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Topic #02:- Coselation and Covariance:-

In DSP, covariance measures the direction and extent of linear relationship between two signals, whole correlation normalizes this measure to provide standarize value between -1 and 1, indicating both the strength and direction of relationship.

⟹ Covariance is useful for analyzing how signals vary together, but its scale can be difficult to interpret.

⟹ Correlation is often preferred for comparing signals across different datasets. It provides scale-free measure of similarity which is useful for tasks like periodicity etc.

Covariance:- Measures how two variables change by effect of each other.

* Positive Covariance:- Indicates the signal tend to move in same direction

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(i.e when one variable increase other variable also increase)

* Negative Covariance:- Indicates signal tend to move in opposite direction (i.e when one variable increase other variable decrease).

Correlation:- A normalized measure of linear relationship between two variables. It provides value between -1 and 1 which indicates both the strength and direction of relationship.

Topic # 02:- Image Arithmatic Function:-

Rules:-

(i) If the result is a floating point number round of its value.

(ii) If the result is above the pixel range, then select the maximum range value.

(iii) If the result is below the pixel

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range (0-255) then select the minimum range value.

(iv) If the result is infinity write it as 0 (zero).

A image matrix

$$A = \begin{bmatrix} 10 & 100 & 5 \\ 5 & 2 & 0 \\ 3 & 1 & 5 \end{bmatrix}$$

B image matrix

$$B = \begin{bmatrix} 5 & 100 & 3 \\ 9 & 8 & 10 \\ 5 & 0 & 1 \end{bmatrix}$$

$$A+B = \begin{bmatrix} 15 & 200 & 8 \\ 14 & 10 & 10 \\ 8 & 1 & 6 \end{bmatrix}$$

$$A-B = \begin{bmatrix} 5 & 0 & 2 \\ -4 & -6 & -10 \\ -2 & 1 & 4 \end{bmatrix} \Rightarrow \begin{bmatrix} 5 & 0 & 2 \\ 0 & 0 & 0 \\ 0 & 1 & 4 \end{bmatrix}$$

Any value / 0 = ∞

$\frac{\delta}{0} \Rightarrow \infty$

Topic #03: Low-Pass & High Pass Filter:-

Low Pass Filter:-

* Focus on removal of noise, from signal.

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* Focus on smoothing of signals.

High Pass Filter:-

* Focus on edge detection.
* Main objective of high pass filter is to focus on intensity (frequency).