Mary Had a Little Lamb

Background

Recursive Least Squares is a powerful tool that can be used to model an unknown system based solely on the inputs and outputs of that system. One application of this is in filtering audio. In this problem you will be taking an input audio clip that is all of the notes of the song “Mary Had a Little Lamb” being played on the piano at the same time for the length of the song, and an output that is an audio clip of the whole song “Mary Had a Little Lamb”. Given this input and output data, build a system that filters the input clip to sound like the output clip.

Other information

There is some starter code included with the problem in `mary_had_a_little_lamb.py`. The input audio clip is `mary_had_a_little_lamb_in.wav`, and the output is `mary_had_a_little_lamb_out.wav`.

The starter code given will read in the .wav files, set up a few helper arrays and variables to make things a little easier, and will write the output to a .wav file called `generated_out.wav`.

HINT: The filtering will need to be adaptive. This is because the audio output changes over time while the input to the system stays consistent. This means that the recursive least squares algorithm will need to include a forgetting factor to place greater weight on newer input/output pairs.