# CMPT 880 Presentation

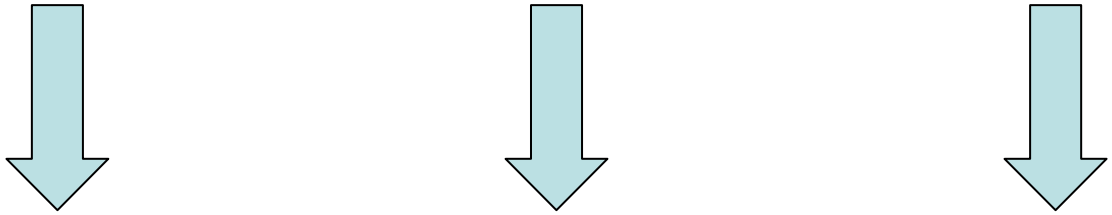
- Introduction to Digital Image Processing

- Martin

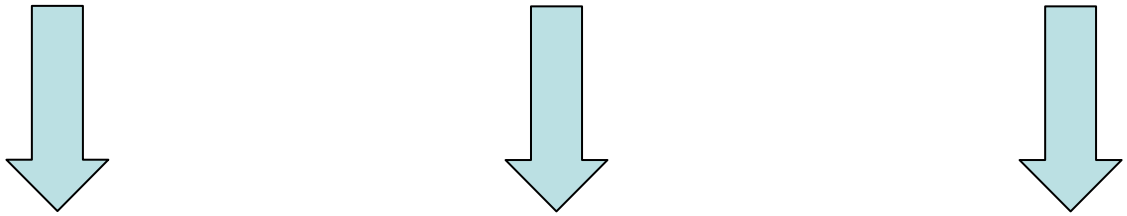
# What is Digital Image?

- An image is a 2D function: $f(x, y)$
- For a digital image, the spatial coordinates and amplitude are discrete.
- Pixels are the elements of a digital image.
- Image Formats: BMP, JPEG, GIF, PNG…

- Imaging (taking pictures of real world)



- Digital Image Processing (processing digital images by a digital computer.



- Computer Vision (interpretation and understanding of an image scene)

# Steps for Digital Image Processing

- Preprocessing/Enhancement
- Segmentation
- Description
- Classification and Recognition

# Preprocessing and Enhancement (1)

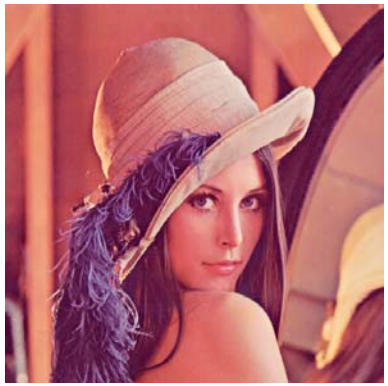
- Removing noise —— Averaging filter, Median filter, Gaussian filter…

# Preprocessing and Enhancement (2)

- Get better contrast: spread gray scale

# Preprocessing and Enhancement (3)

- Color Image



- Gray-level Image

- Binary Image

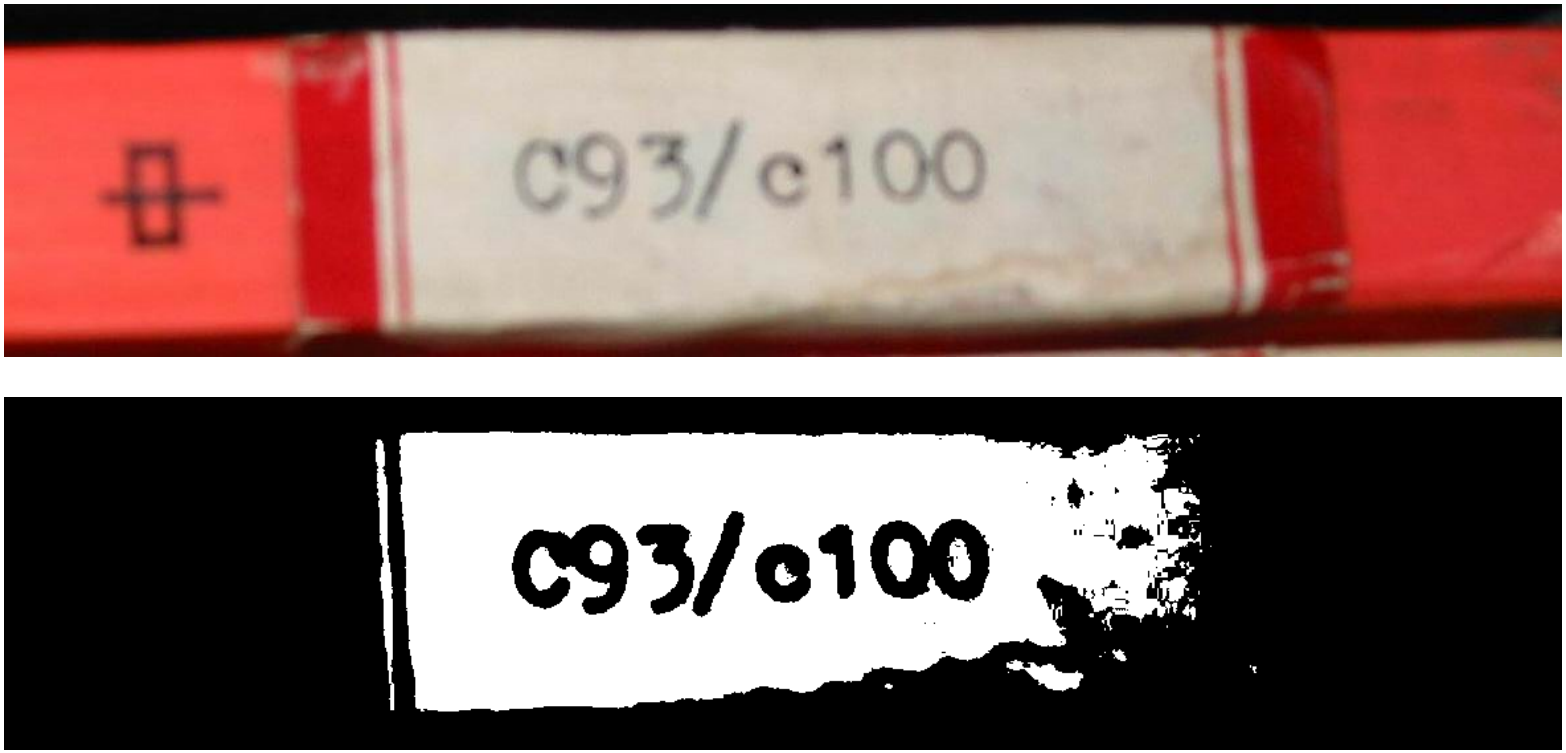
# Preprocessing and Enhancement (4)

- Edge Detection: find the gradient of intensities.

# Segmentation (1)

- Divide the image into regions with their boundaries.
- Image segmentation is a research field which is highly application dependent. There is no standard answer to a specific problem.

# Segmentation (2)



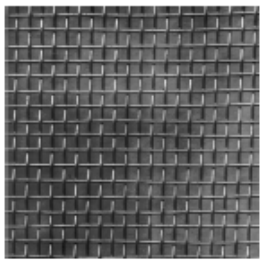
# Description

- Extract features which are the description of the regions.
- Some simple features: Area, Length of Boundaries……

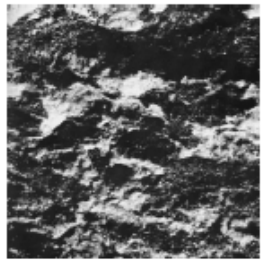
# Classification and Recognition

- Assign patterns to their respective classes based on their descriptions.
- Given the features and descriptions, we want computer to tell us what’s the pattern or texture.

# Texture Classification



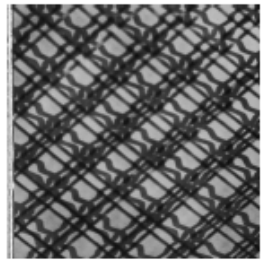
(a) texture 1



(b) texture 2

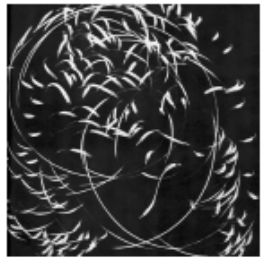
(c) texture 3

(d) texture 4

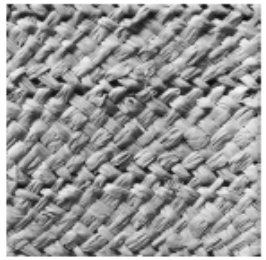


(e) texture 5

(f) texture 6

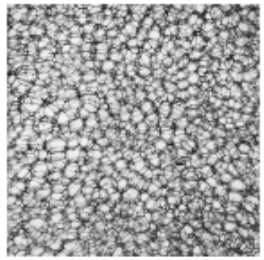


(g) texture 7



(h) texture 8

(i) texture 9



(j) texture 10

# Tools and Techniques for DIP

- 1 Photoshop
- 2 Matlab (Image Processing Toolbox)
- 3 Visual C++.NET—— CImage Class
- 4 OpenCV (Open Source Computer Vision Library)——a collection of C functions and a few C++ classes that implement many popular Image Processing and Computer Vision algorithms.

- Thank you