



## ***Assignment of CSE 4128***

***Khulna University of Engineering & Technology***

### ***Computer Science and Engineering***

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**Assignment No** : 03

**Assignment Topic:** Histogram Matching (Specification)

With the double Gaussian distribution target histogram



Date: 19 March, 2024

## Methodology:

- **Histogram Generation:**
  - Generate the histogram for both the input image and the target histogram.
  - Normalize the histograms to ensure they represent probability distributions.
- **CDF Calculation:**
  - Compute the CDF for both histograms by calculating the cumulative sum of their respective PDFs.
  - Normalize the CDFs to bring them to the same scale for comparison.
- **Mapping Calculation:**
  - Map the CDF of the input image to the CDF of the target histogram.
  - This mapping provides a relationship between input pixel intensities and their corresponding intensities in the target histogram.
- **Histogram Matching:**
  - Use the mapping obtained in the previous step to adjust the pixel intensities in the input image.
  - This adjustment ensures that the histogram of the input image closely matches the target histogram.
- **Visualization:**
  - Visualize the input image, its histogram, PDF, and CDF to understand the distribution of pixel intensities.
  - Show the output image with the matched histogram to evaluate the effectiveness of the histogram matching process.

By following this algorithm and methodology, you can effectively perform histogram matching to adjust the contrast and brightness of images or achieve other desired histogram characteristics.

## Pseudocode:

**// Step 1: Read input image**

```
input_image = read_image("input_image.jpg")
```

**// Step 2: Generate target histogram**

```
target_histogram = generate_histogram("target_image.jpg")
```

**// Step 3: Compute histogram of input image**

```
input_histogram = compute_histogram(input_image)
```

**// Step 4: Compute PDF and CDF of input image histogram**

```
input_pdf = compute_pdf(input_histogram)
```

```
input_cdf = compute_cdf(input_pdf)
```

**// Step 5: Normalize target histogram**

```
normalized_target_histogram = normalize_histogram(target_histogram, input_image)
```

**// Step 6: Compute PDF and CDF of normalized target histogram**

```
target_pdf = compute_pdf(normalized_target_histogram)
```

```
target_cdf = compute_cdf(target_pdf)
```

**// Step 7: Map input image's CDF to target histogram's CDF**

```
mapping = map_cdf(input_cdf, target_cdf)
```

**// Step 8: Adjust pixel intensities in input image based on mapping**

```
output_image = adjust_intensity(input_image, mapping)
```

**// Step 9: Display input image, target histogram, and histograms of input and output images**

```
display(input_image, "Input Image")
```

```
display(target_histogram, "Target Histogram")
```

```
display(input_histogram, "Input Histogram")
```

```
display(compute_histogram(output_image), "Output Histogram")
```

```
display(output_image, "Output Image")
```

