What is Praat?

Praat (pronounced [pɹɑt]) is a free, open-source software created by Paul Boersma and David Weenink at the University of Amsterdam. It has many functions, but is primarily used to analyze speech. We will be using it to learn about some of the acoustic properties of speech sounds

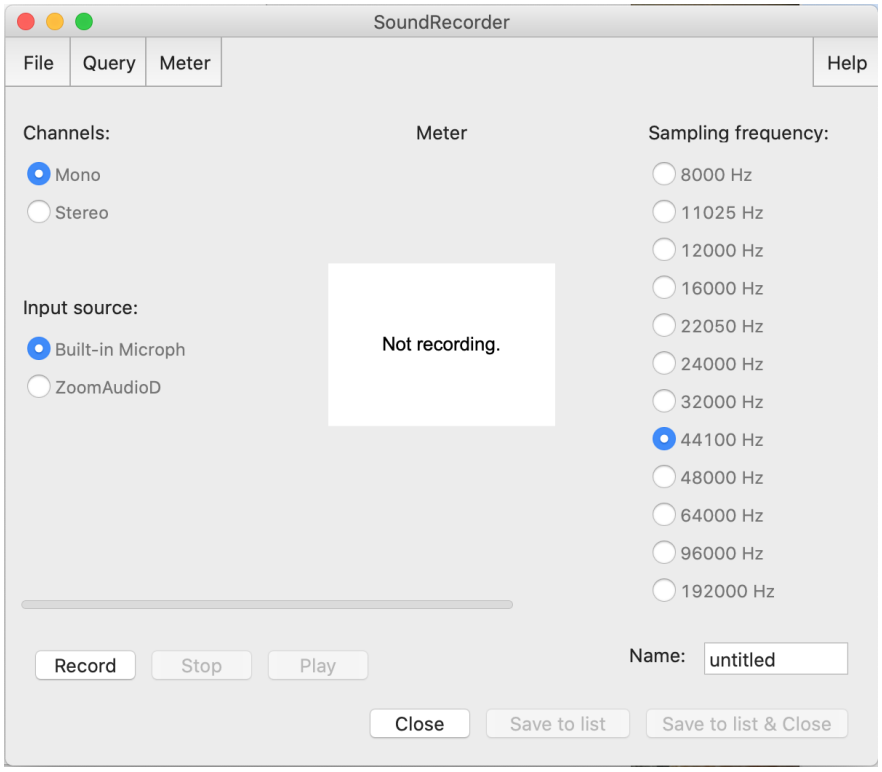
You can download Praat by going to http://www.praat.org and following the links for your specific platform.

***** At Home Activity 1 *****

Download and install Praat before the start of afternoon session 1 on Tuesday, January 25th. If you run into any problems, send me an e-mail at scott.nelson@stonybrook.edu and I will help you troubleshoot.

Opening Praat/Sound Files

When you first open Praat you should have two windows pop up. One should be called Praat Objects and the other should be Praat Pictures. You can close out of Praat Pictures as we won't be using that for anything that we do. In order to do anything with the Praat Objects window, we need an object to work with. So let's create one now. At the top of the Objects window you should be able to click `New` → `Record mono Sound...`. This should cause a new window called SoundRecorder to pop up.



You may have to change your Input source, but otherwise you should be ready to record at this point. To record, simply click `Record` and speak into whatever input source you chose. If your computer does not have a built in microphone and you are unable to record, that is ok. I will show you how to import sound files momentarily. Once you are done speaking, click `Stop`. You can listen back to the recording you just made by clicking `Play`. If you are satisfied with the recording you made, name your file in the text box next to `Name:` and then click `Save to list & Close`. If you are unsatisfied with your recording, you can click `Record` again. This will essentially record over your original recording and start the cycle anew.

In the Objects window you should now see an object named "1. Sound <name of sound>". When this sound is selected, it should bring up a bunch of buttons you can click on the right side of the Objects window. We'll ignore those for now. Instead, let's save the recording we just made. At the top of the objects window click `Save` → `Save as WAV file...` and then save the file onto you computer. Now that we've saved the file, let's see how we can import sound files. The first step will be to select the sound in the Objects window. After you've done this, there is a button at the bottom of the window labeled `Remove`. Once you clicked the remove button, the sound file should disappear. Let's add it back to the Objects window

now by going to the top and clicking `Open` → `Read from file...`. Find the file that you just saved to your computer and select it then click `Open`. You should see it reappear in the Objects window as "2. Sound <name of sound>". Don't worry about the numbering. Praat adds 1 to every new object number added to the window regardless if it has been there before. This resets every time you open the program.

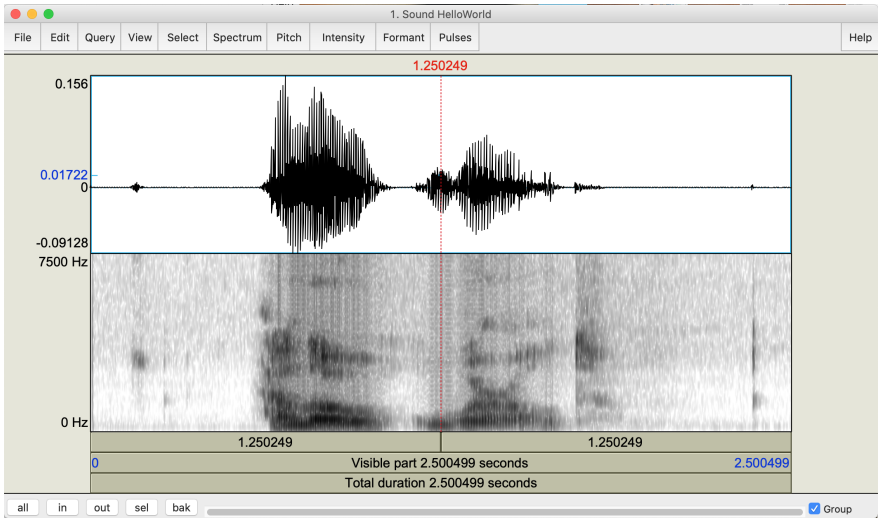
If you were unable to record a sound file directly into your computer, but have other ways of recording sound (e.g. - with your phone), you can upload those into Praat this same way. I'd suggest saving it as a .WAV file when transferring from source to source as Praat can be a little picky with audio file types.

***** At Home Activity 2 *****

Make sure you understand how to record new sounds in Praat. Record yourself saying the phrase "Hello World" and save it to your computer as `HelloWorld.wav`. If you recorded it within Praat, exit out of Praat, reopen it and load the saved file into your Object window. If you did not record within Praat, open Praat now and load the saved file into the Object window.

Spectrograms

Now that we have a sound to work with, let's see what it looks like. If you highlight your sound file in the Objects window, the buttons you saw earlier should reappear. Let's take a look at what a sound object looks like in Praat. Click on `View & Edit` now. A window called SOUND <NAME OF SOUND> should pop up now. This is a spectrogram. It should look something like the figure below.

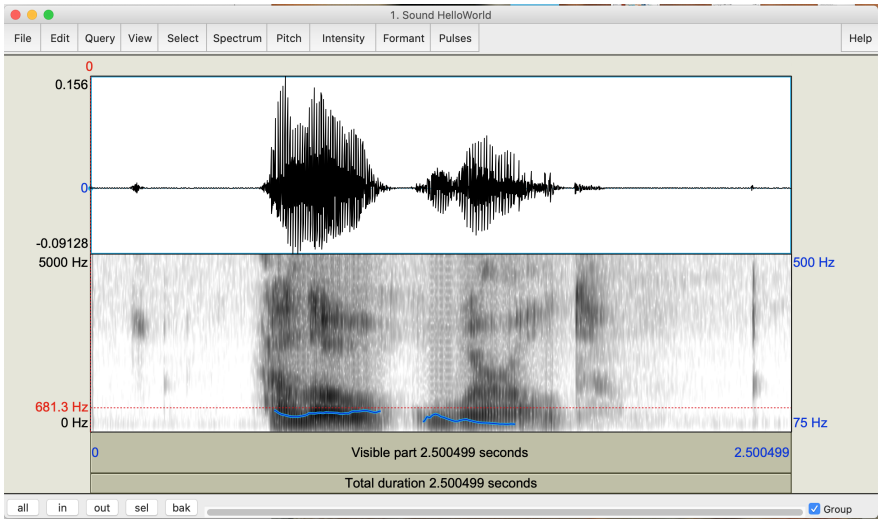


A spectrogram is a visual representation of sound. The x-axis is time, the y-axis is frequency, and the z-axis (represented by how dark a spot is) is amplitude. A higher amplitude means that there is a lot of energy at that specific point. If you click anywhere on the spectrogram, you will be presented with two values: the time at which you clicked (in seconds) and the frequency value at which you clicked. These are useful for making measurements by hand.

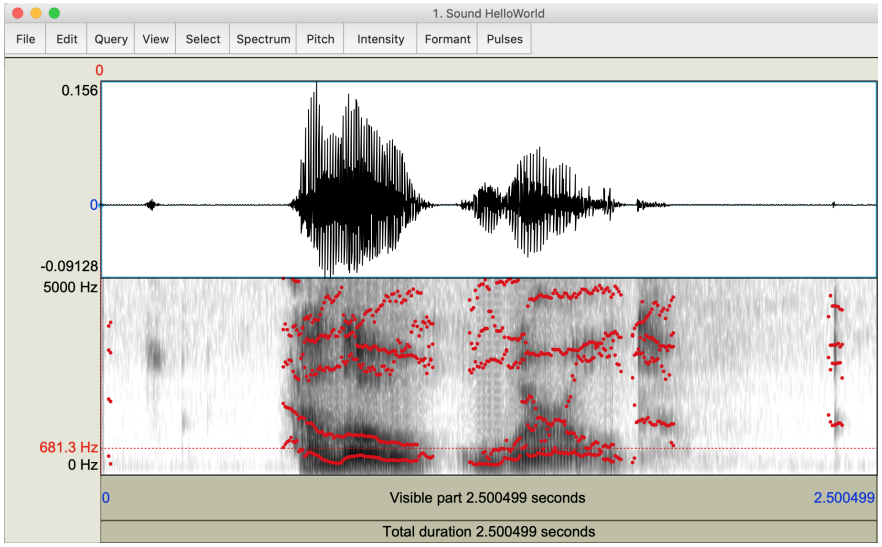
Getting Values

There are different parts of the speech signal that phoneticians and other speech researchers use for analysis. I will mention two of them here today: pitch and formants. Let's start by looking at the sound viewer.

At the top of the window you can click `Pitch` → `Show pitch`. This should do two things to the spectrogram. First, it should add a blue line overtop the spectrogram. This is the pitch path. Second, it should add a blue number (500) to the top right side of the spectrogram. This is the range for the pitch values. Notice now when you click on the spectrogram it shows a value in red on the left, but also at the bottom right it shows a value in blue (given there is a pitch at the certain time selected). This allows us to manually get pitch values at any time we'd like.



If you click `Pitch` → `Show pitch` again, the blue line and numbers will go away. Let's show the formants now. Formants are especially useful when analyzing different vowel sounds. If you click `Formant` → `Show formants` you will see a bunch of red dots appear. Unlike pitch, there are no new numbers on the right hand side as formants are really just measurements of the normal energy distribution on the spectrogram. Even though they are dots, you should notice trend lines appearing. While there is one single pitch value, there are multiple formants within the speech signal. We are primarily interested in the bottom two which are called F1 and F2. If you click on one of the lowest of the red lines at any given point on the spectrogram, the red number on the left is the F1 value at that point. If you click on the second lowest point, then that is the F2 value.



***** At Home Activity 3 *****

Open up "Sound HelloWorld" and analyze its pitch. Try to measure its pitch at five different points. Record the time and pitch value for each one.

Recording your vowels

To prepare for afternoon session 1 on Tuesday, January 25th, please record yourself saying the following words ahead of time. Rather than saying each word in isolation, you should use what is called a carrier phrase to make sure that each vowel word is said in the same style. The carrier phrase that you should use is "I will say ... this time."

1. beat
2. bit
3. bet
4. bat
5. boot
6. put
7. bought
8. bot

You can make one big recording with all 8 words or you can make 8 separate recordings. Make sure to save your files in the .WAV format in a place where you can easily find them.