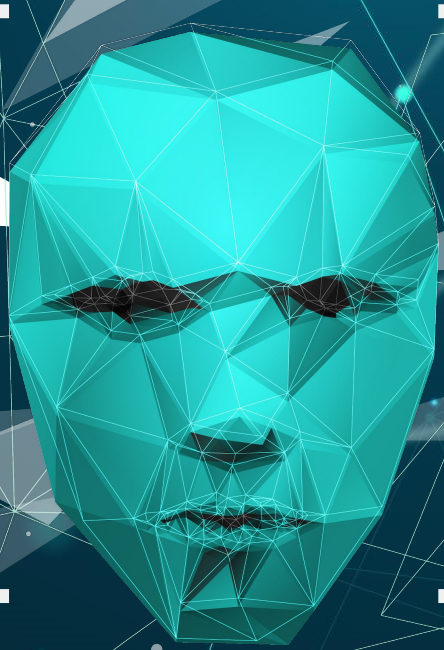
# Dim-Light and Hazy Image Enhancement



# CONTENTS

- Introduction
- Images in different environments
- Proposed Architecture
- Dehazing
- Gamma correction
- Histogram equalization
- Alpha Blending
- Results

# Introduction

- Images have become an essential part of our daily lives and are used for both practical and aesthetic purposes.
- images are used in a variety of applications and industries today.

  Starting from self driving cars, education, medicine, and surveillance.

- Due to bad whether or light effects image gets noisy and hazy.

  This may include haziness and dim light images.

➡ In order to reduce the haziness and improve the brightness of the dim light image I have propped an architecture.

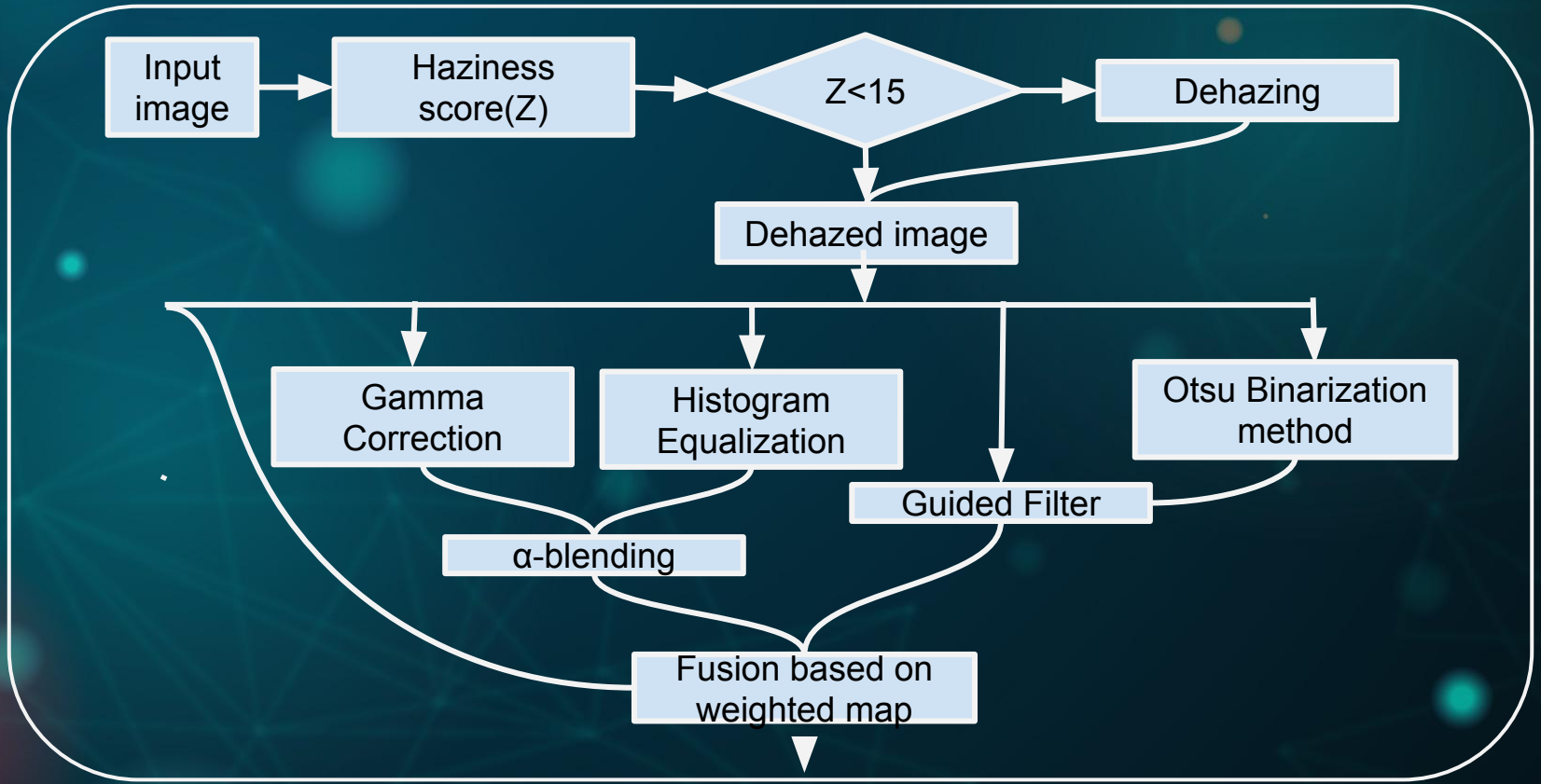
# Image in different environments

Balanced image

Hazy Image

Dim-light image

# Proposed Architecture



# Dehazing

- caused by the presence of unwanted atmospheric particles or haze that scatter light and reduce the clarity of the image.
- Solution: Dehazing based on colorline
  - Main Idea: the color line of an image changes as a result of atmospheric haze and gets shifted.
  - The haze-free color line is calculated by fitting a smooth curve through the data points on the color line.
  - The difference between the original color line and the haze-free color line is used to estimate the amount of haze in the image.
  - Finally, the haze is removed by subtracting the haze-free color line from the original color line and adding the result back to the image.

# Dehazing

Haziness score calculation using Laplacian dehazing

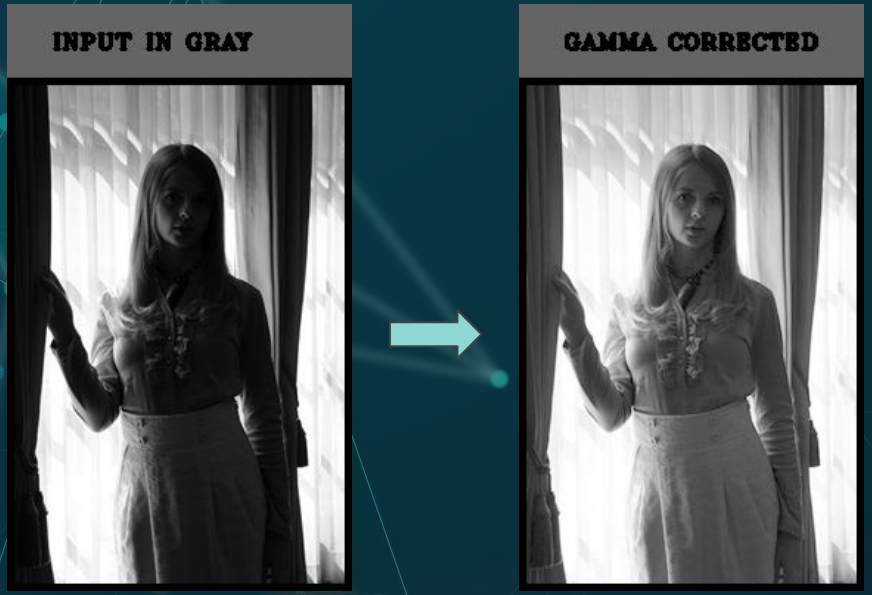
- Takes second derivative of the image on some higher dimensional plane and finds area of rapid changes in images given there is no noise.
- If the image is uniform, the result will be zero.
- Wherever a change occurs, the resultant will have positive value.
- With taking a fixed threshold we can determine the haziness of a image.

# Gamma Correction

- Non-linear adjustment to individual pixel values of given image.
- Increase overall brightness of the image.
- Lower gamma value(eg 0.5) makes image brighter.
- Higher gamma value(eg 2.5) reduce image contrast.

$$O_{ij}^{gamma} = 255. \left(I_{ij}^{input} / 255\right)^{1/\gamma}$$

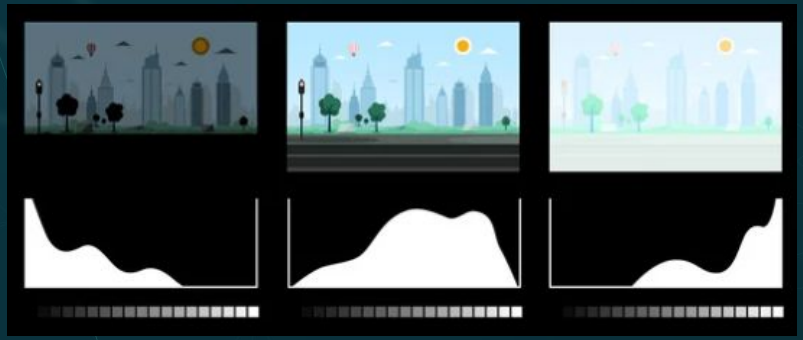
# Gamma Correction




For Gamma = 0.5

# Histogram Equalization

- Improves the contract of the image
- spread the pixel intensity values of an image over a wider range, such that the distribution of pixel intensities becomes more uniform.
- This results in more evenly distributed image pixels.



# Histogram Equalization

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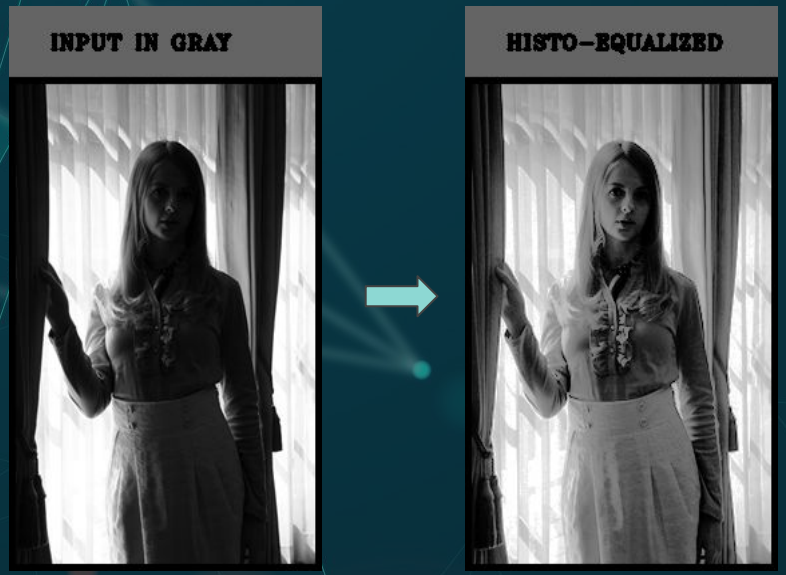

# Alpha Blending

- combine two images or layers with transparency, resulting a single image.
- Alpha ranges between 0(full transparent) to 1(full opaque)
- The alpha value determines how much of the foreground color should be mixed with the background color

$$C_{out} = (1 - \alpha) * C_{bg} + \alpha * C_{fg}$$

C_out is the output color of a pixel,
C_bg is the background color,
C_fg is the foreground color, and
alpha is the alpha value of the foreground color.

# Guided Image Filtering

- efficient method for image smoothing and enhancement that preserves edges
- non-linear filtering method that uses a guidance image to control the filtering process.
- The guidance image is typically a low-resolution version of the original image that contains information about the structure and edges of the image.
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# Alpha Blending

GAMMA CORRECTED

HISTO-EQUALIZED

ALPHA-BLENDING

# Results

INPUT IN RGB

INPUT IN GRAY

OUTPUT IN GRAY

OUTPUT IN RGB

# Results

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INPUT IN RGB

INPUT IN GRAY

OUTPUT IN GRAY

OUTPUT IN RGB

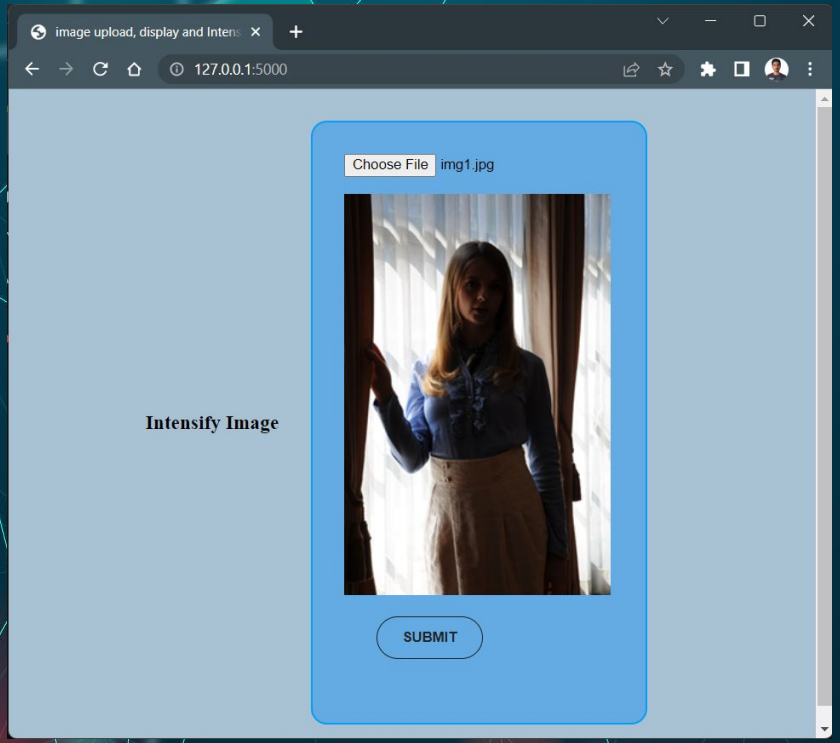
image upload, display and Intens
127.0.0.1:5000
Intensify Image
Choose File
img1.jpg
SUBMIT

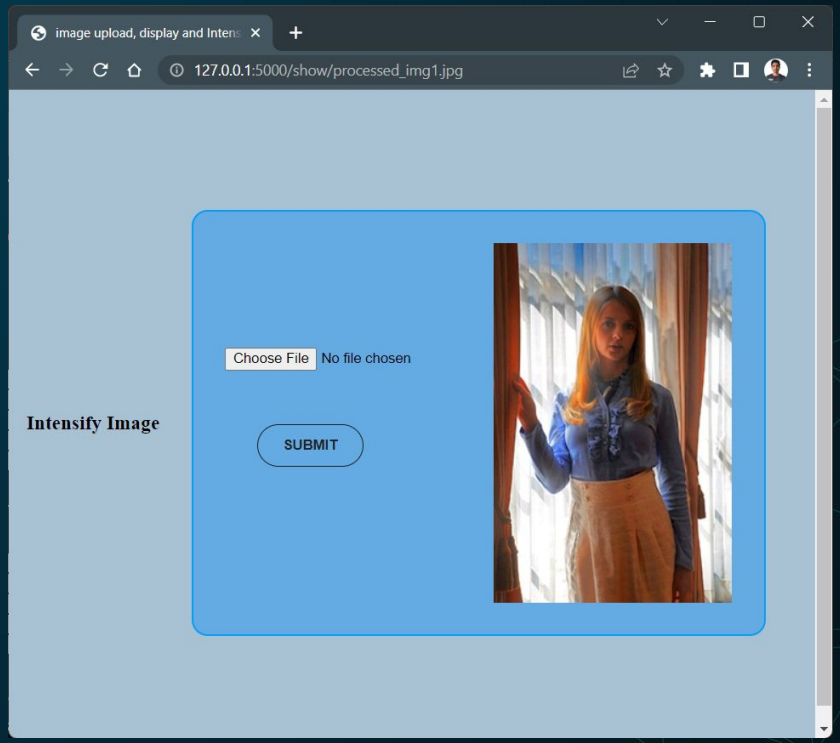
image upload, display and Intens
127.0.0.1:5000/show/processed_img1.jpg
Intensify Image
Choose File
No file chosen
SUBMIT

# THANKS!

# Use our editable graphic resources...

You can easily resize these resources, keeping the quality. To change the color, just ungroup the resource and click on the object you want to change. Then, click on the paint bucket and select the color you want. Don't forget to group the resource again when you're done.