

# Comprehensive Seminar

Presented By  
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Ph.D Scholar  
Reg.No: 20-3-04-139



Under the Supervision of  
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Asst Professor

**Department of Electronics and Communication Engineering  
National Institute of Technology, Silchar**

# I Welcome the Doctoral Committee to the Comprehensive Seminar



- Chairman
- Member
- Nominee of Chairman,
- Supervisor

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Dr.C.Choudhury, Asst Prof, ECE

Dr. Vipin Chandra Pal, Asst Prof, EI

Dr. Ram Kumar Karsh, Asst Prof, ECE

**Department of Electronics and Communication Engineering**  
**National Institute of Technology Silchar**

## Course Work Undertaken

S.No	Course Name	Course code
1	Research Methodology	IC-001
2	Machine learning	CS-1537
3	Image Processing	EC-5141

# Research Methodology (IC-001)

## ✓ **Course Instructors**

- ✓ Prof. M.A. Ahmed
- ✓ Dr. Sourav Verma
- ✓ Prof. Gurudas Das
- ✓ Prof. B.K. Roy
- ✓ Prof. Nidul Sinha

## Course Outline

- ✓ Introduction of Research
- ✓ Why do we do research
- ✓ Objectives of research
- ✓ Various stages of research
- ✓ Communication
- ✓ Time management
- ✓ Stress
- ✓ Components of Ph.D thesis & Research paper
- ✓ Motivation

# Introduction of Research

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- ❑ Research is an art of science and process to discover new knowledge.
- ❑ Systematic Investigation of materials and resources.
- ❑ Collecting and analyzing information on a problem.
- Type of research
  - Basic research
  - Applied research
  - Quantitative research
  - Qualitative research

# Why do we do Research?

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Improve habit of logical thinking



Service to society

*Why?*



Face challenges in finding solutions to unsolved problems



Enhance career opportunities

## Objectives of Research

**To discover new facts.**

**To find solutions to scientific, nonscientific and social problems.**

**To analyze an event or process or phenomenon to identify the cause and effect relationships.**

**To develop new scientific tools, concepts and theories.**



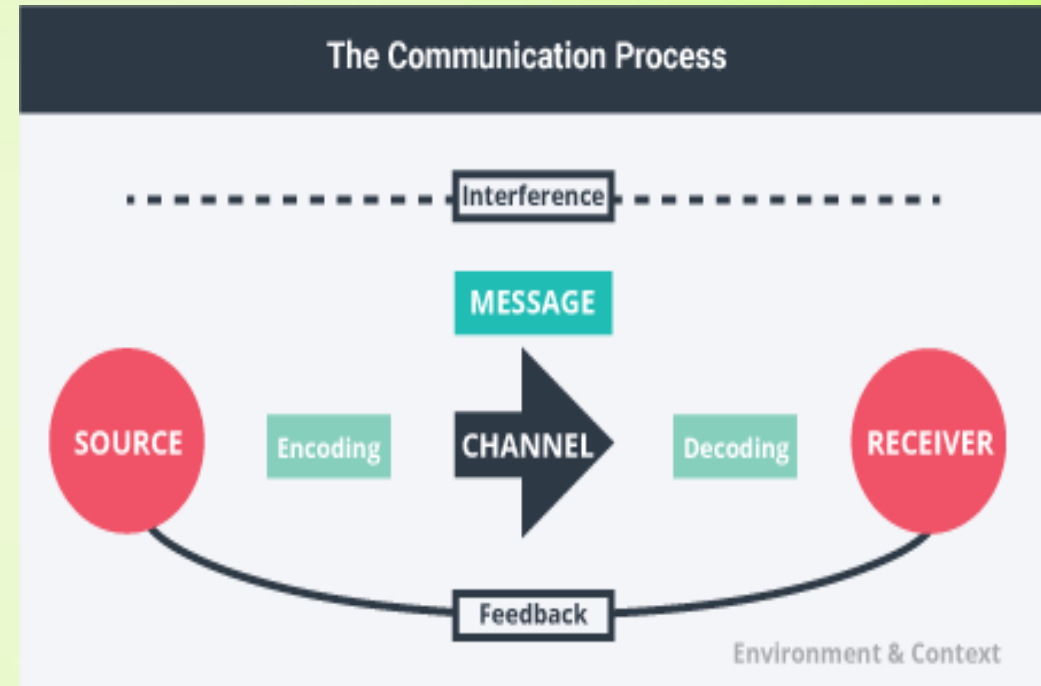
# Various Stages of Research

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# Communication

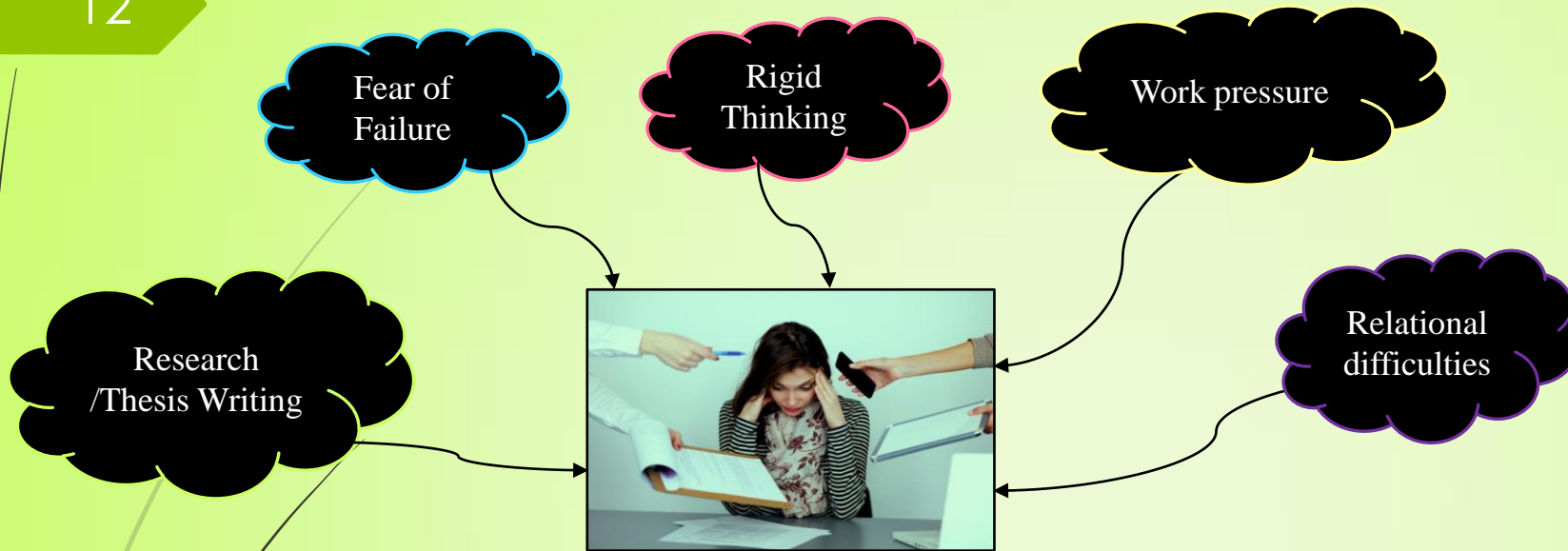
- Definition
- Type of communication
- Benefits of communication
- Barrier of communication



# Time Management

- ✓ Make plan for at least one semester and break the plan for months and weeks and always prepare to— do list.
- ✓ Take feedback at least weekly and tuned the controller, if needed.
- ✓ Fix a daily “thinking slot”.
- ✓ Prioritize multiple task.
- ✓ Have enough sleep each night.
- ✓ Unlearn the bad time habits and learn good time habit.

# Stress



## Stress Management:

Physical Exercise

Time Management

Meditation

Deep Breathing



Positive Attitude

Accepting Failure

Build a hobby

Be Social

Components of PhD Thesis	Components of Research Paper
Title	Title
Abstract	Abstract
Introduction	Keywords
Literature Review	Introduction
Methodology	System Model
Results and Discussion	Problem Formulation & Methodology
Conclusion and Future Scope	Results and Discussion
References	Conclusion
	References

## Motivation

- ✓ Enriched knowledge in going through systematic approach of research work to get better results in effective manner.
- ✓ This subject emphasized on writing skills of research paper, good presentation skills and also on methods of writing Ph.D thesis.
- ✓ Improve communication skill

# Machine learning(CS-1537)

## **Course Instructor**

Dr. Biswajit Purkayastha

Associate Professor

Dept. of computer science Engineering

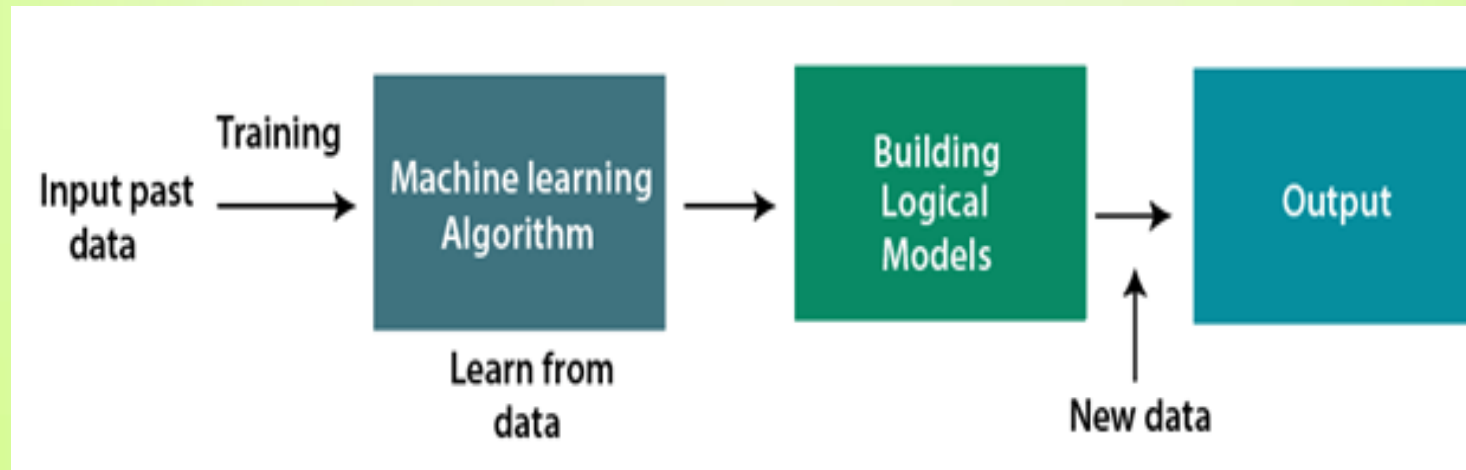
## Course Outline

- ☐ Introduction of machine learning
- ☐ Type of machine learning
- ☐ Feature selection
- ☐ Regression
- ☐ Decision Tree
- ☐ SVM
- ☐ Clustering



## Introduction of machine learning

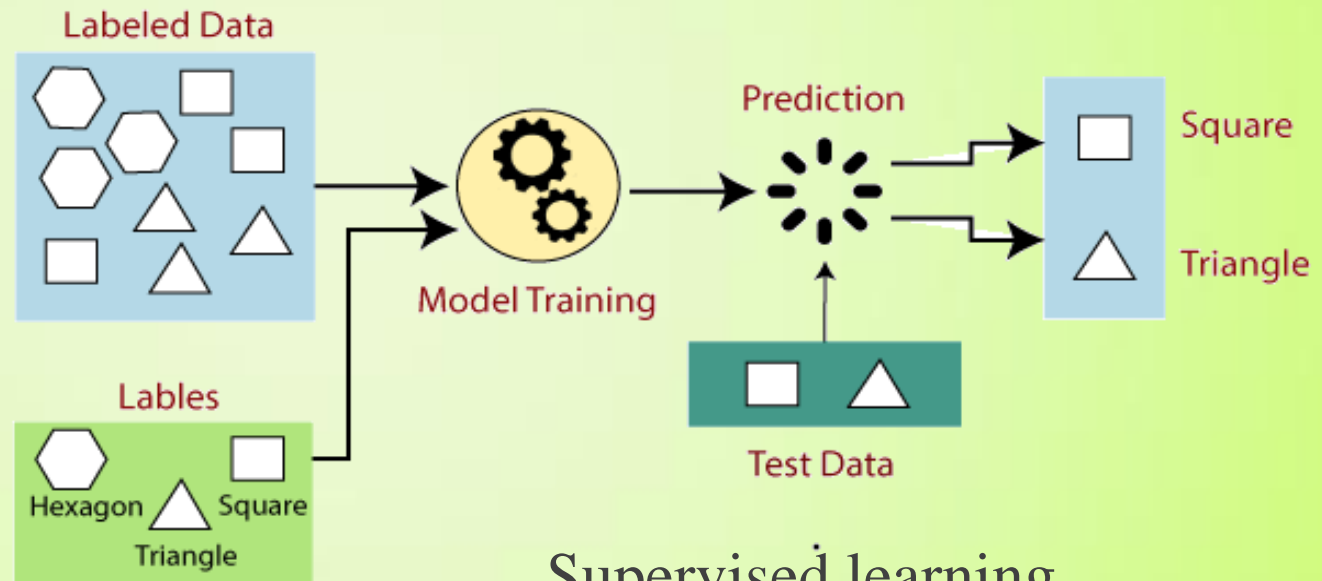
- Machine learning is a subfield of artificial intelligence (AI).
- The field of study known as machine learning is concerned with the question of how to construct computer programs that automatically improve with experience.
- The goal of machine learning generally is to understand the structure of data and fit that data into models that can be understood and utilized by people.



Model of machine learning

# Type of machine learning

- ✓ Machine learning implementations are classified into three major categories, depending on the nature of the learning “response” available to a learning system which is as follows:-
- ✓ Supervised learning
- ✓ Unsupervised learning
- ✓ Reinforcement learning



Supervised learning

# Feature selection

- The goal of feature selection in machine learning is to find the best set of features that allows one to build useful models of studied phenomena.
- The techniques for feature selection in machine learning can be broadly classified into the following categories:
  - Filter methods
  - Wrapper methods
  - Intrinsic Method

Roll numbers	Marks	Results
1	85	First
2	40	Second
3	25	Fail
4	60	First
5	35	Third
6	50	Second
7	20	Fail

Dataset of students

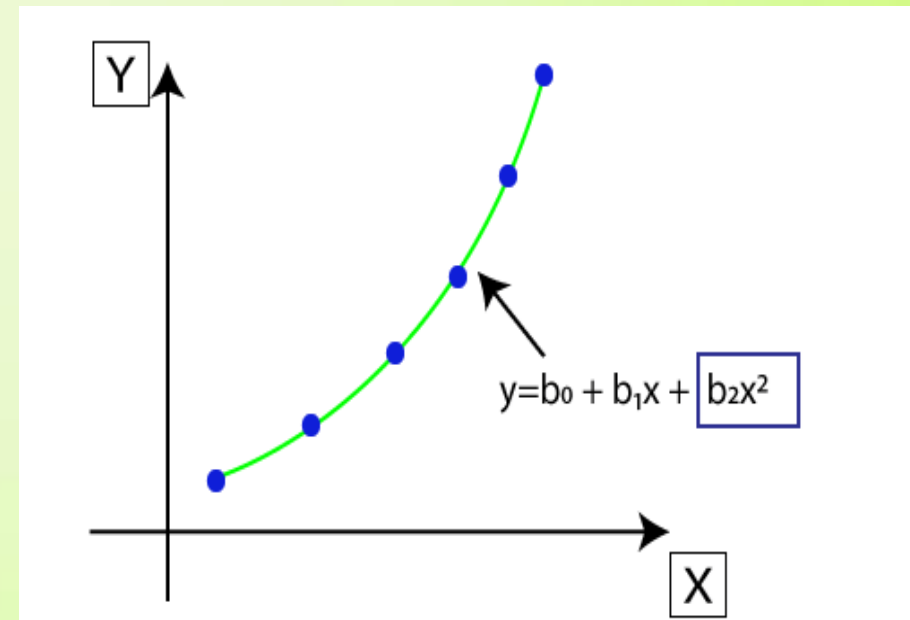
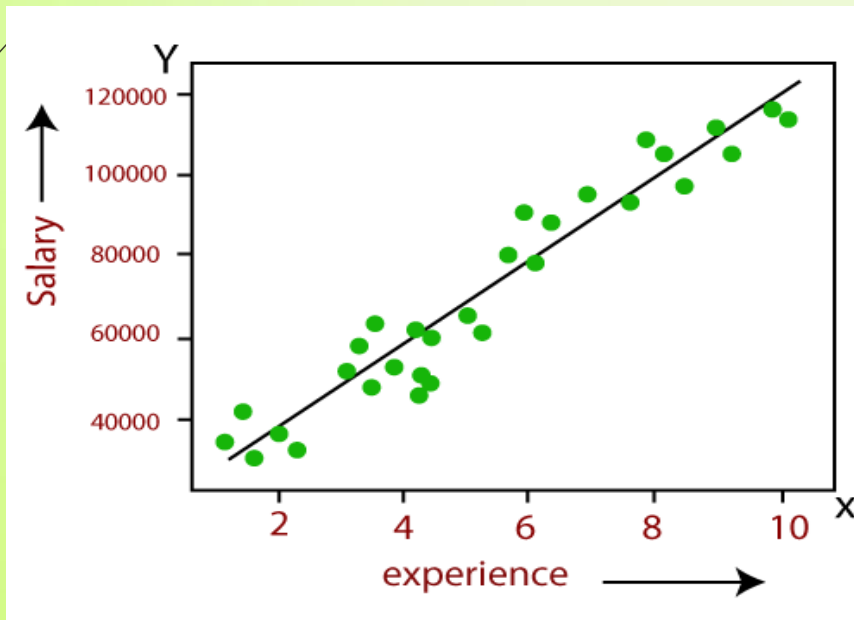
# Regression

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- Regression is a supervised technique.
- A regression problem is the problem of determining a relation between one or more independent variables and an output variable which is a real continuous variable.
- Predicting prices of a house given the features of house like size, price etc.
- **Types of Regression**
  - Simple Linear Regression
  - Polynomial Regression
  - Multiple linear regression

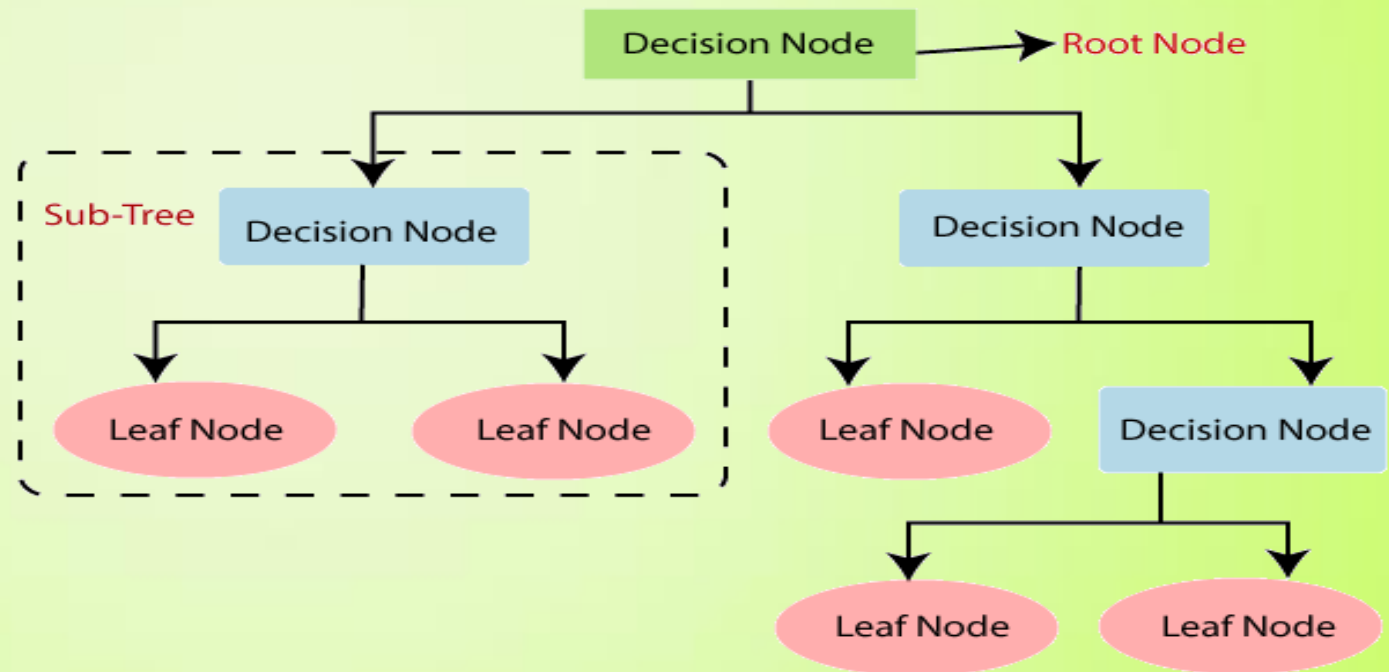
## Linear & Polynomial Regression

- This is one of the most common and interesting type of Regression technique. Here we predict a target variable Y based on the input variable X.
- Y represents salary, X is employee's experience and a and b are the coefficients of the equation. So in order to predict Y (salary) given X (experience in years), we need to know the values of a and b (the model's coefficients).



# Decision Trees

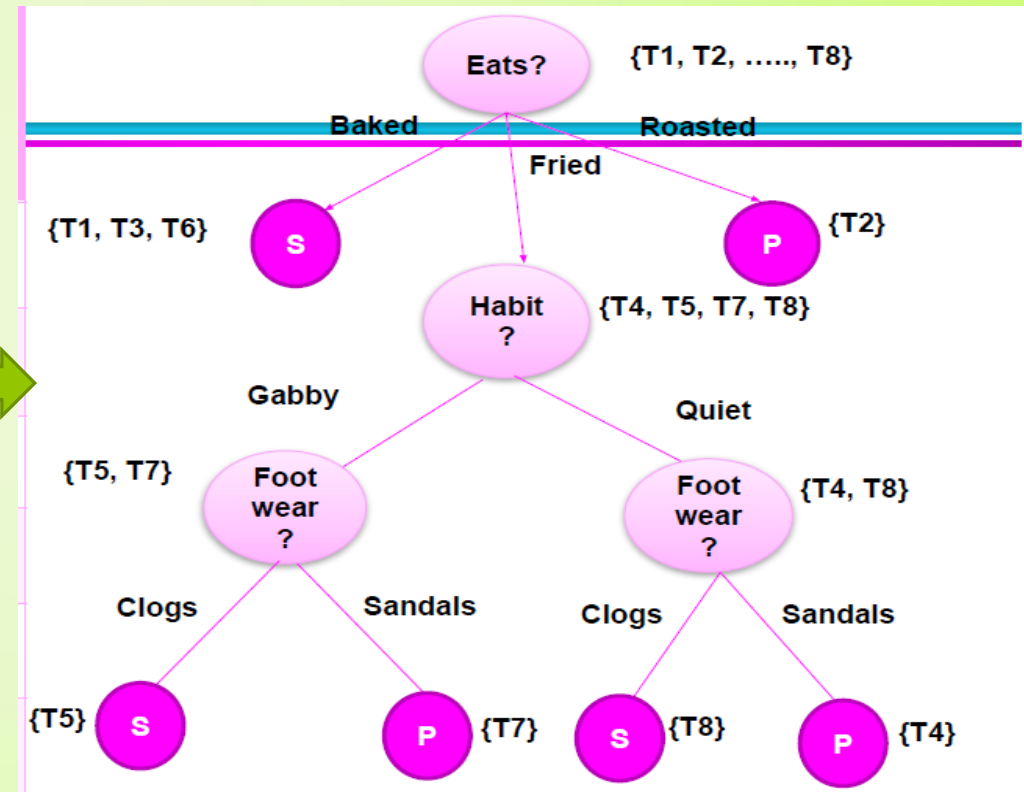
- Decision Tree is a **Supervised learning technique** that can be used for both classification and Regression problems, but mostly it is preferred for solving Classification problems.
- The leaves are the decisions or the final outcomes. And the decision nodes are where the data is split.
- There are two main types of Decision Trees:
  - Classification trees (Yes/No types)
  - Regression trees (Continuous data types).



# Decision Trees con....

NAME of training pattern	Attributes			Class
	HABITS	EAT	FOOTWEAR	
T1	Gabby	Baked	Clogs	Students
T2	Gabby	Roasted	Sandals	Professor
T3	Gabby	Baked	Sandals	Students
T4	Quiet	Fried	Sandals	Professor
T5	Gabby	Fried	Clogs	Students
T6	Quiet	Baked	Sandals	Students
T7	Gabby	Fried	Sandals	Professor
T8	Quiet	Fried	Clogs	Students

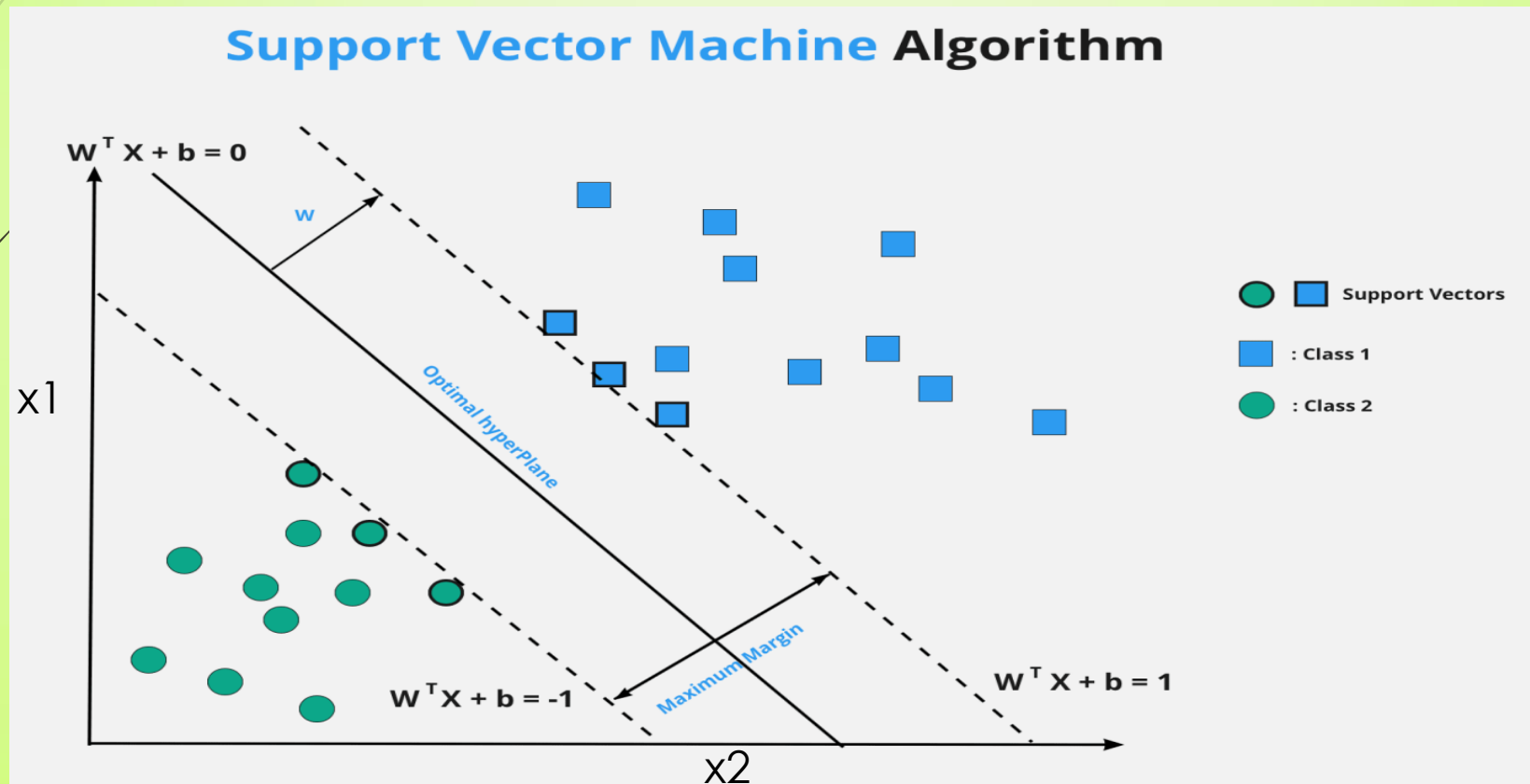
Training Data



Model: Decision Tree

# Support Vector Machine

- **Support vector machines (SVMs)** are a set of supervised learning methods used for classification and regression. It is mostly used in classification problems.





# Clustering

- ✓ Clustering or cluster analysis is a machine learning technique, which groups the unlabeled dataset.
- ✓ A way of grouping the data points into different clusters, consisting of similar data points. The objects with the possible similarities remain in a group that has less or no similarities with another group.
- ✓ It is an unsupervised learning method, hence no supervision is provided to the algorithm, and it deals with the unlabeled dataset.
- ✓ Here we are discussing mainly two popular Clustering algorithms that are widely used in machine learning:
  - ❖ K-Means algorithm
  - ❖ Agglomerative Hierarchical algorithm

# Motivation

- Machine learning provides both the theory behind computer vision and the foundation for image processing algorithms.
- ✓ Basic CNN need in image processing.
- ✓ Machine learning career which is very experimental and creative job.
- ✓ Improving quality of image like noise removal, contrast enhancement, edge detection, action recognition etc.
- ✓ In the field of machine learning the possibilities are truly endless.

# Image Processing (EC-5141)

## **Course Instructor**

Dr. Ram Kumar Karsh

Assistant Professor

Dept. of Electronics and Communication Engineering

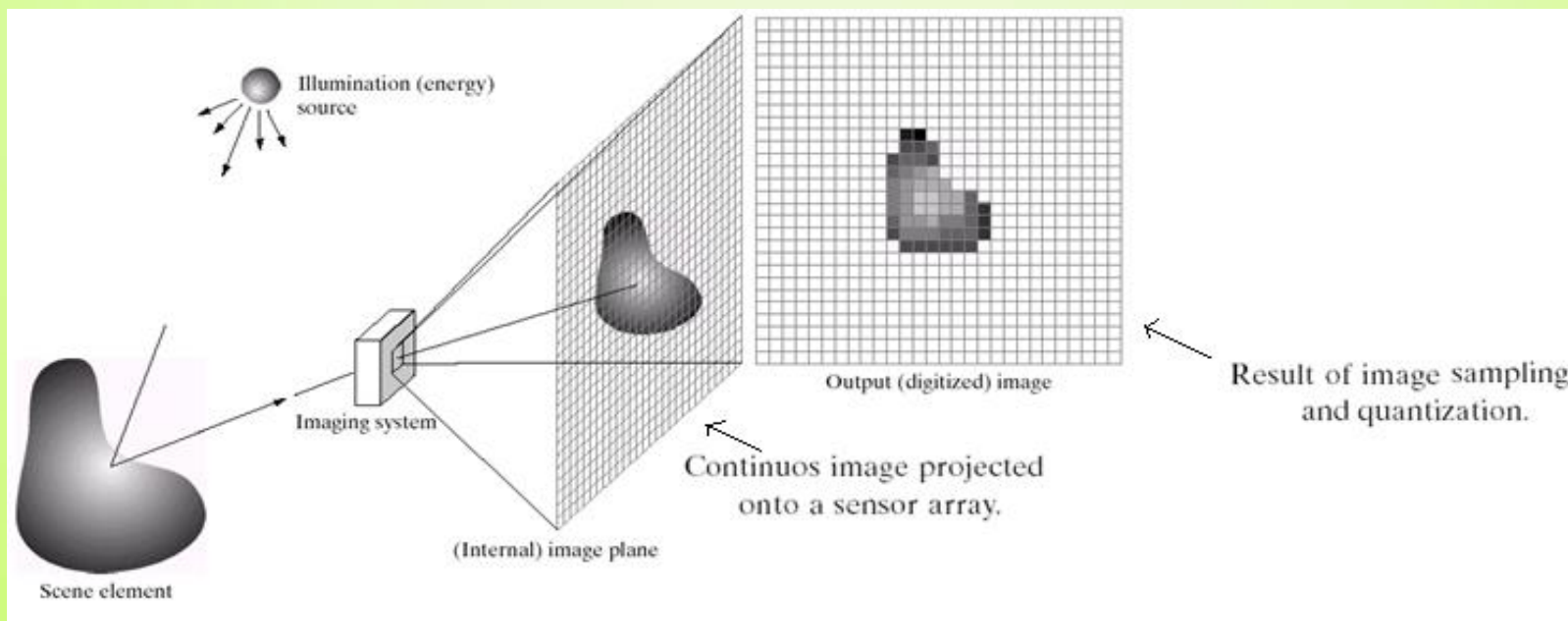
# Course Outline

- Digital Image Processing
- Pixels and their relations
- Steps in Image Processing
- Image Enhancement
- Image Restoration
- Image Segmentation & Compression
- Morphological processing
- Area of research
- Motivation

## Digital Image Processing

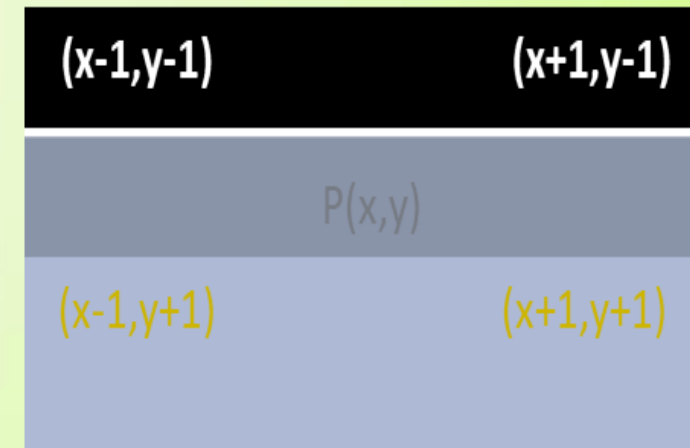
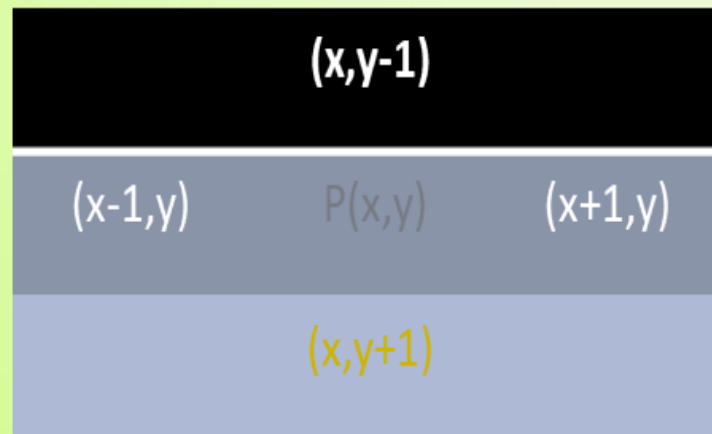
- **An image** is defined as a two dimensional function,  $f(x, y)$ , where  $x$  &  $y$  are spatial coordinate and the amplitude of  $f$  is called intensity or gray level.
- **DIP** is a method to perform some operations on an **image**, in order to get an enhanced image or to extract some useful information from it.

### Image Formation



## Pixels and their relations

- ✓ It is the smallest controllable element of a picture or image.
- ✓ A pixel  $p$  at location  $P(x,y)$  has two horizontal and two vertical neighbor.
- ✓ A pixel  $p$  at location  $P(x,y)$  has four diagonal pixels.

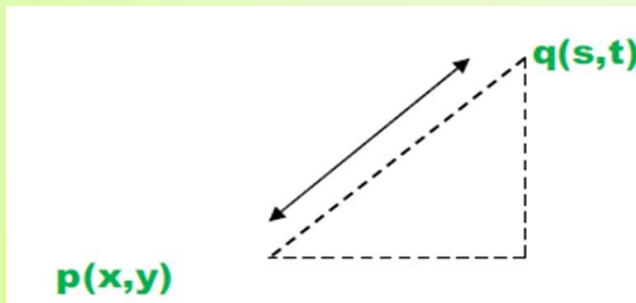


# Pixels and their relations cont..

- ✓ The diagonal and four neighbor pixels are called eight neighbors.
- ✓ Two pixels are connected if they are neighbors.
- ✓ The Euclidean distance between pixels  $p(x,y)$  and  $q(s,t)$  is defined as

$$D_e(p,q) = [(x-s)^2 + (y-t)^2]^{1/2}$$

- ✓ City-block distance( $D_4$ ) =  $|x - s| + |y - t|$



		2		
	2	1	2	
2	1	0	1	2
	2	1	2	
		2		

Diamond

# Steps in Image Processing

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- Image Acquisition
- Image Enhancement
- Image Restoration
- Image Compression

**Low level processing**

- Morphological processing
- Image segmentation

**Mid level processing**

- Image Representation
- Object Recognition

**High level processing**



## Image Enhancement

- Image enhancement is the process to improve the quality of image.
- Enhancement is the process of manipulating an image so that the result is more suitable than the original image for a specific application.

### Image enhancement technique

\* Point Processing Technique      \* Mask

- Some useful examples and methods of image enhancement:



Remove Noise Using Median Filter

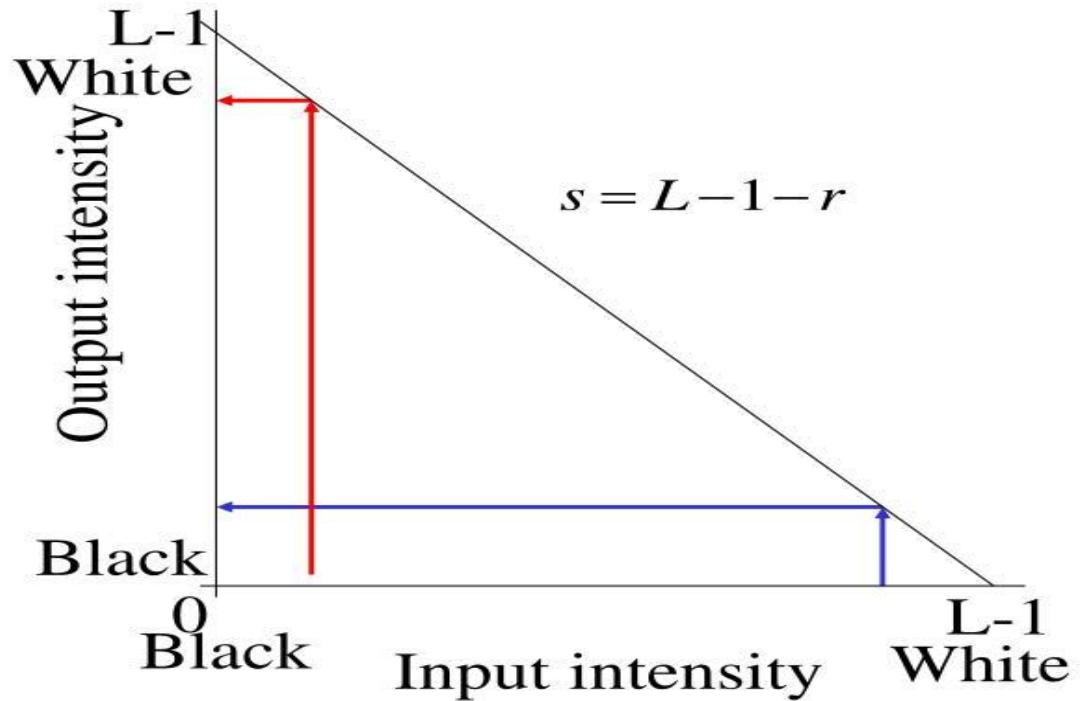


Enhancing grayscale images with histogram equalization

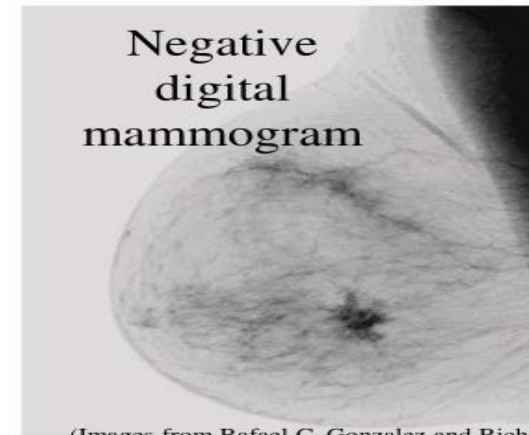
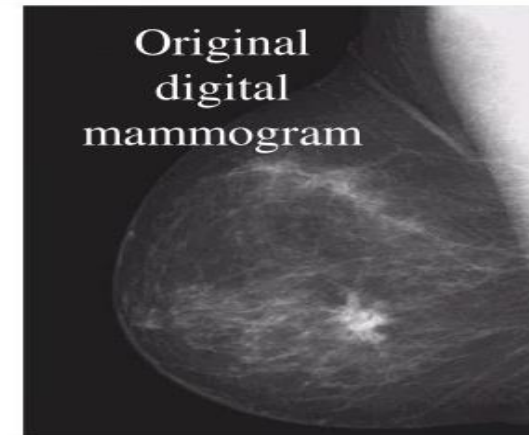
# Image Enhancement con..

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## Image Negative



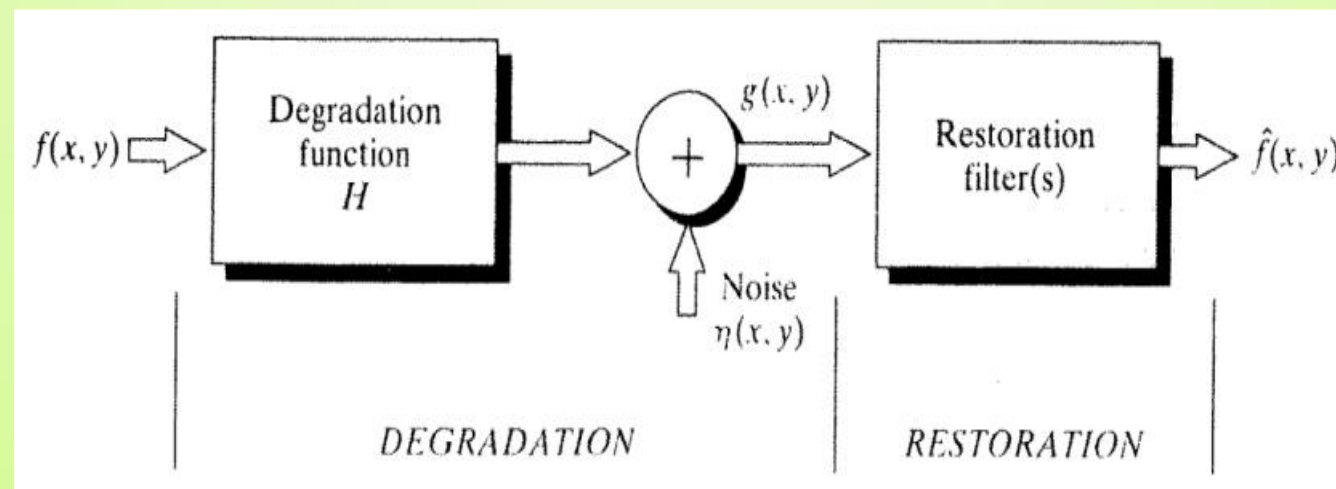
$L$  = the number of gray levels



(Images from Rafael C. Gonzalez and Richard E. Wood, Digital Image Processing, 2<sup>nd</sup> Edition.

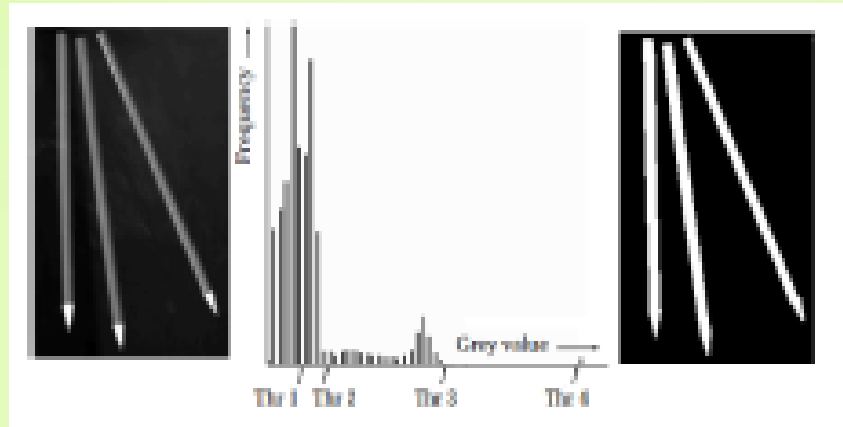
## Image Restoration

- Image restoration attempts to reconstruct or recover an image that has been degraded by a degradation phenomenon.
- Degradation comes in many forms such as motion blur, noise, and camera miss focus.



## Image Segmentation & Compression

- Subdivides an image into its constituent regions or objects.
- The goal of image segmentation is to divide an image into several parts/segments having similar features or attributes.



Thresholding methods

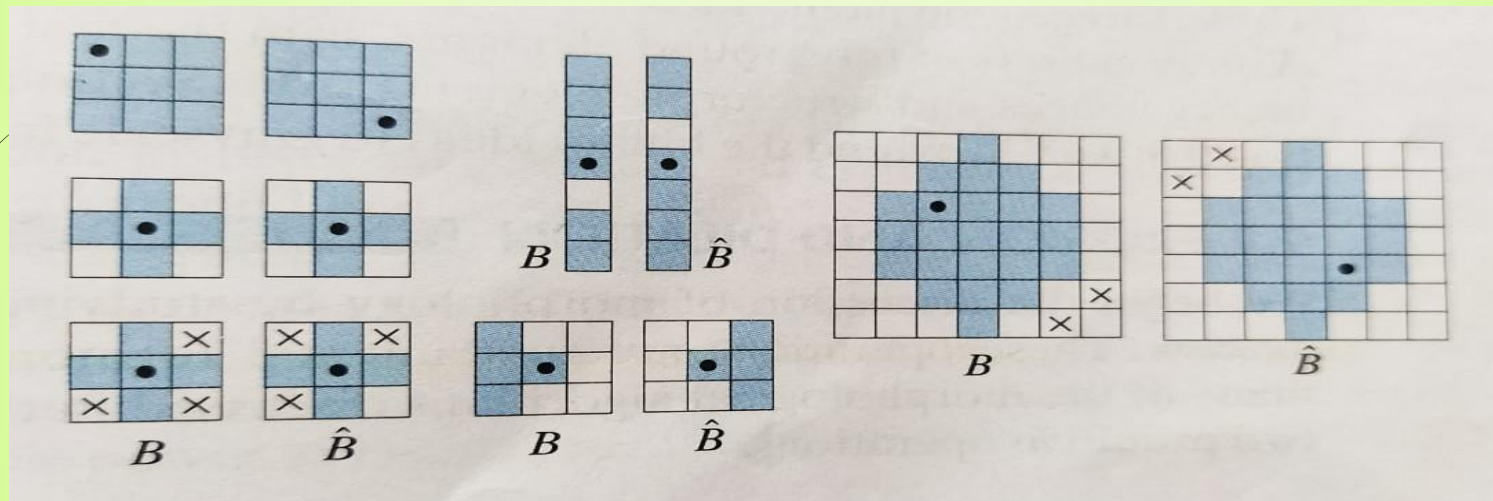
- Image compression reduces the amount of memory needed to store an image.

**Lossless Image Compression**

**Lossy Image Compression**

# Morphological processing

- **Morphological operations** are a set of operations that process images based on shapes and size.
- They apply a structuring element to an input image and generate an output image.

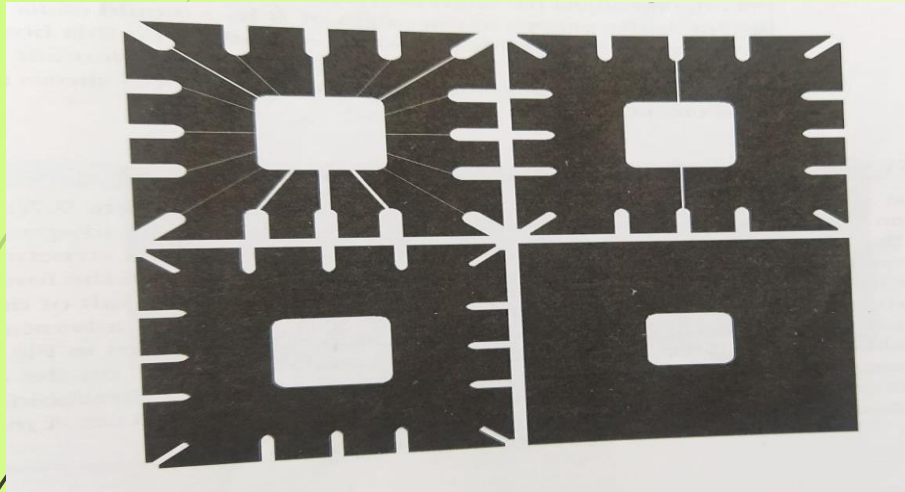


**Structuring element and their reflections about the origin**

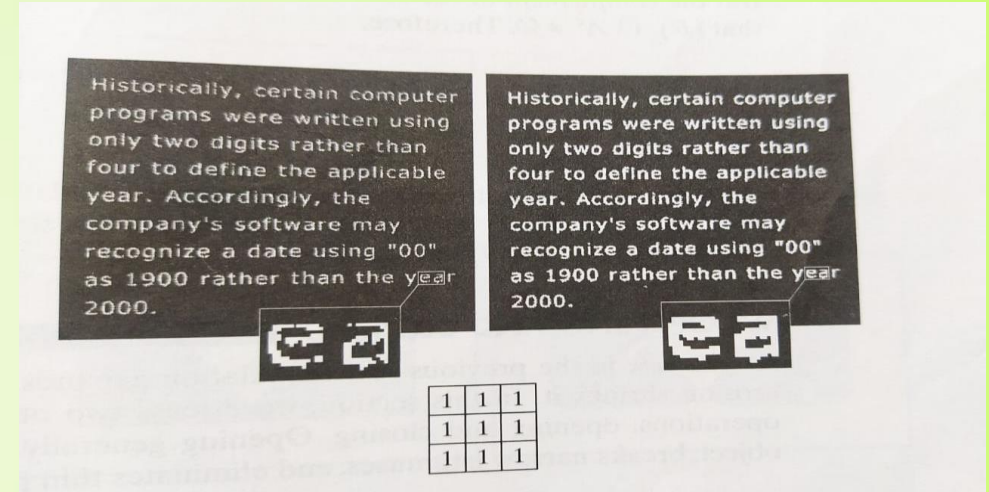


# Morphological processing con.....

- The most basic morphological operations are **Erosion and Dilation**



Using erosion to remove image components.(a) A 486X486 binary image of a wire-bond mask in which foreground pixels are shown in white.(b)-(d) image eroded using SE of size 11x11,15x15, and 45x45 elements, respectively, all valued 1



(a) Low-resolution text showing broken characters (b) SE (c) dilation of (a) by (b). Broken segments were joined

## Area of Research (Action recognition)

- ▶ Action recognition is a one of the fundamental challenges in image processing and computer vision.
- ▶ Action recognition is a specific field of Object recognition or deep learning
- ▶ Object recognition algorithms are divided in two parts
- ▶ Two stage based algorithms
- ▶ One stage based algorithms
- ▶ Datasets

## Motivation

- This course give me advance idea for image analysis and object recognition.
- Euclidean distance: used in image classification and social distancing system.
- The processing of image is faster and more equrate.
- No processing chemicals are needed.
- Practical implementation makes a motivational field of study.
- Application of image processing like Robotics, medical field etc.



## References

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- Rajasekar, S. Philominathan P and Chinnathambi V (2013) Research methodology.
- Machine Learning - Saikat Dutta
- Pattern recognition, techniques and application - Rajjan Shinghal.
- Gonzalez, Rafael C., and Richard E. Woods. Digital image processing. (2002).
- Jain, Anil K. Fundamentals of digital image processing. Englewood Cliffs, NJ: Prentice Hall,, 1989.



**Thank You**