In this lab, students will use both the CyDAQ device and MATLAB in order to implement a simple form of Voice Activity Detection (or VAD) in a noisy environment.

Data Collection:

* Microphone Sensor
* Utilize on-board sensor to filter out spectral content outside of typical speaking range (~ 80Hz to 260Hz)
  + Thoughts: Why do we filter at this range? What benefit does this offer in a real life application?

MATLAB:

* Determine appropriate signal magnitude for voice detection
* Implement thresholding at this value (a)
  + Thoughts: Why do we care about thresholding
* Import Voice recording as ‘data’ vector
* Write a function taking arguments (data, a), output signal y
  + If magnitude>=a for some number of consecutive samples,
    - Display to command window “Voice Activity Detected”
    - Signal passes as expected in y
  + Else (if magnitude<a for some number of consecutive samples)
    - Sample is replaced by zero
    - Display “No Voice Activity Detected”
* Harder Test: Generate random noise vector (randn(length(data))), add this to our recorded voice data
  + Thoughts: What are we modeling here?
* Try various scaling values for noise. What happens as noise increases? Why do we care? Can we do anything in software to lessen issues caused by artificial noise?

Report Extras:

What sorts of applications could this be used for in real life?

Bonus Vocab:

* FEC (Front End Clipping): clipping introduced in passing from noise to speech activity;
* MSC (Mid Speech Clipping): clipping due to speech misclassified as noise;
* OVER: noise interpreted as speech due to the VAD flag remaining active in passing from speech activity to noise;
* NDS (Noise Detected as Speech): noise interpreted as speech within a silence period.