

Attempt 1



In Progress

**NEXT UP: Submit Assignment**



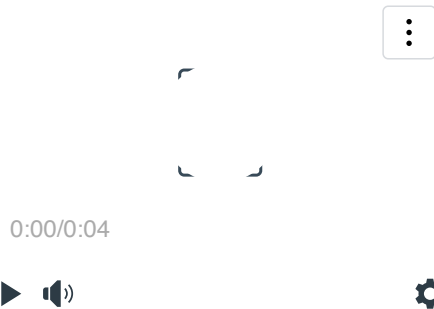
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### Unlimited Attempts Allowed

#### Details

##### Goal of the assignment:

In this assignment, you will analyze the spectrum of a short sound clip of a piano chord and use that to identify the notes in the chord. Here is the full-length sound clip (4s). You can find the actual `.wav` files under `Files/sound_clips`. `mystery_chord.wav` is the full-length file and `mystery_chord_clip.wav` is the short version that you will need to analyze.



##### Steps:

1. Create a new Colab notebook. Name it **your-name-fourier** (replacing your-name with *your actual name*, of course!!) Study the code in the `04-SignalProcessing-Part2.ipynb` notebook and copy and paste into yours **only the code that you need for this assignment**.
2. Your code should be able to load a `.wav` file and plot its spectrum (this is all already done and available in my notebook). In addition to that, your code should contain a **peak finder** function called `peak_finder` that takes as input: (1) the magnitude part of the spectrum; (2) the sampling rate; and (3) a number `n` and returns the top `n` peaks (highest values) in the spectrum, giving you their corresponding frequencies. This function is not available in my notebook and you will have to write it. You can check that everything works as expected by using the sine snippet or the violin snippet in the File folder, which should have a peak at **approximately** (not exactly!) 440 Hz (corresponding to the standard A note that orchestras use for tuning).
3. Once your function works as expected, load the snippet `mystery_chord_clip.wav` and plot its spectrum. Then, use your peak finder function to extract the top six peaks and their frequencies, and use the table below to identify the **three notes** that you think are contained in the chord. As we discussed in class, notes played on a real instrument will have overtones (i.e., many frequencies will appear in addition to the fundamental)...
4. Add a text cell with a sentence reporting what notes you think the chord contains and why.



Note	Frequency (Hz)
C3	130.81
C#3/Db3	138.59
D3	146.83
D#3/Eb3	155.56
E3	164.81
F3	174.61
F#3/Gb3	185.00
G3	196.00
G#3/Ab3	207.65
A3	220.00
A#3/Bb3	233.08
B3	246.94
C4 (Middle C)	261.63
C#4/Db4	277.18
D4	293.66
D#4/Eb4	311.13
E4	329.63
F4	349.23
F#4/Gb4	369.99
G4	392.00
G#4/Ab4	415.30
A4	440.00
A#4/Bb4	466.16
B4	493.88
C5	523.25

#### Hint:

You need to identify the positions in the list corresponding to the top  $n$  values. Once you have the positions corresponding to the top  $n$  values, to compute the frequencies you can multiply those positions by the sampling rate and divide by **2 times the length of the sample (i.e., length of the magnitude list)**. The reason why you need to divide by 2 is due to the symmetric nature of the Fourier Transform, a detail you don't need to worry about.

#### Deliverables:

A Colab notebook containing all the code and plots, and a cell with your interpretation of the spectrum. Please upload that to Canvas. That's all you need to upload.

#### Use of LLMs:

You are allowed (and even encouraged) to ask Gemini (available directly in Colab) or other LLMs for help if you don't know how to do something.

#### View Rubric

##### Rubric for signal processing assignment

Criteria	Ratings					Pts
Code execution	25 pts	20 pts	15 pts	10 pts	0 pts	/ 25 pts



## Rubric for signal processing assignment

Criteria	Ratings					Pts
	<b>Excellent</b> The Colab notebook is properly named, and all steps are executed correctly.	<b>Good</b> The notebook is properly named, and all required steps are executed, but there are minor issues in the code.	<b>Satisfactory</b> The notebook runs, but there are a few issues with the code.	<b>Needs improvement</b> The notebook has serious errors, or the steps are incomplete. The dataset is not loaded correctly, or the peak finder function does not work.	<b>Incomplete</b> The notebook does not run, or the steps are not completed. Substantial parts of the assignment are missing.	
Output and Interpretation	<b>10 pts Excellent</b> The output is correct and the frequencies are correctly interpreted.	<b>7 pts Good</b> The output is correct but there are some issues with the interpretation of the frequencies.	<b>5 pts Satisfactory</b> The output is not entirely correct and the interpretation of the frequencies is not entirely correct.	<b>3 pts Needs improvement</b> The output is incomplete or wrong and there is very limited interpretation of the frequencies.	<b>0 pts Incomplete</b> The output is wrong or there is no interpretation of the frequencies.	/ 10 pts
Clarity and presentation	<b>5 pts Excellent</b> The notebook is well-organized, with code and text cells clearly organized. Explanations in text cells are detailed and well written.	<b>4 pts Good</b> The notebook is mostly well-organized, but some explanations could be clearer, or text cells are not as detailed as they could be. Formatting is acceptable, with minor improvements needed.	<b>3 pts Satisfactory</b> The notebook is functional but there are some issues with formatting, organization, or clarity.	<b>2 pts Needs improvement</b> The notebook is disorganized, with unclear explanations or poorly formatted text. The structure of code and text cells needs substantial improvement.	<b>0 pts Incomplete</b> The submission does not meet the basic requirements of the assignment.	/ 5 pts

Total Points: 0

### Choose a submission type

