Iqraq's Note

Signal Denoising

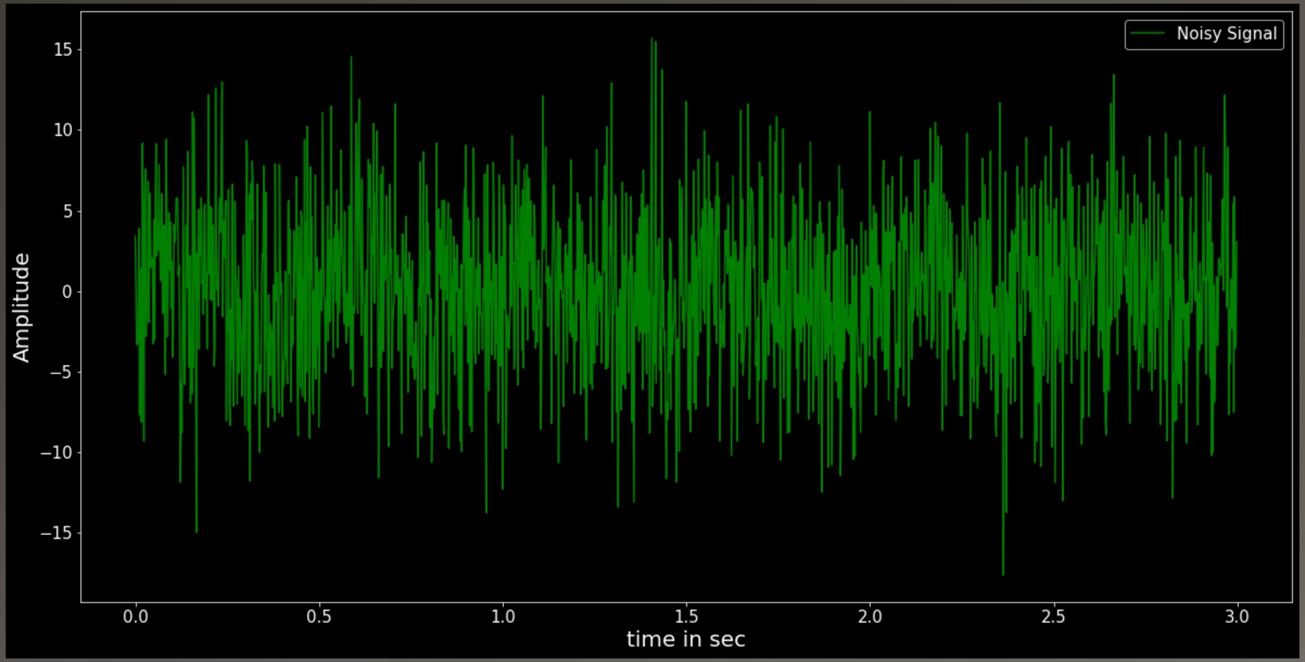
Moving average filter

- $y(n) = \frac{1}{M}\sum_{i=0}^{M-1} x(n+i)$
- Where M is number of interval(average)
- X(n) = discrete signal value at that particular point

- Assuming you are trying to find the average value at 10th point/interval of a signal with the average of 4 interval (M = 5), you could either
- 1. y[10] = $\frac{y[10]+y[11][\ +y[12]+y\ [13]+y[14]}{5}$ or
- 2. y[10] = $\frac{y[8]+y[9][\ +y[10]+y\ [11]+y[12]}{5}$

Example

- Let say you have a 3(s) signal with 256 hz sampling rate of generated noise

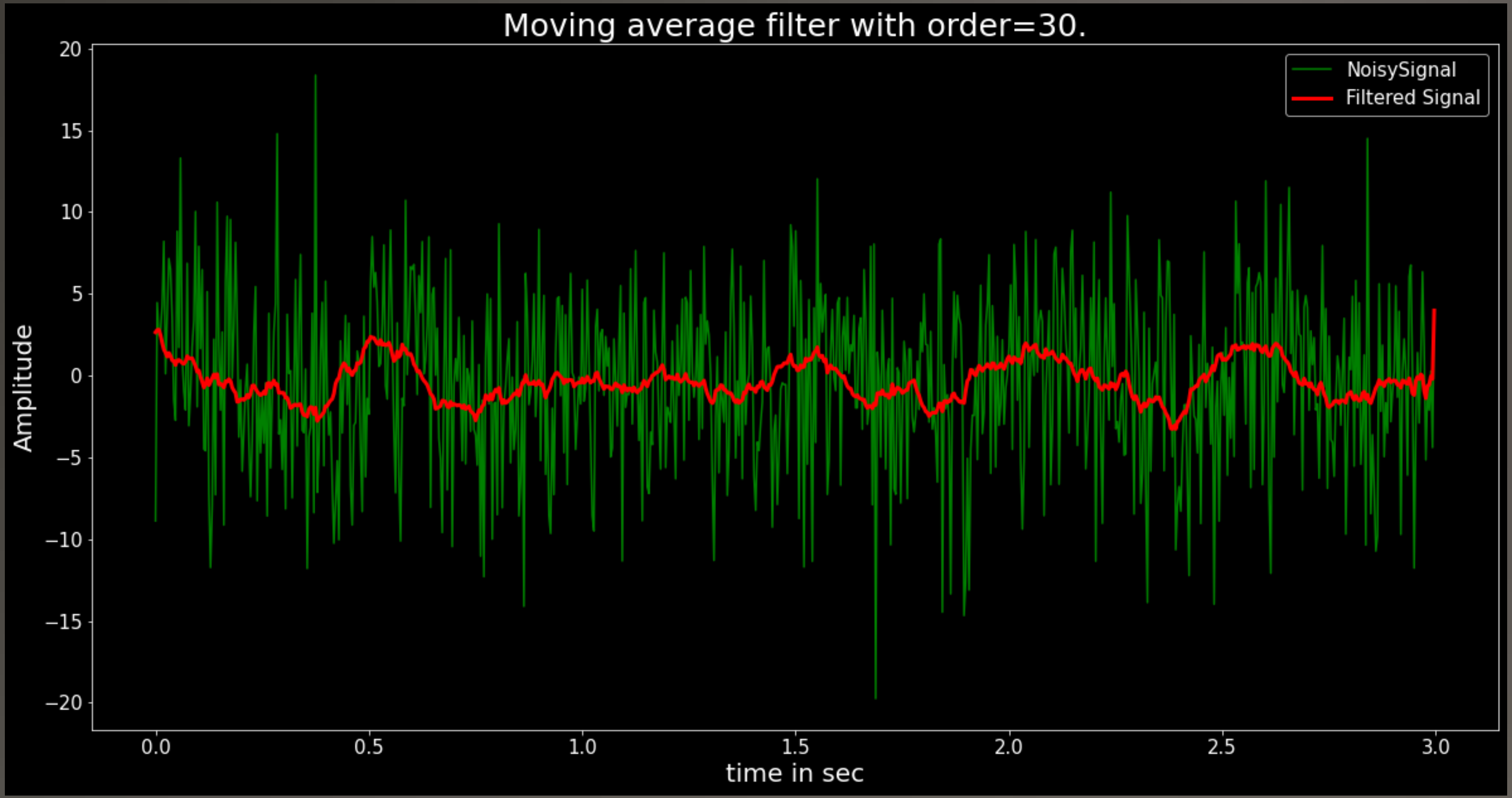


Remember that
T = 1/fs
So if sampling rate is 256 hz
T = 1/256 = 0.004
3 seconds / 0.004 =750 intervals/points

And we can use this formula to find the average
At every points

$$y(n) = \frac{1}{M}\sum_{i=0}^{M-1} x(n+i)$$

If we set the M = 30, this will be out graph



*the higher the M – the smoother and less accurate the graph will be

Median Filter

- Assuming your have following data sequence

1,2,3,4,5,6,7 – the median of this sequence = 4'

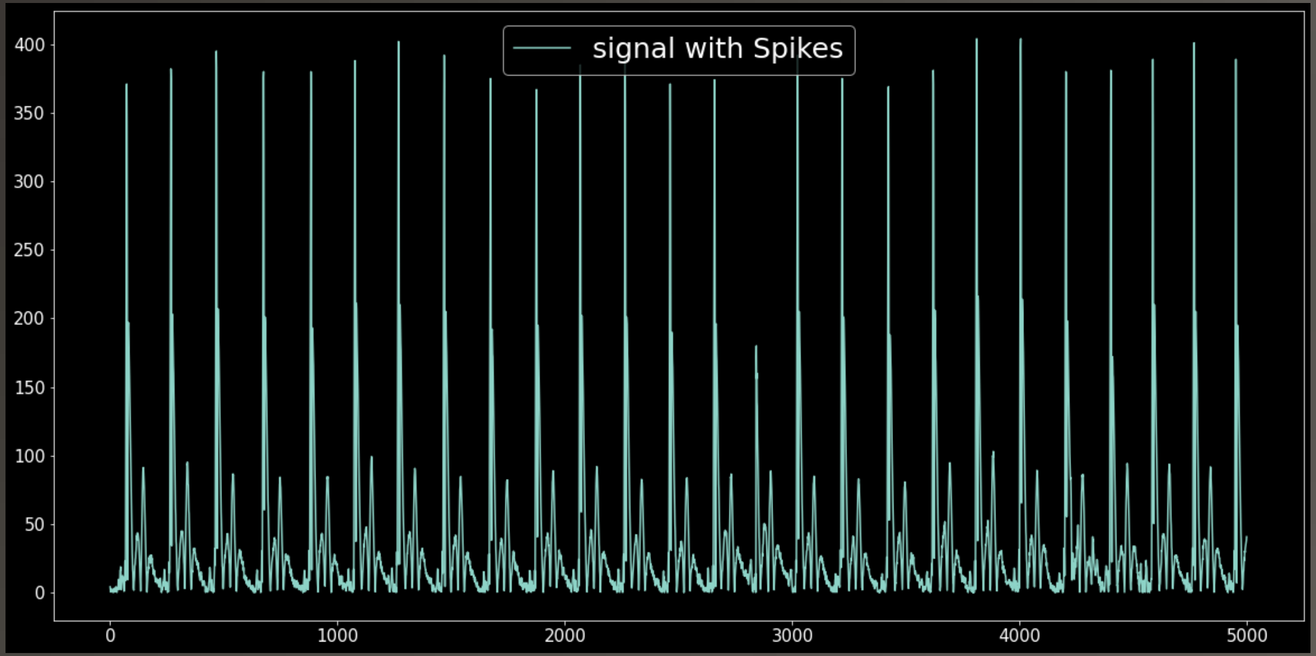
If the data sequence is even

1,2,3,4,5,6,7,8- the median would be 4+5/2 = 4.5

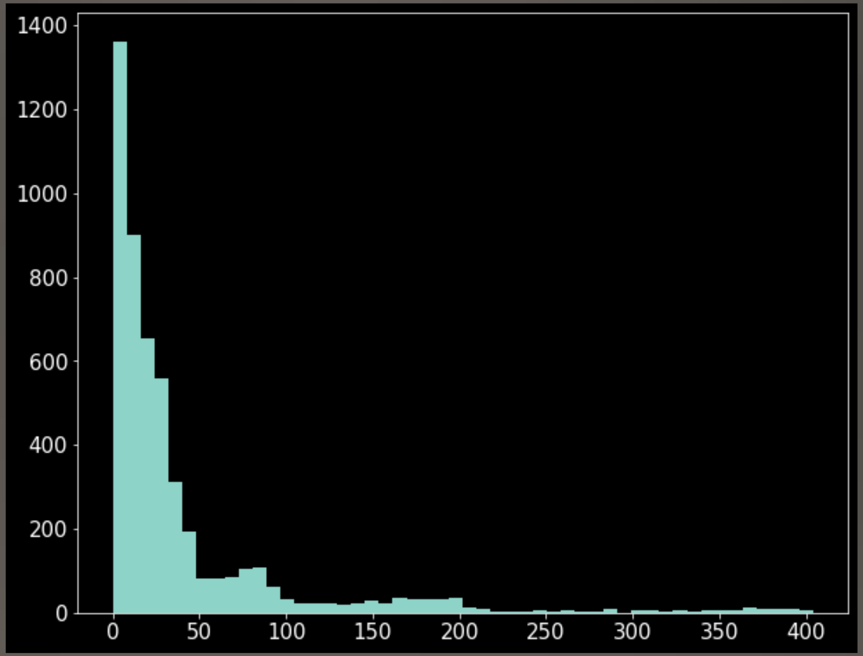
If it is unsorted – you 'll need to sort it first before figuring out the median

Same concept as average filter, but instead of averaging M amount of data points, you are finding the median of M amount of data point

Example – removing noisy spikes filter

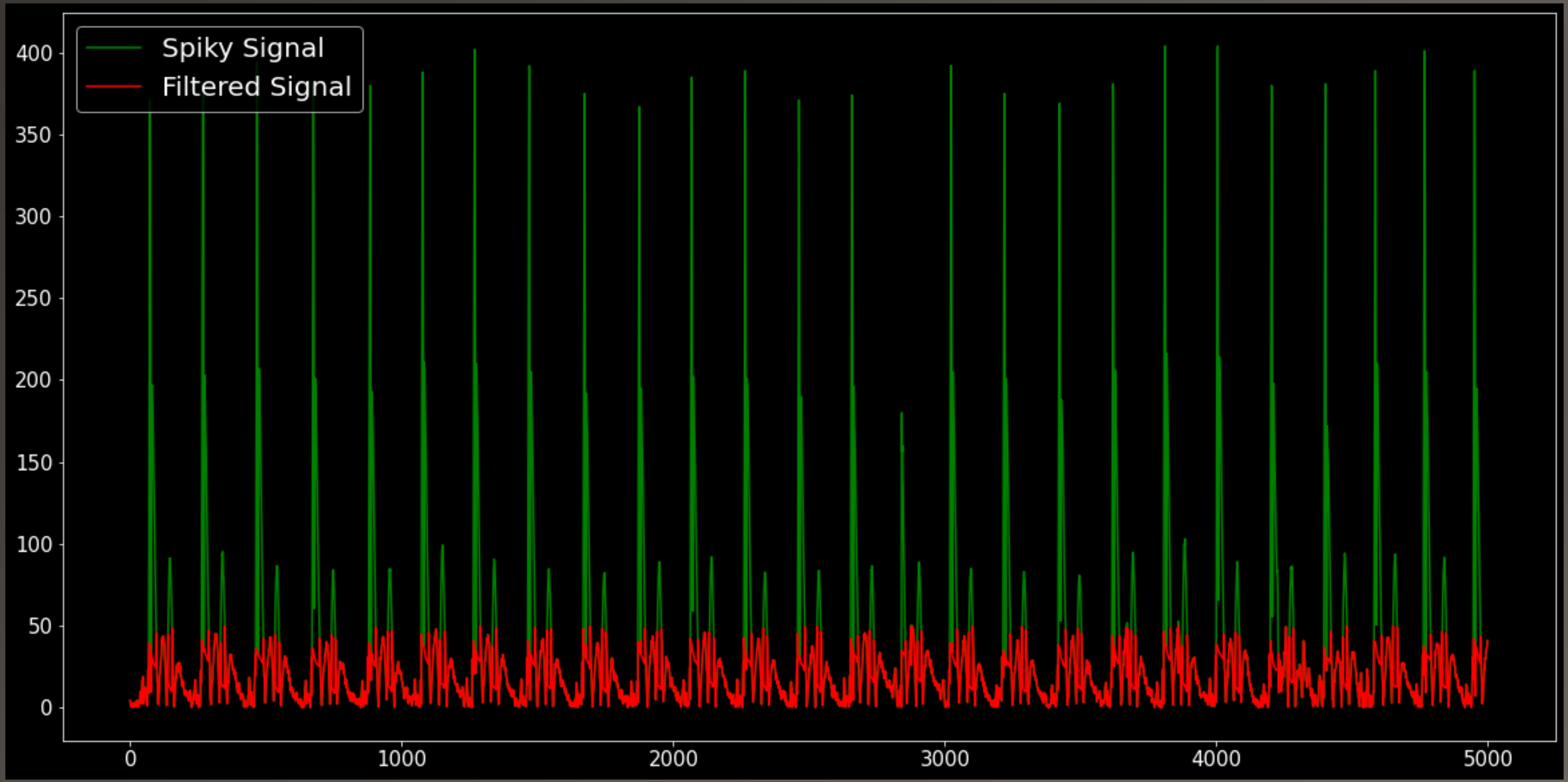


Spikes signal



Signal representation within M

Final product



Good with repetitive noise where else
If mean filter is applied, the final product
Will be less accurate