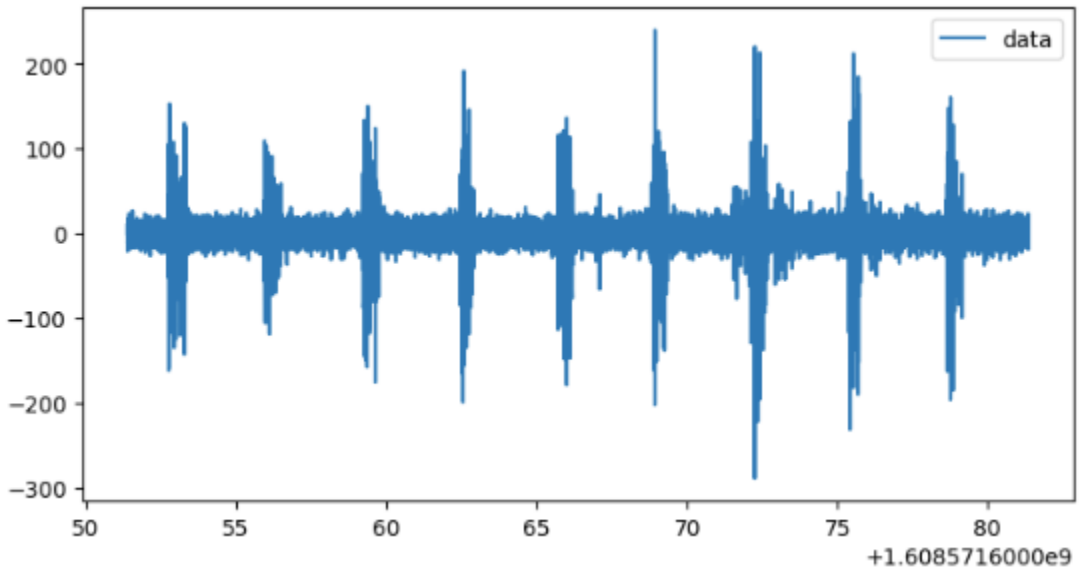
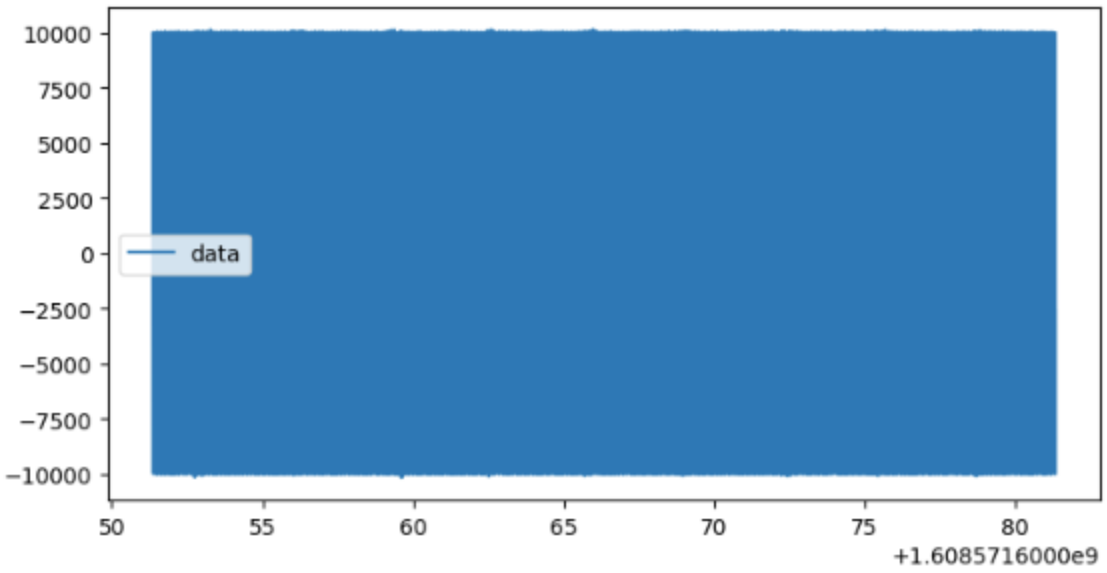
Research Intern Challenge:

At Pison, we develop wearable bio-sensors and utilize the data to understand and classify hand gesture movements in real-time. Our sensors are super-sensitive, designed to pick up uV of electricity at the skin's surface from nerves and muscles. On the other hand, this sensitivity makes us prone to picking up interference caused by power adapters and large appliances.

What you see here is a single channel of EMG data (about 30 seconds which contains 9 index finger lift gestures). It is clean enough that we can count them by eye.



I have gone ahead and saturated the muscle signal with a sinusoidal signal of unknown frequency to represent interference.



Your task is to identify the noisy source (based on its frequency), remove it, and count the number of gestures in the underlying ‘clean’ signal.

1. Identify the frequency of the noise signal
2. Remove it and count the number of gestures.
3. Return a copy of your processing code.

Some hints:
1. Plotting a FFT or the PSD of the data will help to identify the frequency of the signal.
This is a helpful tutorial:
http://notebooks.pluxbiosignals.com/notebooks/Categories/Pre-Process/digital_filtering_rev.html
2. Once you know it, running a "notch filter" is your best bet to remove it.
3. the resource I sent you is a helpful starter, but there are also convenient libraries built into pandas, numpy, and scipy (libraries) which do essentially the same thing.

Data:
Data is attached as a .csv.

Good luck and feel free to reach out with any questions for guidance!

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