Exercise 2: Fundamental Frequency Estimation

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Instructions

- Implement and return files as **Exercise_2_firstname.ipynb** along with **your speech file**.
- Return your answers to MyCourses by **23:59 on Monday, September 18th**, 2023.

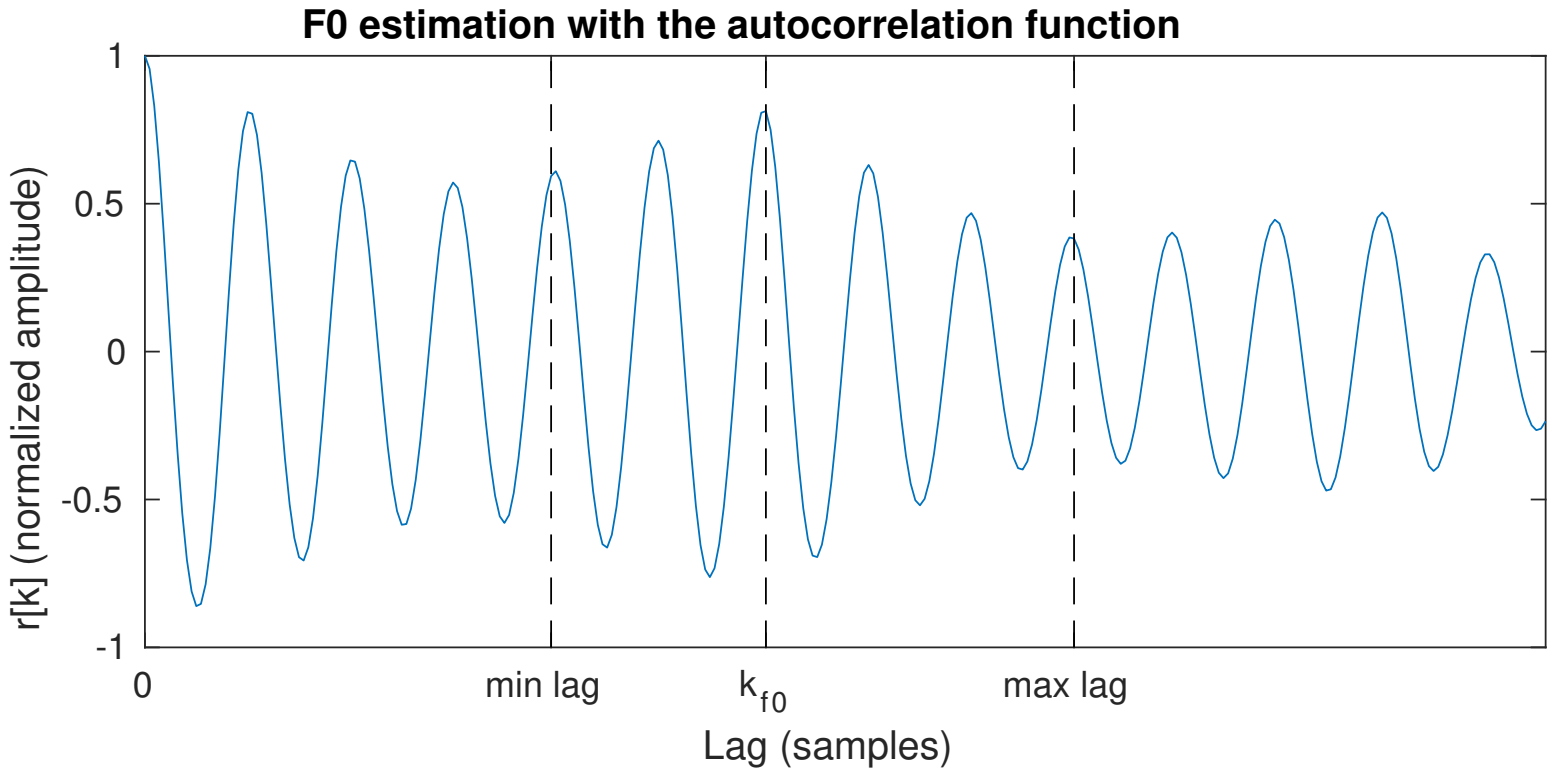
Objective

- Learn and understand concepts about fundamental frequency ($F0$) estimation practically.
- Exploring two most common basic approaches to $F0$ estimation from speech: **autocorrelation method** and the **cepstral method**.
- We will be implementing following two functions:
  (1) **F0_autocorr** –> Function for $F0$ estimation using the autocorrelation method.
  (2) **F0_cepstrum** –> Function for $F0$ estimation using the cepstral method.

Fundamental Frequency (F0)

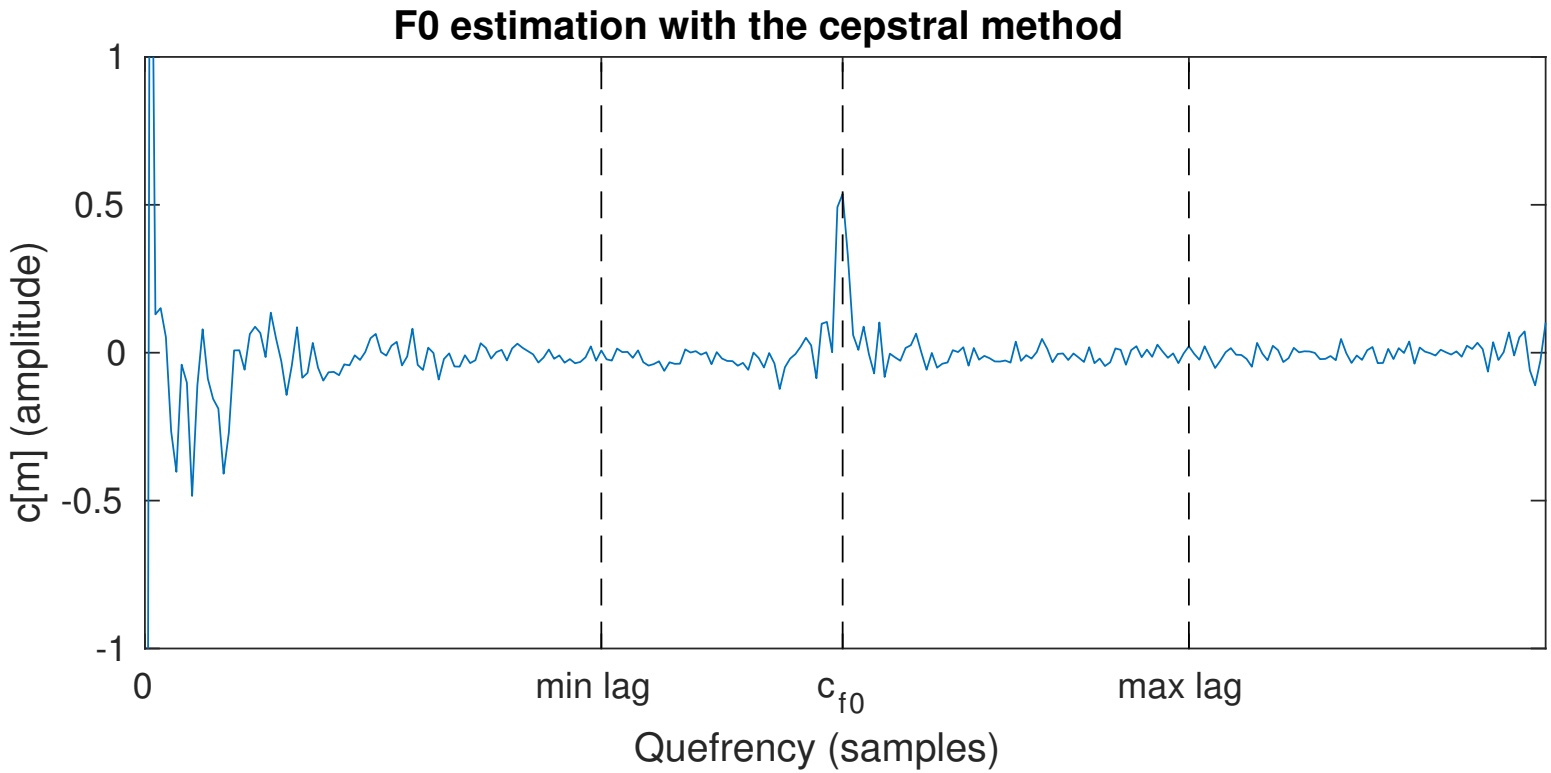
- F0 is the rate of vibration of the vocal folds at the glottis (quasi-periodic oscillations)
- F0 refers to speed of oscillations and is thus a measure of the physical phenomenon, and is roughly in the range [80 400] Hz.
- The pitch of a speech signal refers to the perceived frequency, that is, what a human listener hears.

F0 Estimation Using Autocorrelation Method



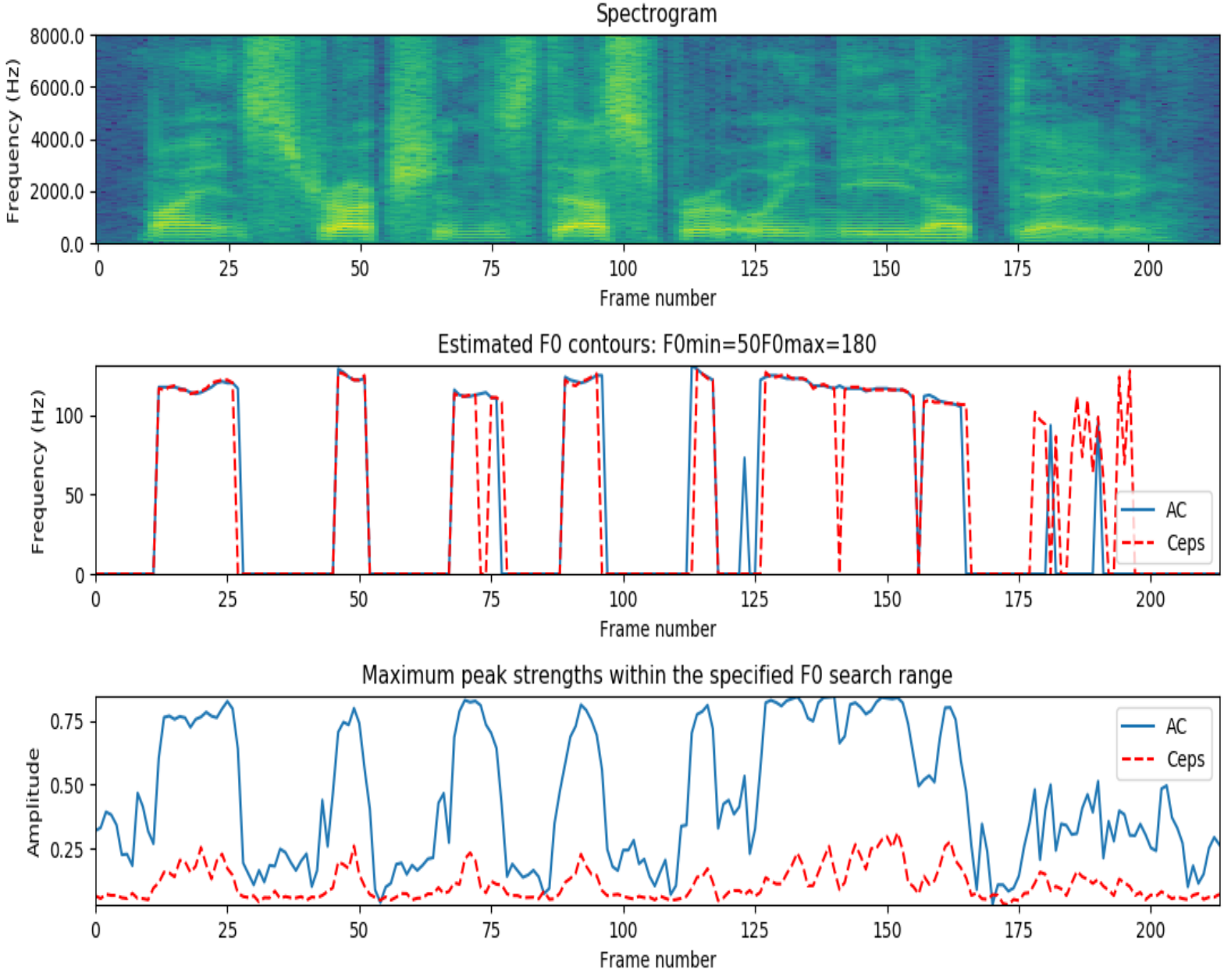
- Useful functions: (numpy) correlate, amax, argmax

F0 Estimation Using Cepstral Method



- Useful functions: (numpy) fft, ifft, log10, absolute, real, amax, argmax

Expected plot



Experiment with the parameters

- How does tuning following **parameters affect the autocorrelation method**?
  - Frame length
  - Windowing function
  - F0 search range
  - Voicing threshold value
- How about above parameters for the **cepstrum method**?

Learnings

Experimental findings, Analysis, Reasoning and and any other?

Contact

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