The purpose of this assignment is to use frequency analysis to decode a hidden message. As you know, telephones make a "tone" sound whenever you dial any of the buttons. Each tone contains a unique combination of two frequencies. You can read about which buttons map to which frequencies at this webpage: `http://en.wikipedia.org/wiki/Telephone_keypad`

You should also know that telephone keypad assigns letters of the alphabet to the digits.

I have taken a short message and "typed" it into a phone keypad. You are given the resulting audio clip in `ca2Data.mat`. Your job is to work backwards to figure out the message. There are two steps. First, you must analyze the frequency content of each dialed tone in order to determine which two frequencies it contains - determine which button on the keypad produced those tones. Secondly, once you have the sequence of numbers, work backwards to see if you can determine the message. This will be tricky. For example, if I were to dial "4 4", that *could* mean "I-G" or "G-H" but the only actual word you can spell is "H-I" (hi).

You will use the FFT function to determine which frequencies are in the signal, and therefore which buttons were dialed on the phone. But instead of using Matlab's build it `FFT`, you should use the `myFFT` function I am providing you, which is basically just the regular `FFT` with a few extra features built in making it easier for you to use. Suppose you have some signal `s` and a sampling frequency `fs`, you can use the following commands to plot the signal's frequency content:

```
[ S , f ] = myFFT( s , fs );
plot( f , abs(S) );
```

You can zoom in on the x-axis to examine the energies at different frequencies.

Your end result will be that you will tell me the secret message and how you determined it. Provide a detailed explanation of how you derived your answers as well reflections on any observations you've made. As before, your paper should be no more than one page long and should strictly follow the IEEE two-column template.

Honors Students should also decode the message in `ca2Honors.mat`.

You *must* work in teams of two, or by yourself, and you may consult with other teams for ideas. However, your methods, analysis, and write-up should be uniquely your own. You do not need to hand in any hard copies of your paper. Instead, you should submit a single zip file containing your paper (MSWord format ONLY; PDFs will be returned with no grade) as well as any code you wrote (well documented) via Canvas. Submissions should arrive by Friday 2/23/2018 at 11pm.