

ECE251A – Winter 2023
Matlab Assignment 4 (100 pts)

You are given `x.wav` and `v2.wav` (both 74000 samples long at 32kHz). $x[n]$ is the sum of a speech signal $s[n]$ (yes, really, there's a speech signal in there) plus additive noise $v_1[n]$. $v_2[n]$ is a signal which is highly correlated with $v_1[n]$ (the noise in $x[n]$), but does not contain any of the speech. Your job is to recover the clean speech. You may use any approaches covered in this class and any built-in Matlab functions.

Design filters of order 4 through 20 in steps of 4. For each filter you design, provide some numerical results about the quality of the filter. Also, comment on the perceptual quality of the output signal (i.e. how your estimate of $s[n]$ sounds when you listen to it) over the various filters. Finally, give a guess about the system architecture and filter order(s) which produced the given signals.

Turn in

- a 1-page written summary of your approach (i.e. 1 page of text, possibly including a couple of equations if appropriate);
- the coefficients and/or formulas for all the filters you design, along with numerical/graphical results for each of them;
- the other results mentioned above;
- all your code.

Your report will be graded on correctness of the approach(es) you used, and completeness of the required elements of the assignment. You will not be penalized strictly on the basis of your results if the methods you used were appropriate and you addressed all the requirements. You are encouraged to discuss your approaches with other students. However, do not share code: since this assignment is unique and there are many correct approaches, it will be very easy to spot copied code.

.