou.mat	1	o	short	modal	258.052	498.542	13.007	-2.459	18.71	20.469
kou.mat	2	u	short	modal	498.542	660.182	10.456	-1.433	15.491	1.007
kouL.mat	1	o	short	modal	183.771	371.84	15.715	0.582	17.661	10.577
kouL.mat	2	u	long	modal	371.84	664.019	17.66	-0.226	17.621	5.994
noGu.mat	1	o	short	glottal	203.659	267.468	23.627	14.075	18.396	6.587
noGu.mat	2	u	short	glottal	334.636	465.612	15.828	7.704	15.669	1.454
noLu.mat	1	o	long	modal	206.389	444.834	19.19	4.425	19.165	7.607
noLu.mat	2	u	short	modal	444.834	595.961	11.085	-4.378	15.915	1.871
nou.mat	1	o	short	modal	177.954	374.419	10.721	0.382	19.414	2.846
nou.mat	2	u	short	modal	374.419	471.812	5.618	2.438	15.364	0.199

Means of three equal intervals for each file

Filename	Label	seg_Start	seg_End	H1c_mean	H1c_means001	H1c_means002	H1c_means003
Gai.mat	1-a-short-	154.993	241.778	19.524	21.76	21.788	15.265
Gai.mat	2-i-short-g	241.778	447.722	14.792	14.646	17.97	11.827
aGa.mat	1-a-short-	127.354	215.402	15.279	14.356	19.158	12.472
aGa.mat	2-a-short-	242.999	353.387	8.207	4.842	13.055	6.819
ai.mat	1-a-short-	109.075	316.273	19.063	12.878	21.267	23.019
ai.mat	2-i-short-r	316.273	513.833	18.351	21.449	18.616	14.915
aka.mat	1-a-short-	327.73	381.61	9.135	10	10.052	7.632
aka.mat	2-a-short-	514.339	637.869	7.967	9.353	8.235	6.361
kaGa.mat	1-a-short-	110.185	174.578	16.543	16.443	17.589	15.722
kaGa.mat	2-a-short-	235.029	323.077	11.401	9.54	8.756	15.049
koGu.mat	1-o-short-	167.14	223.641	15.259	17.046	15.767	13.061
koGu.mat	2-u-short-	284.793	396.801	17.068	13.588	17.119	20.063
kou.mat	1-o-short-	258.052	498.542	13.007	17.423	13.044	8.675
kou.mat	2-u-short-	498.542	660.182	10.456	10.635	13.418	7.448
kouL.mat	1-o-short-	183.771	371.84	15.715	16.504	17.35	13.4
kouL.mat	2-u-long-n	371.84	664.019	17.66	17.874	20.16	14.953

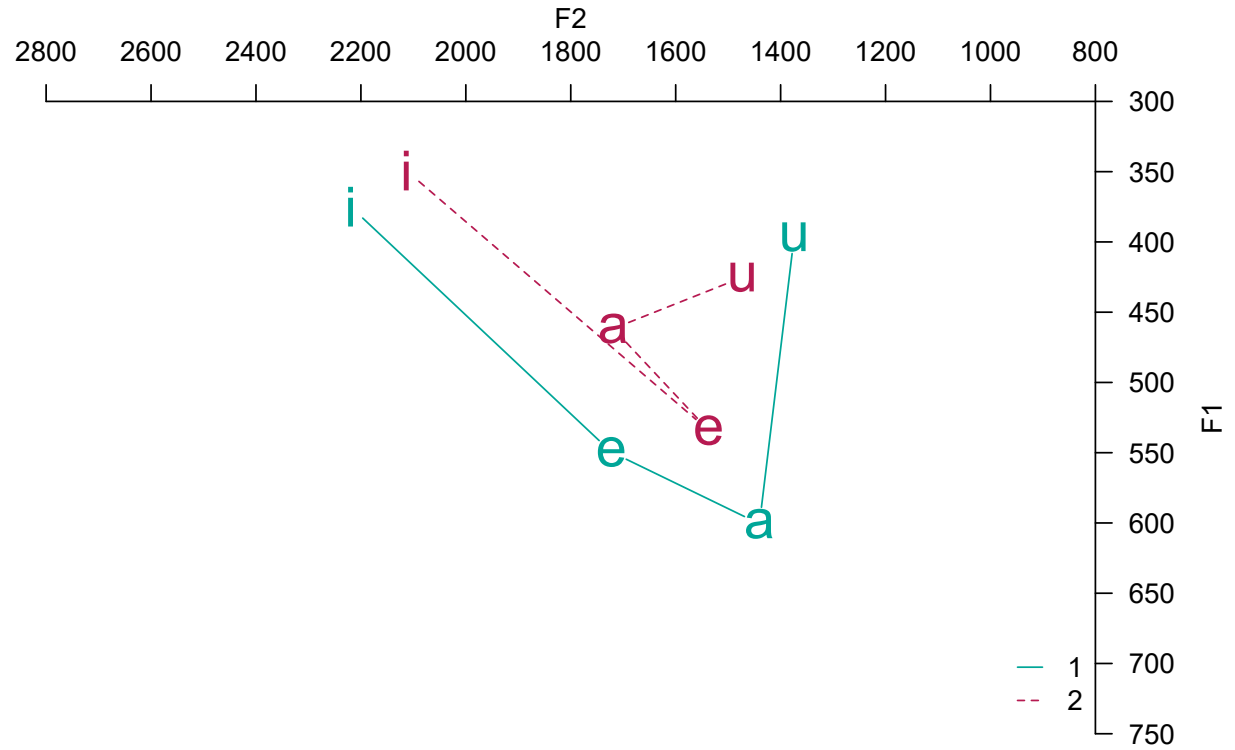
What can you draw/analyze using output from VoiceSauce

Pitch track (F0 track of the seven tones in Xiapu Min)



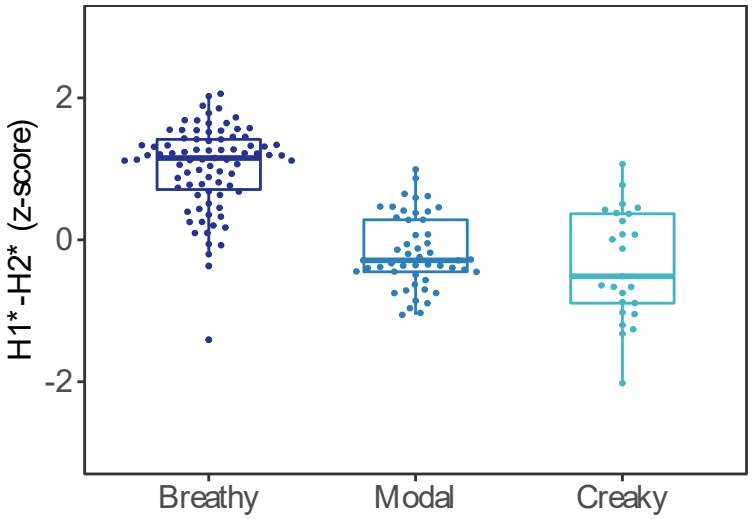
What can you draw/analyze using output from VoiceSauce

Vowel chart (stressed and unstressed vowels in Cahuilla)



What can you draw/analyze using output from VoiceSauce

Boxplots of various measures



How to download and use VoiceSauce

- Windows users: Standalone .exe file
- Mac users: Install Matlab and run the scripts in Matlab
- Refer to https://yuanchaiyc.github.io/website/subpages/VS-tutorial.html for detailed installation instructions

Case study for today

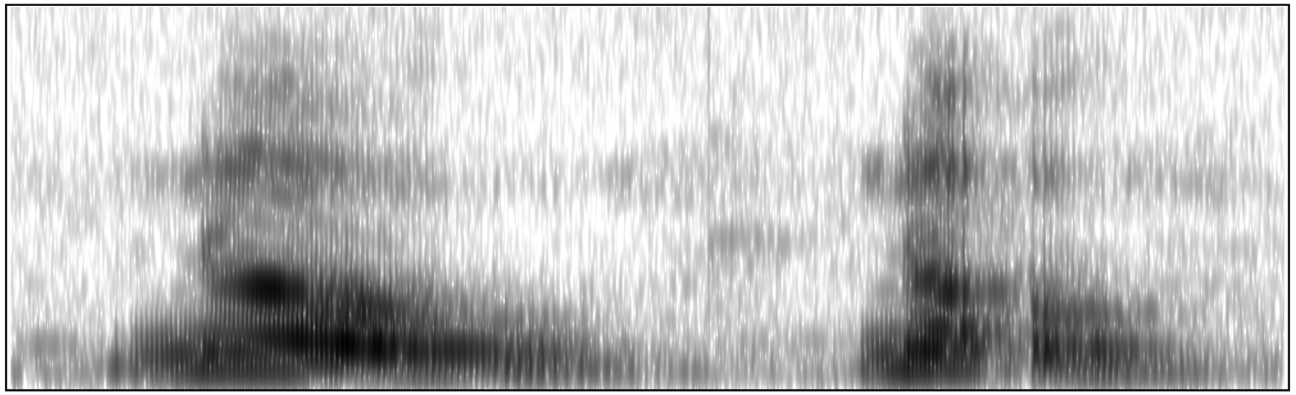
- The acoustics of **V** and **VʔV** in Hawaiian
- Hawaiian has phonemic glottal stop:

aha	“what”
ʔaha	“line, life”
noːu	“yours”
noʔu	“mine”

(The UCLA Phonetics Lab Archive)

Case study for today

- Research question: Are the vowels surrounding the glottal stop creakier than the plain vowels?
  - noːu vs. noʔu

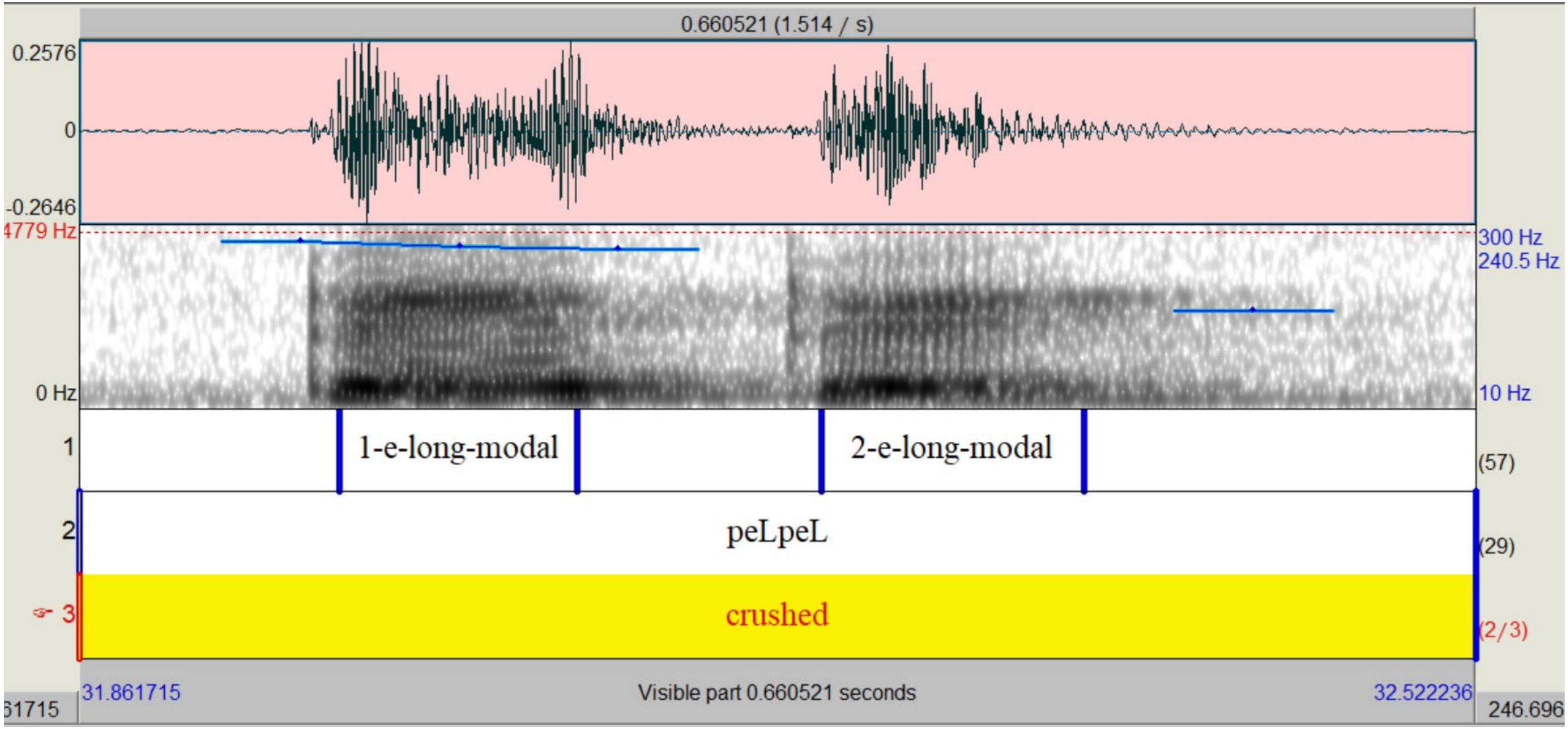


	oː	u		o		u	
noːu				noʔu			
yours				mine			

Getting started

- Prepare data in Praat
  - Create a Textgrid
  - Segment and annotate the target segment
  - Save the Textgrid
    - either as for the whole recording
    - or split the recording into individual target words – RECOMMENDED
    - You can use **Praat scripts** or **Praat plugins** to chop a long recordings into smaller chunks. Come talk to me if you want to know more about the tools!

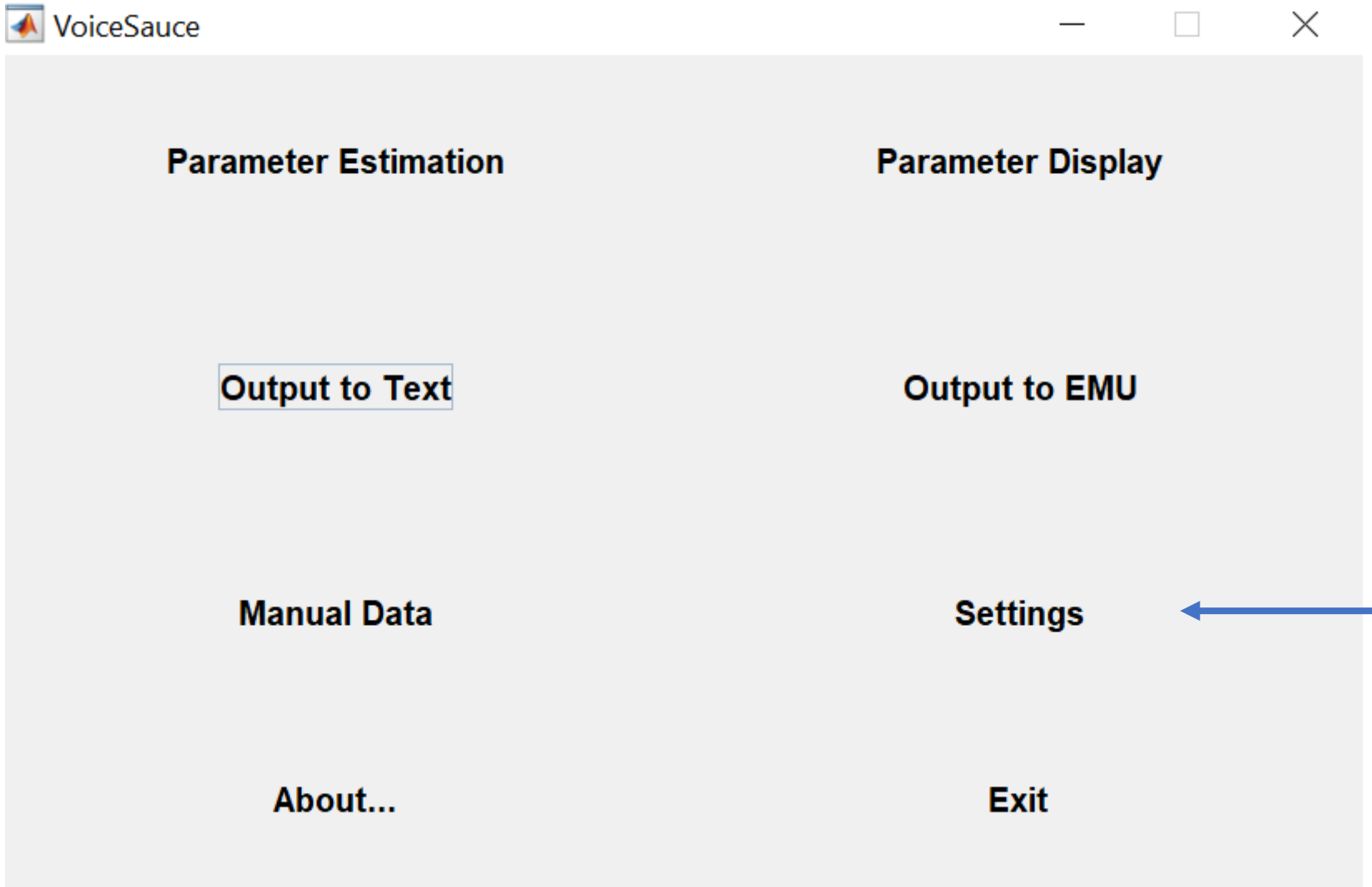
Getting started

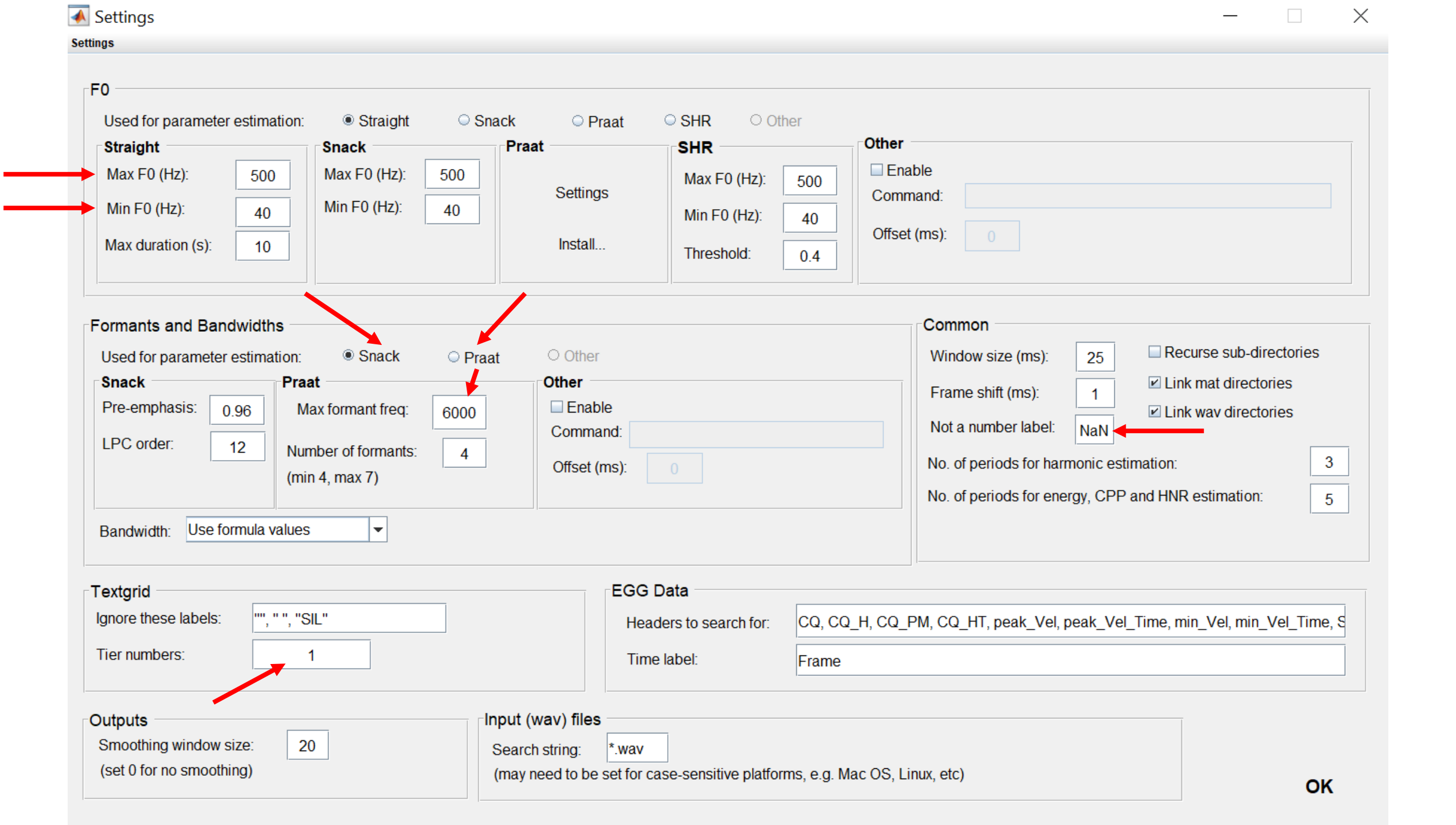


Getting started

- Download the preprocessed data here:

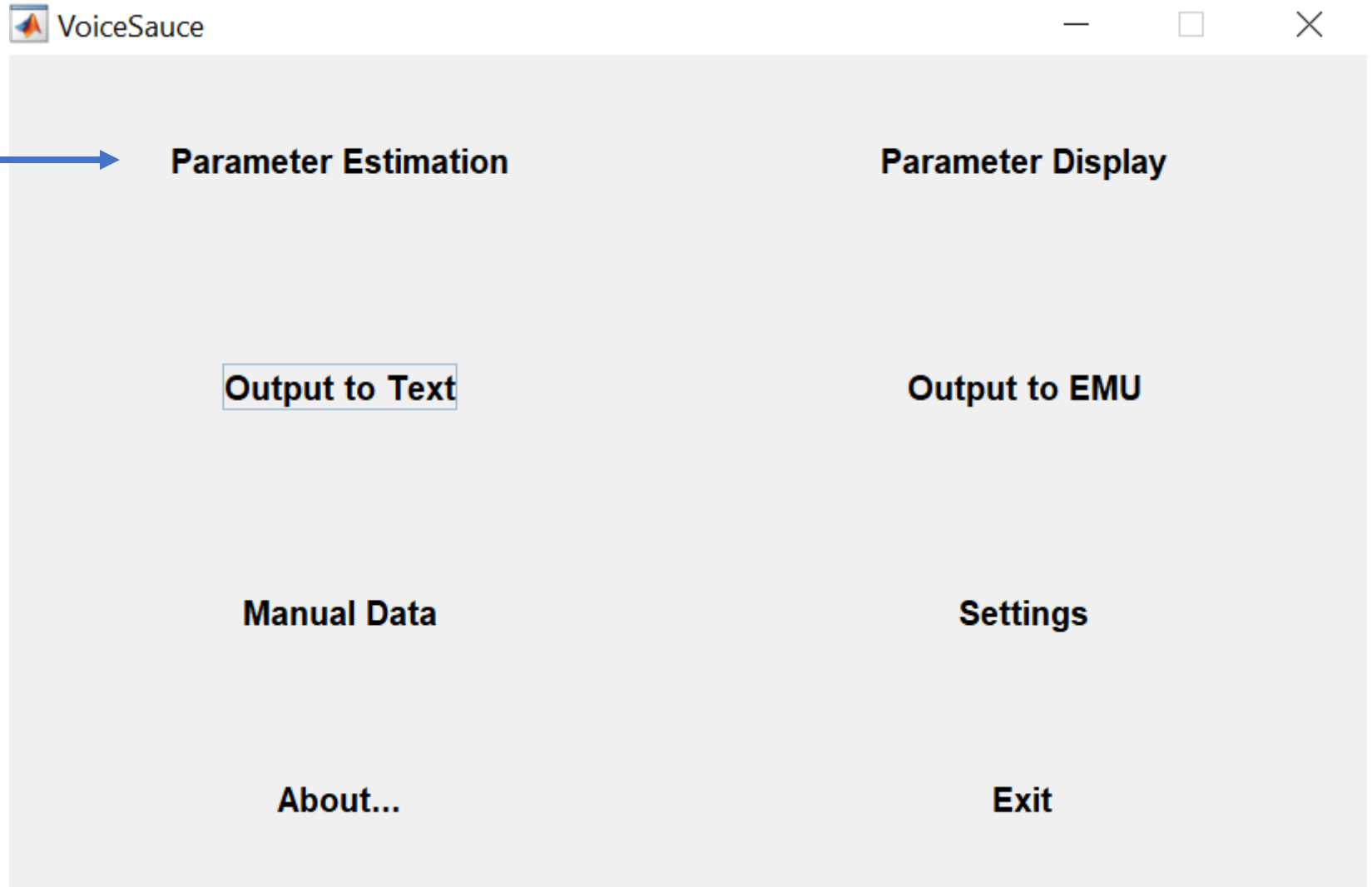
Pass on the .wav and .Textgrid to VoiceSauce

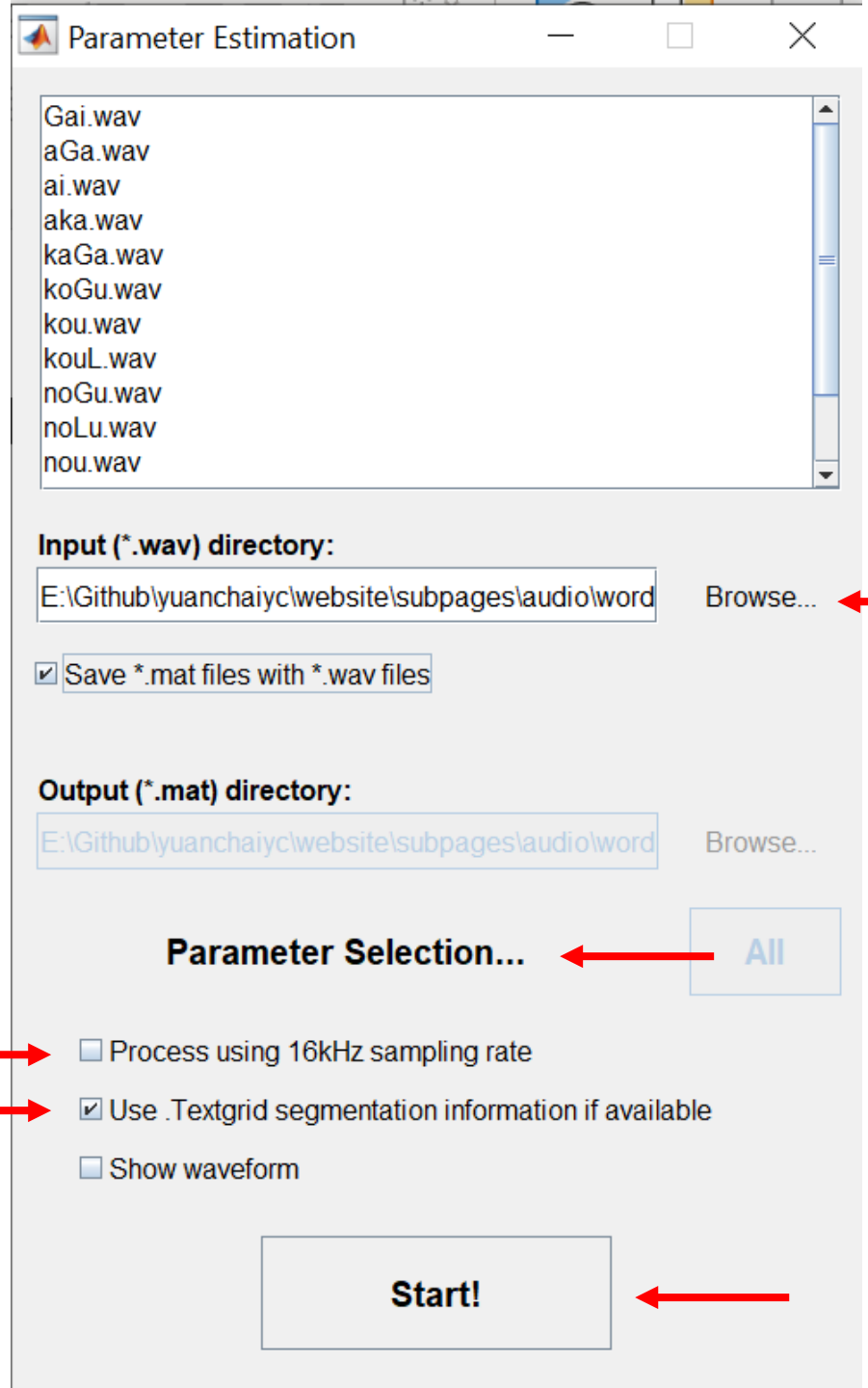



Settings
Settings
F0
Used for parameter estimation:
Straight
Snack
Praat
SHR
Other
Straight
Max F0 (Hz):
500
Min F0 (Hz):
40
Max duration (s):
10
Snack
Max F0 (Hz):
500
Min F0 (Hz):
40
Praat
Settings
Install...
SHR
Max F0 (Hz):
500
Min F0 (Hz):
40
Threshold:
0.4
Other
Enable
Command:
Offset (ms):
0
Formants and Bandwidths
Used for parameter estimation:
Snack
Praat
Other
Snack
Pre-emphasis:
0.96
LPC order:
12
Praat
Max formant freq:
6000
Number of formants:
4
(min 4, max 7)
Other
Enable
Command:
Offset (ms):
0
Bandwidth:
Use formula values
Common
Window size (ms):
25
Frame shift (ms):
1
Not a number label:
NaN
Recurse sub-directories
Link mat directories
Link wav directories
No. of periods for harmonic estimation:
3
No. of periods for energy, CPP and HNR estimation:
5
Textgrid
Ignore these labels:
"", " ", "SIL"
Tier numbers:
1
EGG Data
Headers to search for:
CQ, CQ_H, CQ_PM, CQ_HT, peak_Vel, peak_Vel_Time, min_Vel, min_Vel_Time, S
Time label:
Frame
Outputs
Smoothing window size:
20
(set 0 for no smoothing)
Input (wav) files
Search string:
*.wav
(may need to be set for case-sensitive platforms, e.g. Mac OS, Linux, etc)
OK

Step 2: Parameter estimation

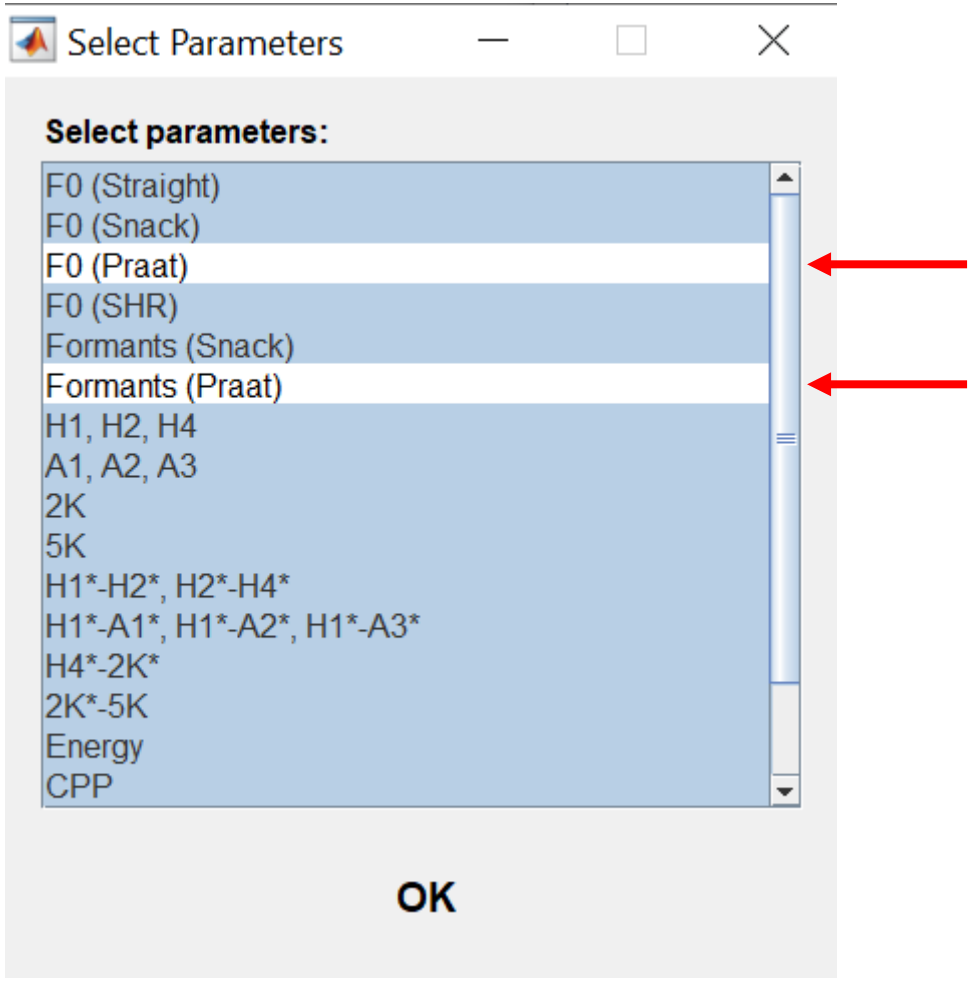
Step 2



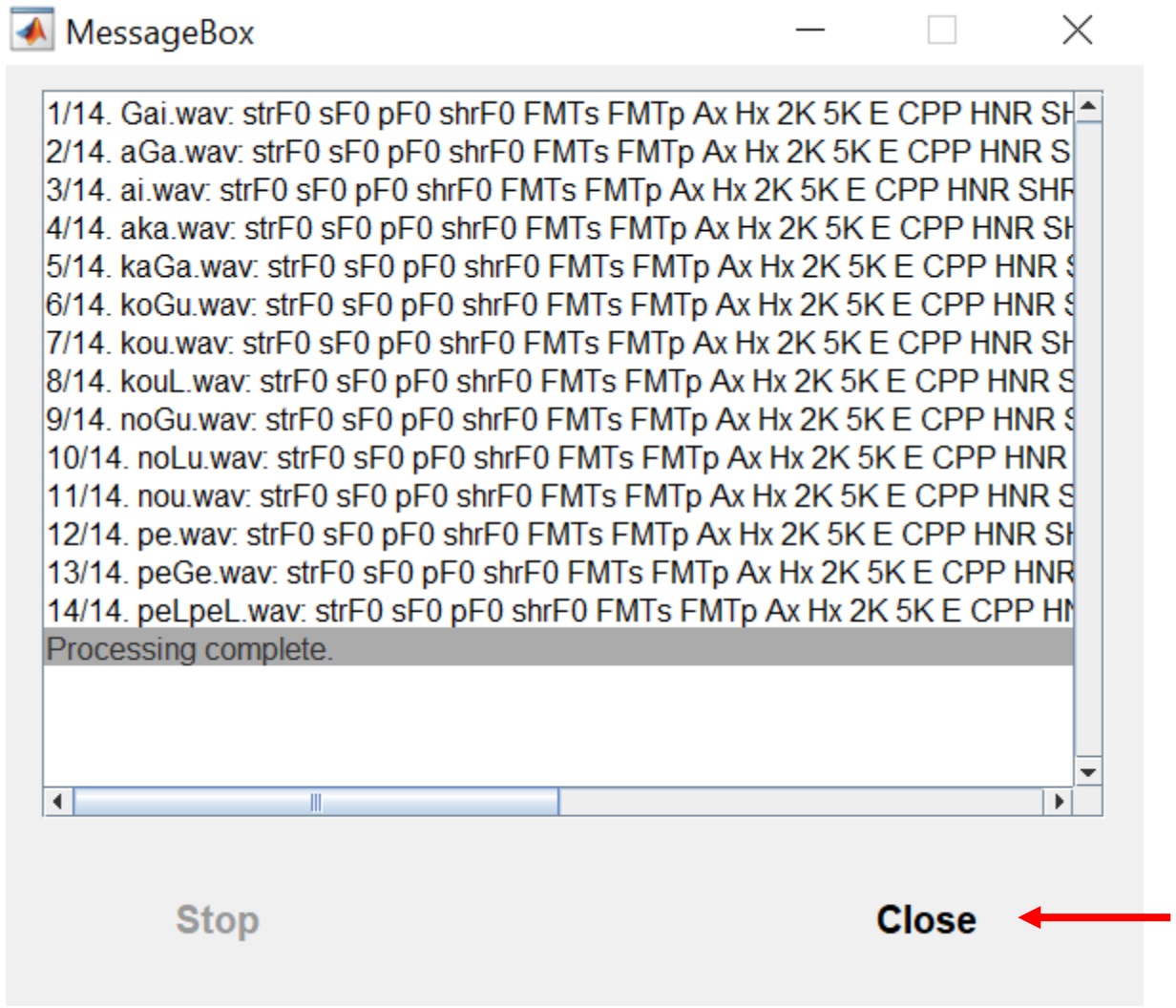

Parameter Estimation
Gai.wav
aGa.wav
ai.wav
aka.wav
kaGa.wav
koGu.wav
kou.wav
kouL.wav
noGu.wav
noLu.wav
nou.wav
Input (*.wav) directory:
E:\Github\yuanchaiyc\website\subpages\audio\word
Browse...
Save *.mat files with *.wav files
Output (*.mat) directory:
E:\Github\yuanchaiyc\website\subpages\audio\word
Browse...
Parameter Selection...
All
Process using 16kHz sampling rate
Use .Textgrid segmentation information if available
Show waveform
Start!

Step 2: Parameter estimation

If you are using Matlab online, make sure you **deselect** all the measures involving Praat.

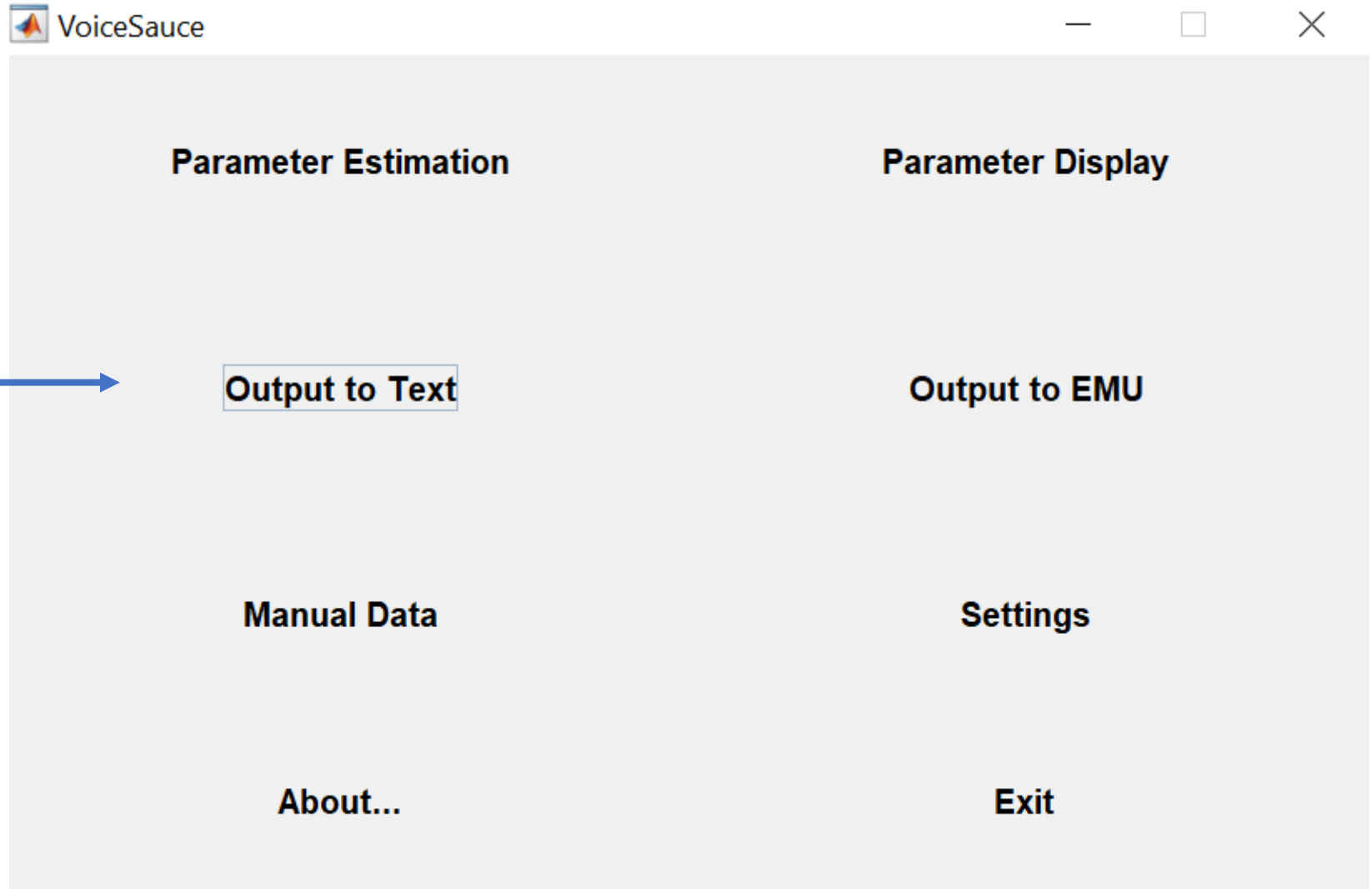


Step 2: Parameter estimation



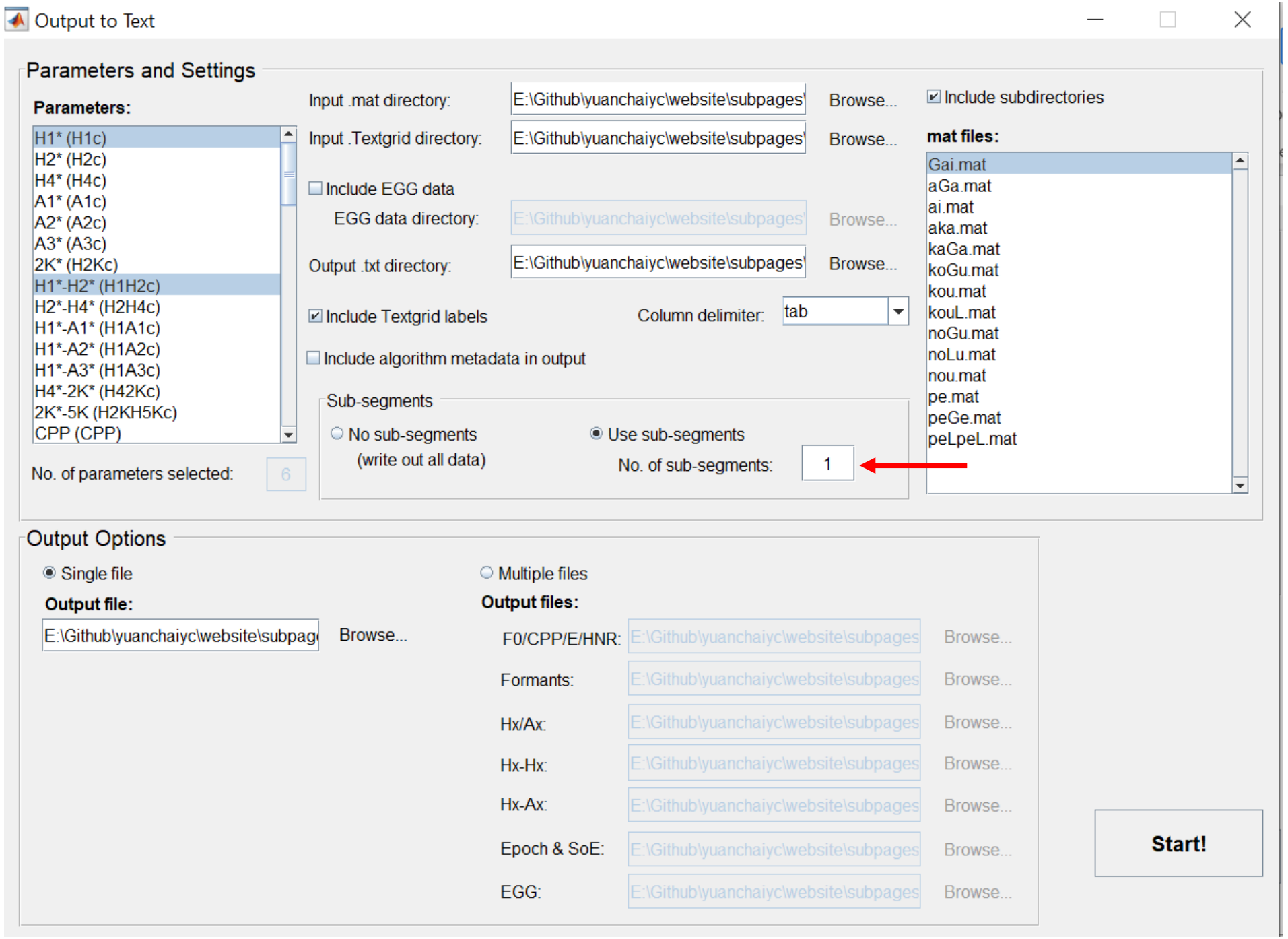
Step 3: Output to text

Step 3



Parameters to select for today:

H1*
H1*-H2*
HNR05
strF0
sF1
sF2
SoE



Step 4: Visualize the output in Excel

- Open output.txt in Excel
- If you have trouble opening the txt file, you can open the prepared output.xlsx in the folder that you downloaded.

Step 4: Visualize the output in Excel

- Draw boxplots
- Select “phonation” and “H1-H2”
- Go to Insert → Charts → Box & Whisker
- Press “OK”

Step 4: Visualize the output in Excel

- Draw vowel chart