CMPE 476 Digital Signal Processing

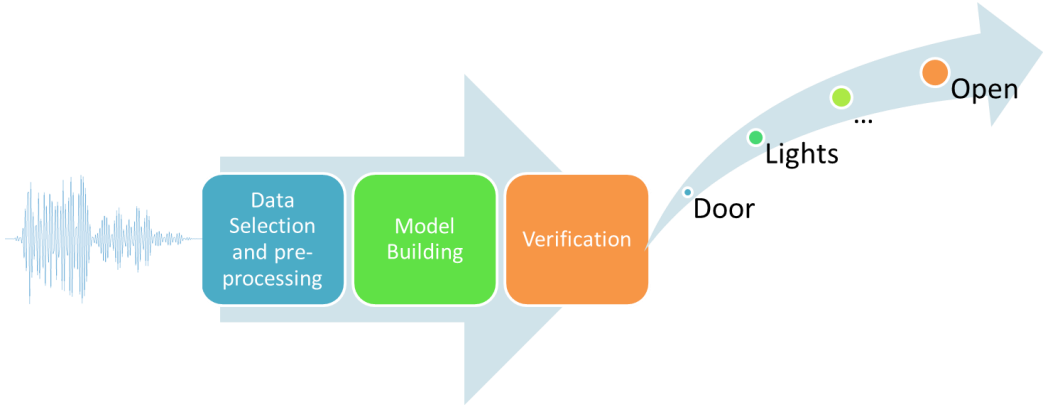
Spring 2023

Course Project Description

Problem Statement

Given 11 different types of voice commands, recorded in various folders in SharePoint locations, use the assigned words 'only' to build an audio recognition system using analytic modeling techniques.

This means that you should come up with an equation for your model. The equation should be written using the z-domain syntax and can be simple polynomials or rational functions (depending upon the technique being used). The output is one of the 11 classes (words) that your model 'somehow' detects.



Methodology

The data is saved in 11 folders (according to the words themselves) here (Data). You should tentatively follow the methodology given below:

1. From each folder, pick-up 65% data (waveforms) randomly. {MATLAB's **`randi`** function can help}
2. Use any technique(s) to build your model using this 60% of this data subset while using the remaining 5% for validation of your model as the model building process takes place.
3. For each assigned word to your group, you should come up with one MATLAB Function {https://www.mathworks.com/help/matlab/function-basics.html}. Hence, Each group should submit as many functions as they have words assigned to them.
4. Once the model is finalized record the structure and coefficients and perform some statistical analysis. { https://www.youtube.com/watch?v=4ipdsefA5ik }

5. Then use the remaining 35% data from the original to apply on the model (without re-calculating model coefficients) to see how effective is your model. You may use measures such as Accuracy, Mean Squared Error (MSE), Specificity, Sensitivity, F1 Scores, etc. to do this analysis. {e.g., https://www.mathworks.com/matlabcentral/answers/513574-confusion-matrix-sensitivity-and-specificity}
6. Present your results graphically as much as possible.
7. Item 1 to 3 of the above list MUST be completed at the Projecthon (06/05/2023). Remaining items will be part of the report and can be submitted by the final exam date. {for cross-section groups, the Final exam's date of the section which is earlier will be considered for their submission}
8. There will be an in-person project discussion for each group to evaluate the group's understanding of what they have done in the project. (Last week of May, tentatively).
9. Report template will be uploaded separately.
10. Tentative Grading Rubric for Project work:
    a. Projecthon 50%
    b. Discussion 40%
    c. Report 10%

Important Note

Your maximum learning happens in course project. This year's project is an opportunity to build a voice activated home-automation system that you may take to the next level and make a useful (or even commercial) product out of! Please, put some 'heart' in the work and DO NOT CHEAT!

If you are using a piece of code from internet, you need to cite it in your report, otherwise you will be penalized for plagiarism!

DO NOT USE CHAT-GPT!!!

All coding MUST be done in MATLAB (QU-cloud version ONLY) for consistency.