CS 215 - Assignment 2

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1   Question 5

A sine wave of the form $y = 5sin(2.2x + pi/3)$ is plotted, corrupted and filtered by three methods - moving median filtering, moving average filtering and moving quartile filtering and the **root mean squared errors** of the outputs of each method are :

- 30 percent data corrupted

    1. **Moving Median Filtering** $= 28.121810$
    2. **Moving Mean Filtering** $= 99.607732$
    3. **Moving Quartile Filtering** $= 0.017173$

- 60 percent data corrupted

    1. **Moving Median Filtering** $= 692.400109$
    2. **Moving Mean Filtering** $= 351.490789$
    3. **Moving Quartile Filtering** $= 59.808615$

The clean sine wave, corrupted wave, and the filtered waves using all three methods are plotted in Figure **??** and Figure **??**.

From the plots and the root mean square error data, it is clearly evident that the **moving quartile filtering** method has the **least root mean square error** and, hence, is the **best** method of filtering corrupted data.

This is because since the data is increased by around 100 when it is corrupted, we need to consider the smallest values in any interval while filtering.

    Mean of a data considers even the **corrupted values** and is heavily **influenced** by them. Hence we can safely rule out 'mean' as an optimum method for filtering.

    Median of a data considers the middle term and is not influenced as heavily as mean by corruption but still, if **more than 50 %** of the data is corrupted then the median will also be a **corrupted value**, and so we can rule out median as well.

    Quartile of a dataset focusses on the lower 25% data by value and we can say that it will **prioritize the clean (non corrupted) data** in any interval and hence will not get influenced by the corrupted data untill more than 75% data in an interval has been corrupted.

Hence moving quartile filtering is the best way to filter our data.

Usage of MATLAB Code

- Load code in the following path 'matlab_code/q5/q5.m'

- Run the code

- This should output all values of root mean squared error for all three methods, both for 30% corruption and 60% corruption.

- This should also generate two figures, one containing all the required plots for 30%corruption and the other for 60% corruption

2   Question 6

Usage of MATLAB Code

- Load code in the following path 'matlab_code/q6/'

- There should be three different matlab files corresponding to the required three fucntions

- This is done since MATLAB versions ¡2016 do not support function declarations in a single script file

- Load and run every function in the command line window for testing

Updating the Histogram
Let the frequency be plotted on the y axis.
Then increase the value of frequency corresponding to the new data value by 1.