Main Libraries in use:

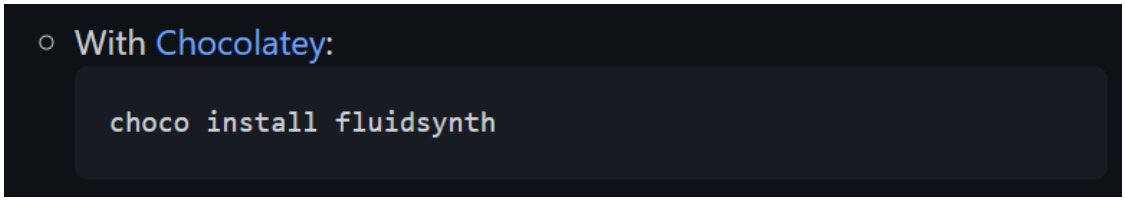
- Mingus (https://bspaans.github.io/python-mingus/)
- Fluidsynth (https://www.fluidsynth.org/)
- IPython (https://ipython.org/ipython-doc/3/api/generated/IPython.display.html)
- Pydub (https://github.com/jiaaro/pydub)
- Midi2audio (https://github.com/bzamecnik/midi2audio)
- Mido (https://mido.readthedocs.io/en/latest/)

Step 0 (Pre-requisites):

- Have **Python** Installed in Machine
- Environment Options (either or is fine)
    - **Jupyter Notebook (Anaconda)**
- OS
    - **Windows** is only supported since there is an error in connecting Mingus with FluidSynth

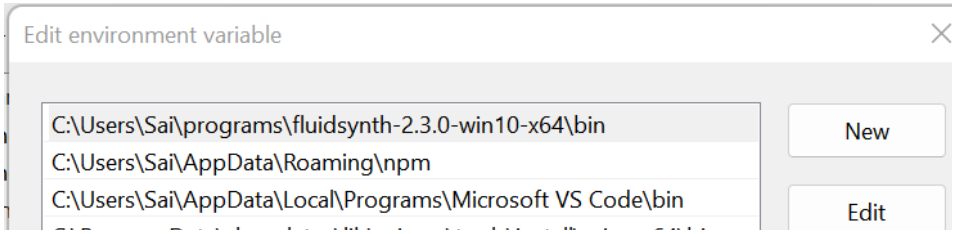
Step 1 (Installing Fluidsynth).

- Refer to this page for more ways to download fluidsynth:
    - https://github.com/FluidSynth/fluidsynth/wiki/Download
- Open terminal and install fluidsynth using the 'choco' package manager



- Install the **'Chocolatey'** package manager if you don't have one already
    - Installation link if needed:
        - https://chocolatey.org/install
- Make sure to **copy the file path of where you downloaded Fluidsynth** we will be using this file path and **include it in our environment variables**

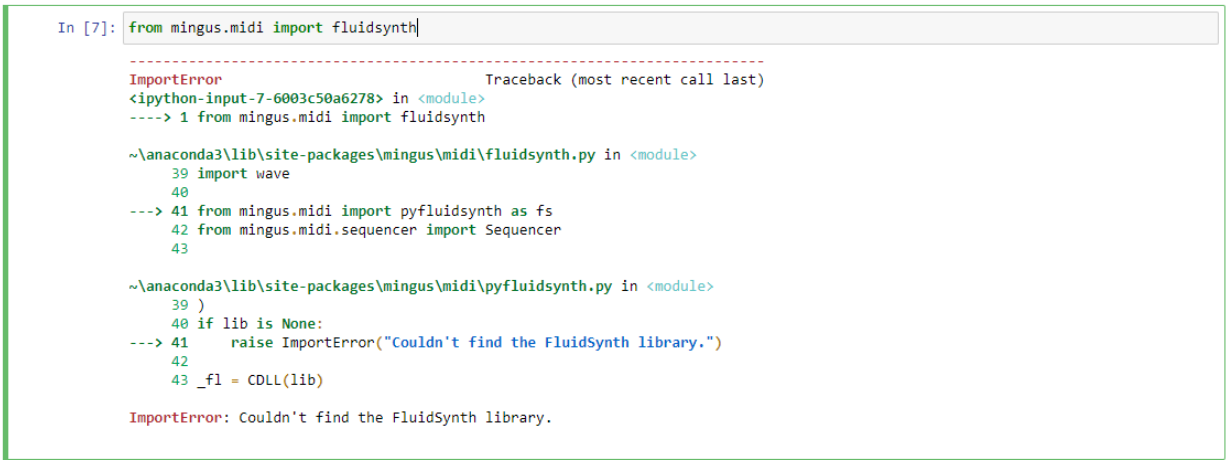
- Add Fluidsynth to PATH:
    - Type **'Edit the System Environment Variables'** after pressing the **'Windows Key**', and click it
    - Click on **'Environment Variables'**
    - Double click on the **path** variable under **'User Variables for [user name]'**
    - Click on **new** on the pop-up tab and **type/paste in the file path of fluidsynth/bin** directory (look at the image below for reference)



- Save this setting
- Error/Debugging
    - This step has to be done for any of Mingus's packages to work since its a dependency
    - To verify, reopen environment variables to ensure FluidSynth is in PATH

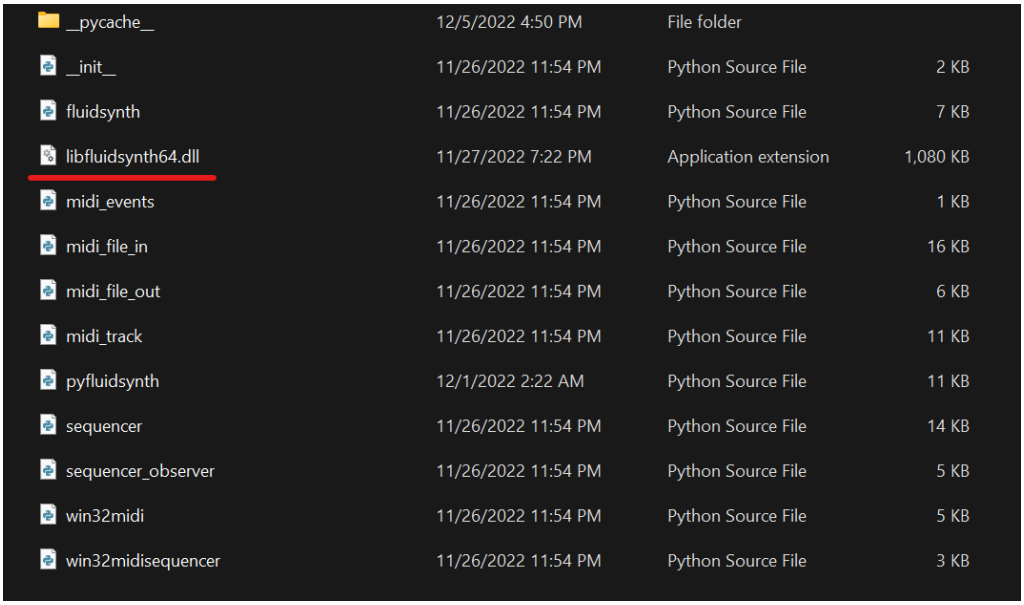
Step 2 (Installing Mingus):

- **Open up your IDE** (either JupyterNote Notebook or VSCode)
- In the downloaded **'BackTracker Capstone Project/BackTracker'** Folder, open up **'testImports'**. This file is not the actual project, but rather simply a test **to see if fluidsynth is imported correctly**
- **Run the first cell** which imports mingus of %pip install mingus
- **Run the second cell** and you will likely come across an error like the image below



- This is an expected error, and is a problem with the Mingus library to attach to Fluidsynth correctly.
- To fix this follow these steps:
    - Step 1)
        - Ensure the **PATH of FluidSynth (**previous step) is **imported correctly**
    - Step 2)
        - Download the '**libfluidsynth64.dll'** file
            - Github Download: https://github.com/fkortsagin/Heretic-Shadow-of-the-Serpent-Riders-Windows-10/blob/master/libfluidsynth64.dll
    - Step 3)
        - **Locate where your 'Anaconda3' (or directory in which your editor is installing packages)** folder is then **follow this path 'Anaconda3' → 'lib' → 'site-packages' → 'mingus' → 'midi'**
        - Example Path:
            - C:\Users\srini\anaconda3\Lib\site-packages\mingus\midi
        - Copy and paste the '**libfluidsynth64.dll'** file in this directory

- Your directory should like the image below



__pycache__	12/5/2022 4:50 PM	File folder	
__init__	11/26/2022 11:54 PM	Python Source File	2 KB
fluidsynth	11/26/2022 11:54 PM	Python Source File	7 KB
libfluidsynth64.dll	11/27/2022 7:22 PM	Application extension	1,080 KB
midi_events	11/26/2022 11:54 PM	Python Source File	1 KB
midi_file_in	11/26/2022 11:54 PM	Python Source File	16 KB
midi_file_out	11/26/2022 11:54 PM	Python Source File	6 KB
midi_track	11/26/2022 11:54 PM	Python Source File	11 KB
pyfluidsynth	12/1/2022 2:22 AM	Python Source File	11 KB
sequencer	11/26/2022 11:54 PM	Python Source File	14 KB
sequencer_observer	11/26/2022 11:54 PM	Python Source File	5 KB
win32midi	11/26/2022 11:54 PM	Python Source File	5 KB
win32midisequencer	11/26/2022 11:54 PM	Python Source File	3 KB

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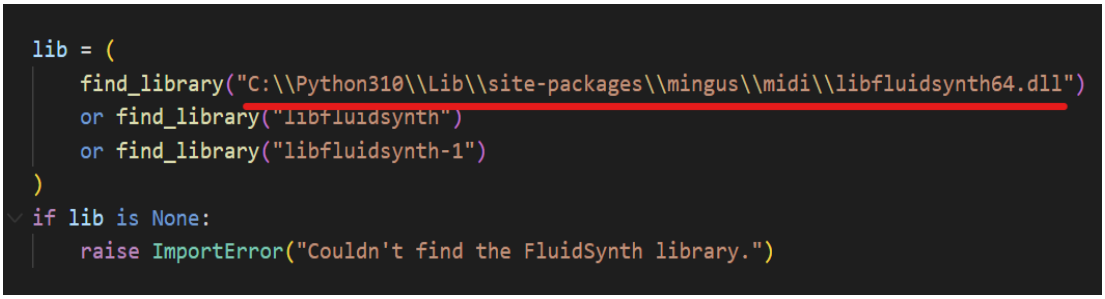
- Step 4)
  - In the same directory, **open "pyfluidsynth.py" with an editor** (VSCode, PyCharm, textFile) and **go to 36**
  - Look at image below



```
lib = (
    find_library("C:\\Python310\\Lib\\site-packages\\mingus\\midi\\libfluidsynth64.dll")
    or find_library("libfluidsynth")
    or find_library("libfluidsynth-1")
)
if lib is None:
    raise ImportError("Couldn't find the FluidSynth library.")
```

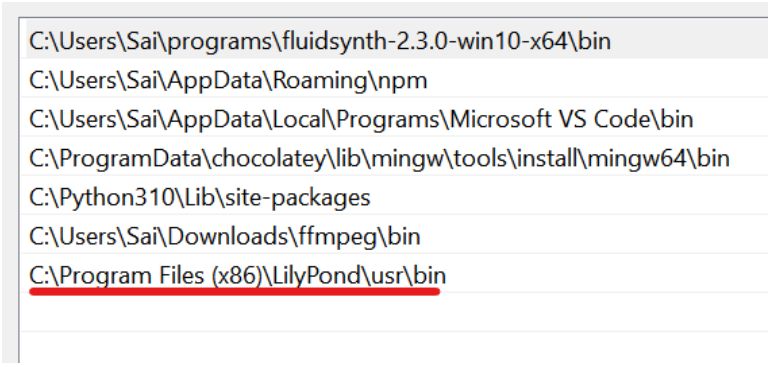
  -
  - **Copy the full path of 'libfluidsynth64.dll'** you just placed in the directory and **insert it inside of find_library() on line 35**
  - Make sure to include double slashes to avoid escape command
- Step 5)
  - Go back to the **'testImports'** file in your editor and **re-run the second cell**. The error should not be present anymore

- Note:
  - The solution provided is not mine, it was found in an 'Github' forum found here:
    - https://github.com/aniawsz/rtmonoaudio2midi/issues/6
    - Credit to Github user 'https://github.com/carlosholivan' for the solution

- This was by far the step that causes the most error from my personal testing. This not an error on the project side, but rather an error in either in ‘Mingus’ or ‘Fluidsynth” in importing modules correctly

Step 3 (Install LilyPond for Sheet Music):

- Go to this site and **download LilyPond**
  - https://lilypond.org/download.html
- Similar to FluidSynth take note of the installation directory and add to PATH
  - Example: C:\Program Files (x86)\LilyPond\usr\bin



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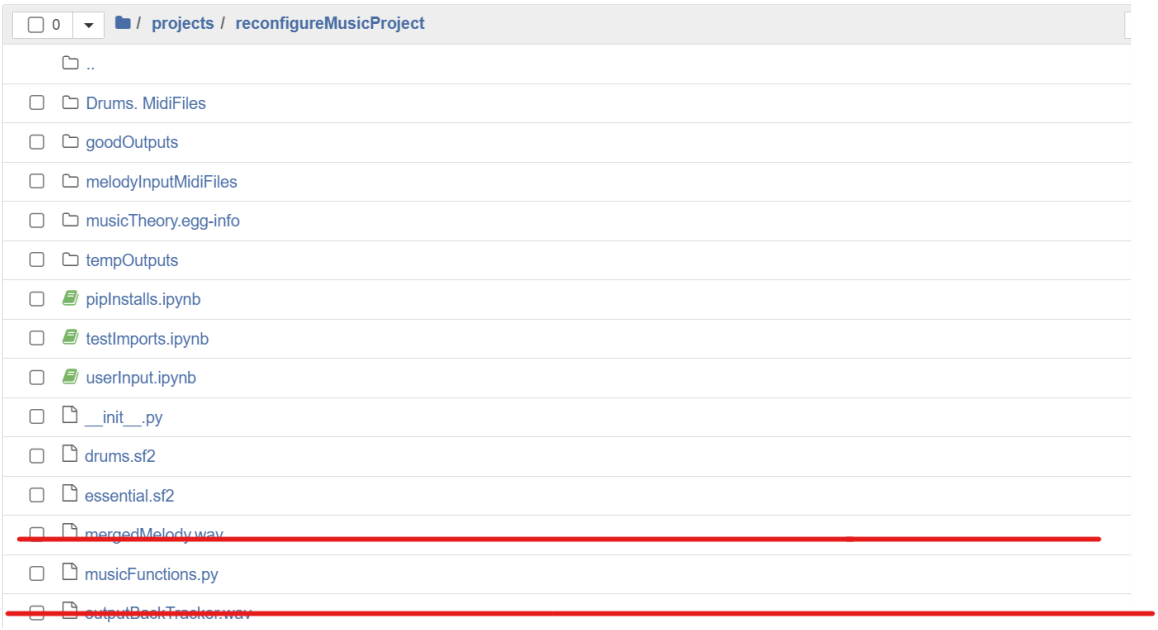
Step 3 (Pip installations for Packages):

- Open the **‘pipInstalls’** file in ‘Music Capstone Project’
- **Run the first cell**
  - This will download the needed dependencies under your ‘Anaconda’ (or other environment) site-packages
  - This shell only needs to run once

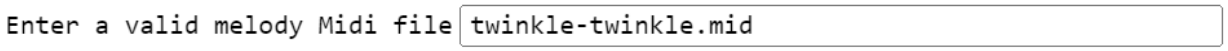
Step 4 (Download SF2 Files)

- Our program uses two main SF2s which are:
  - Essential SF2 (Provides Variety of instrument Capability)
  - Drum SF2 (Provides instrument capability for Percussion)
  - These SF2 files are **not provided in the project due there large capacity** and must be **downloaded and placed into the project folder**
  - **Download Essential SF2 and rename sf2 as (essential.sf2)** https://drive.google.com/file/d/1VZkoiVOonffpJWxZah-AdQkxaTFIzZ6q/view
  - **Download Drum SF2 and rename sf2 as (drums.sf2)** https://drive.google.com/file/d/1DOoDqcSt-HIxSpzCpjhZvWH_Ur-xgzL-/view
  - File Structure should look like this (ignore the striked files)

- 

Step 5 (Use the program):

- In order to **add your own melody** into this project, add a ‘midi’ file inside of **‘melodyInputMidiFiles’**. Currently there is only one ‘midi’ file for testing which is twinkle-twinkle, but you can insert any midi-file you want
- When prompted with this

- Make sure to **include the ‘.mid’** at the end of the response
- Continue to follow the questions that the program asks and the audio files will be generated at the end
- Also, we included outputs that we thought sounded well from previous experimentation under the ‘goodOutputputs’ sub-file
- Able to view sheet music by going into directory of the project