

# PyRFF User Manual

v.1.0



## Semi-automated estimates of RFF

A complete guide to installing, configuring, and using the software for computing relative fundamental frequency (RFF).

🔗 [Learn more about RFF](#)

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## What is PyRFF?

PyRFF is a software tool designed to help users measure relative fundamental frequency, or **RFF**.

PyRFF can be used for applications focused on **voice assessment** because it offers a semi-automated method to estimate laryngeal tension without requiring any programming knowledge. This makes PyRFF an accessible and efficient solution for researchers and clinicians working in speech and voice analysis.

The development of PyRFF was conceptualized in the Stepp Lab for Sensorimotor Rehabilitation Engineering at Boston University. Its research, development, and funding were made possible through the support of our collaborators at Altec, Inc. and Delsys, Inc., as well as the National Institute on Deafness and Other Communication Disorders (NIDCD) of the National Institutes of Health.



## Usage Notes

This version of RFF software is implemented in Python, translated from the original MATLAB-based algorithm described here:

Vojtech, J.M., Segina, R.S., Buckley, D.P., Kolin, K.R., Tardif, M.C., Noordzij, J.P., & Stepp, C.E. "Refining algorithmic estimation of relative fundamental frequency: accounting for sample characteristics and fundamental frequency estimation method," *Journal of the Acoustical Society of America*, Vol.146(5), pp. 3184-3202, 2019.

It is intended for use with the stimuli described in this publication, which are uniform vowel-voiceless consonant-vowel utterances that comprise two vowels (e.g., /a/, /i/, /u/) surrounding the voiceless consonant, /f/. It is recommended that at least nine utterances are captured with equal stress on the vowels.

### ⚠ Operating system requirements

The current version of PyRFF is only supported on Windows operating systems. Future releases will expand support to macOS.

For questions or comments, email the Stepp Lab at [stepplab@bu.edu](mailto:stepplab@bu.edu) or submit feedback through [this form](#).

If you use PyRFF in your work, please **cite the PyRFF paper** below:

### 🔍 Main citation

TBD 😊

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# Installing, Running, and Uninstalling PyRFF

## Installation Instructions

### 1. Download the PyRFF Installer

*Visit the official PyRFF repository on GitHub to download the appropriate version for your platform (currently, only Windows).*

### 2. Run the Installer

- If you downloaded an .msi file, double-click it to launch the installer.
- If a security warning appears, click More info, then select Run anyway to proceed with the installation.

### 3. Choose an Installation Location

- The installer will prompt you to select a destination folder for PyRFF.
- Ensure you have permission to read and write to the selected location. If unsure, the default installation path is recommended.

### 4. Administrator Permissions (if required)

- Some systems may require administrator rights to install PyRFF.
- If prompted, enter the administrator credentials or approve the installation request.

## Running PyRFF

Once installed, you can launch PyRFF using any of the following methods:

- **From the Desktop:** Double-click the PyRFF shortcut icon.
- **From the Start Menu:** Open the Start menu, search for “PyRFF,” and select the program.
- **From the Installation Folder:** Navigate to the PyRFF installation directory and double-click `PyRFF.exe`.

## Uninstalling PyRFF

If you need to remove PyRFF from your system, use one of the following methods:

### 1. Using the Uninstaller

- Navigate to the PyRFF installation folder.
- Double-click `Uninstall.exe` and follow the on-screen instructions.

### 2. Using the Control Panel

- Open the **Control Panel** and go to **Programs and Features** (or **Add or Remove Programs**).
- Locate **PyRFF** in the list of installed programs.
- Click **Uninstall** and follow the prompts to complete the process.

# Audio File Preparation

Before using PyRFF, audio files containing vowel–voiceless consonant–vowel (**VCV**) samples must be prepared for subsequent analysis.

## 1. Segment Your VCV Samples

- Option 1: Crop individual VCV samples. Here, you would extract and save each VCV sample as a separate audio file.
- Option 2:
  - ♦ Organize VCVs so that each file contains only one vowel category.
  - ♦ Each file may include multiple VCV sequences with the same vowel for easier analysis. For example:
    - ⇒ One file could contain 3 VCVs with the vowel /i/ (e.g., /ifi ifi ifi/).
    - ⇒ Another could contain 3 VCVs with the vowel /u/ (e.g., /ufu ufu ufu/).

## 2. Name Your Files Consistently

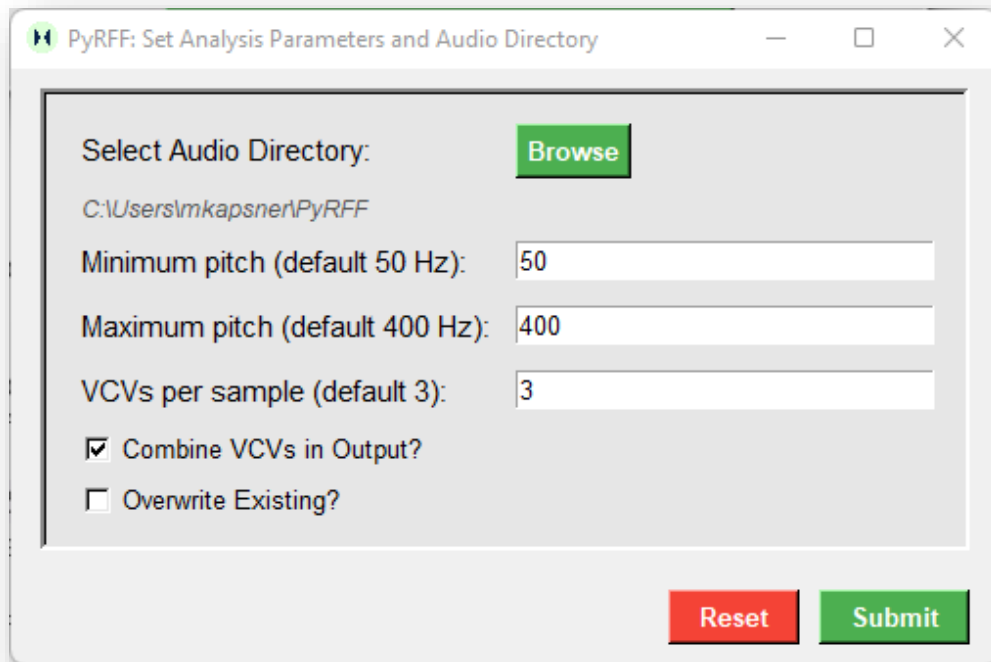
- Use a structured naming convention to clearly identify each file.
- The filename should include:
  - ♦ Speaker Identifier: Unique code representing the speaker (e.g., "MTD01" for speaker 1).
  - ♦ VCV Sequence: Specific VCV combination in the file (e.g., "afa" for /a/).
- Example filenames:
  - ♦ MTD01\_afa.wav (Speaker MTD01, VCV with /a/)
  - ♦ SPK02\_ifi.wav (Speaker SPK02, VCV with /i/)
  - ♦ XYZ03\_uvu.wav (Speaker XYZ03, VCV with /u/)

## 3. Organize Files for Analysis

- Create a folder on your computer for the analysis process.
- Place all the segmented VCV files in this folder to keep them organized and accessible.
- Ensure there are no duplicate or incorrectly named files to prevent confusion during analysis.
- Try to group audio files with the same number of VCVs per file together. This will improve the accuracy of automated fricative identification.

## Software Instructions

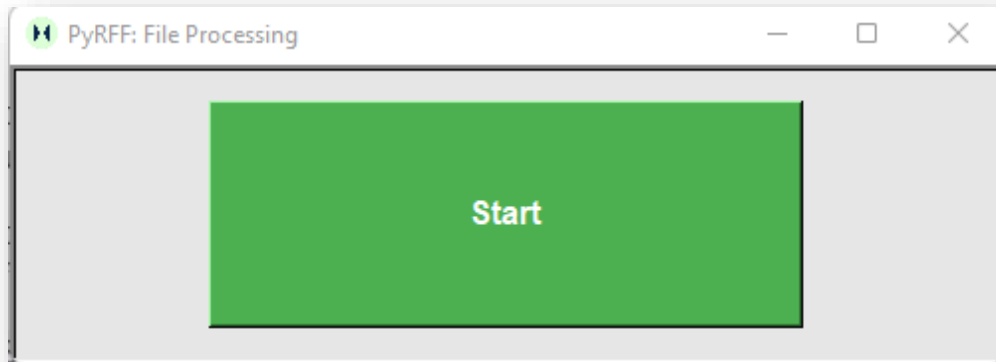
1. Run PyRFF from the desktop icon, from the Start Menu, or by opening `PyRFF.exe` from the PyRFF folder you installed.
2. After the program loads, you will see a dialog box (**Fig. 1**).



**Figure 1.** Dialog box to input starting parameters.

3. Click "**Browse**" to select the folder location where you put your audio files to be analyzed. PyRFF will default to the PyRFF directory.
4. The default pitch settings for analysis are minimum 50 Hz, maximum 400 Hz. You may alter these if needed for your samples.
5. The default expected number of VCVs per audio file is 3 (e.g., /ifi ifi ifi/). **If you have a different number of VCVs in your audio files, update this number.**
6. PyRFF will default to combining all output for one speaker into a single Excel worksheet. If you wish to keep the output separate for each audio file, deselect "Combine VCVs in Output?"

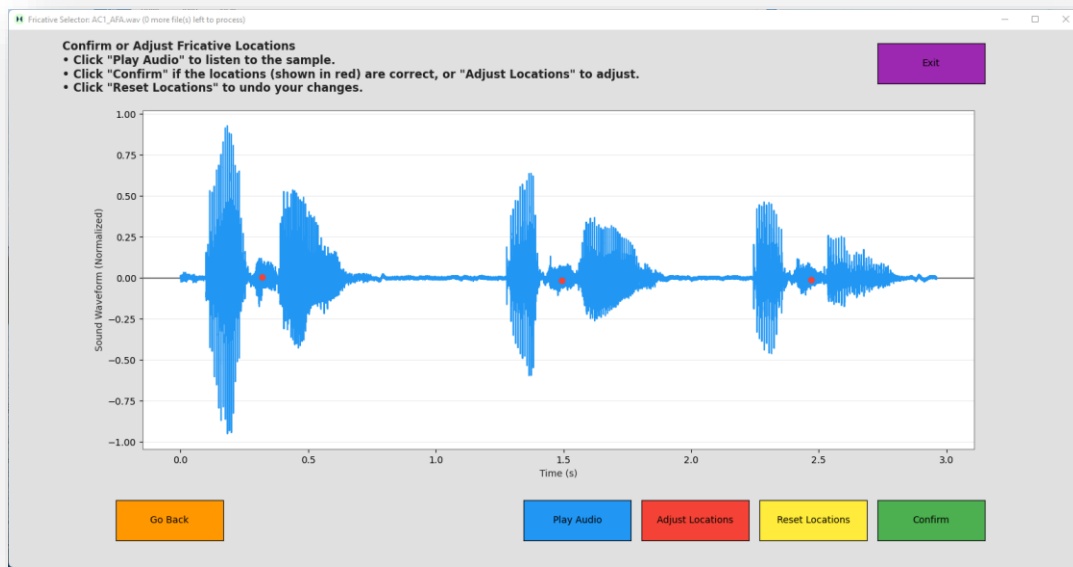
7. PyRFF will default to NOT overwriting existing output in the directory you choose. If you wish to overwrite previous output in the selected directory (i.e., redo the analysis), select “Overwrite Existing?”
8. Click “**Submit**” to confirm the settings and “**Start**” to begin analysis (**Fig. 2**)



**Figure 2.** Start button to begin semi-automated RFF analysis.

9. A window will display progress as the software extracts fundamental frequency contours for each audio file (“Step 1 of 3”).
10. A window will display progress as the software extracts fricative locations for each file (“Step 2 of 3”).
11. After Step 2 of 3, a “Fricative Selector” graphical user interface will open for each audio file (**Fig. 3**). The interface will have marked general locations where it thinks that an /f/ may be located as **red dots** overlaying the **blue** audio waveform.
  - The number of identified locations corresponds to the estimated number of instances entered in **5**. Fewer **red dots** may appear if the algorithm was unable to locate the specified number of VCVs.
  - At this point, **you want to verify that the algorithm identified the general location of each /f/ correctly** and, if not, manually input these locations.
    - ♦ You may listen to the audio by clicking Play Audio
    - ♦ If you want to add, remove, or move any of these locations, then click Adjust Locations and follow the instructions to select new location(s).





**Figure 3.** Graphical user interface for correcting and confirming the locations of the fricative /f/ in the VCV utterances displayed in the audio waveform.

- ◆ You may reset the original locations using Reset Locations
- ◆ When you are happy with the fricative locations, select Confirm
- ◆ To correct a previous file, click Go Back
- ◆ To exit the analysis completely, select Exit
- Complete this fricative verification process for all files.
- Once completed, a window will display progress as the software calculates RFF for each audio file ("Step 3 of 3").
- Once the RFF calculations are complete, the program will close automatically. Your results will be saved in an Excel file named `aRFF_final.xlsx`, located in a subdirectory called `performance` within the folder containing your audio files.

### ⚠ Need to Step Away?

Exiting and restarting the software will pick back up on the current file, unless "Overwrite Existing?" is checked in **7**.

## Troubleshooting

### ✕ Did PyRFF encounter an error?

If PyRFF encounters an error, it may either close unexpectedly or display a popup message indicating the issue. In either case, a crash report named `crash_{current_datetime}.log` will be saved in the PyRFF directory.

For troubleshooting assistance, please contact the Stepp Lab at [stepplab@bu.edu](mailto:stepplab@bu.edu) or submit feedback through [this form](#) with a description of the problem and attach the crash report file.

### Trouble installing PyRFF?

- Ensure that you have both read and write permissions for the folder you install to.
- If you are using an institutional computer, you may need to request permission to install an EXE file.
- PyRFF currently is supported for Windows 7, 8, 10, and 11. If you are attempting to install PyRFF with a different operating system, it is unlikely to run.

### Trouble rerunning PyRFF on the same folder?

- Make sure you have closed the results spreadsheet, `aRFF_Final.xlsx`.
- To redo RFF analysis on previously analyzed files, make sure “Overwrite Existing?” is checked in the initial dialog box.

For help with common issues, please visit our PyRFF FAQ page, linked from <https://sites.bu.edu/stepplab/research/rff/>