

# Digital Image Processing: Introduction



Centurion  
UNIVERSITY

Presented by

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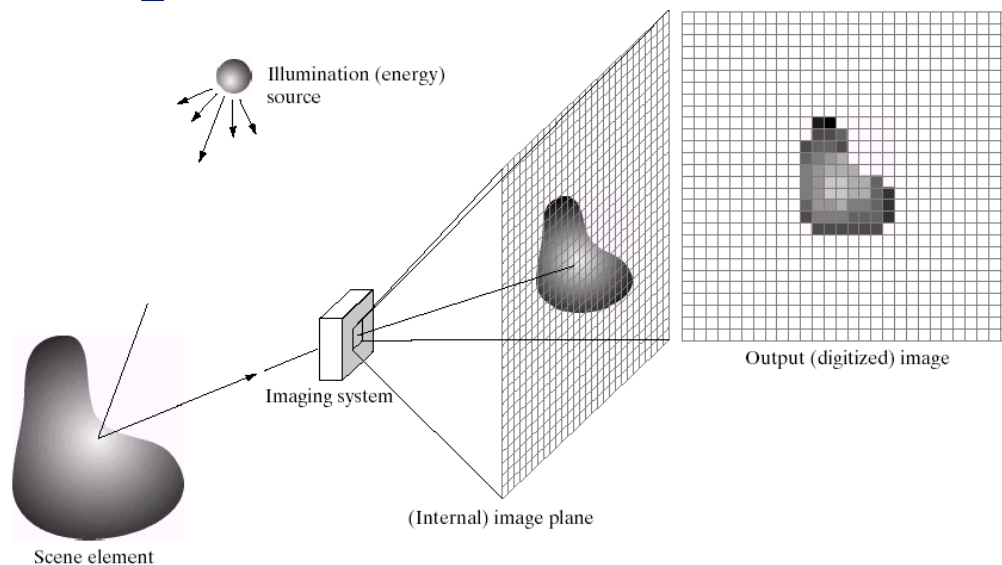
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# This lecture will cover:

- ❖ What is a digital image?
- ❖ What is digital image processing?
- ❖ Categorization of image processing
- ❖ Image processing systems
- ❖ Media for digital data recording ,storage and distribution
- ❖ Data formats of digital image
- ❖ Display of digital image
- ❖ Advantages of digital image processing

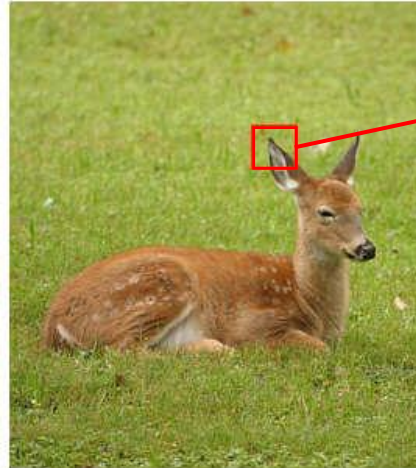
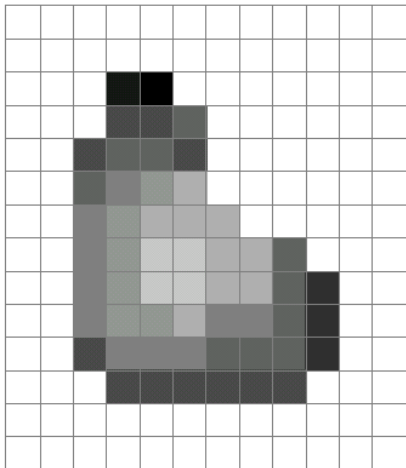
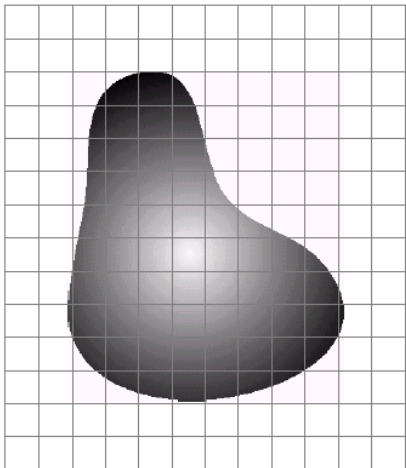
# What is a Digital Image?

- Digital image is an array of numbers depicting spatial distribution of certain field parameters (such as reflectivity of electromagnetic radiation, emissivity, temperatures, some geographical or topographical elevation)
- A **digital image** is a representation of a two-dimensional image as a finite set of digital values, **called picture elements or pixels**



# What is a Digital Image? (cont...)

- Digital image consists of discrete picture elements called pixel.
- Each pixel has a coordinate  $(x, y)$  in the discrete space representing a continuous sampling of the earth surface
- A numerical value, represented as DN, is associated with each pixel
- Pixel value is also called image intensity, image brightness or gray level which stored as binary digits in computer.



# What is Digital Image Processing?

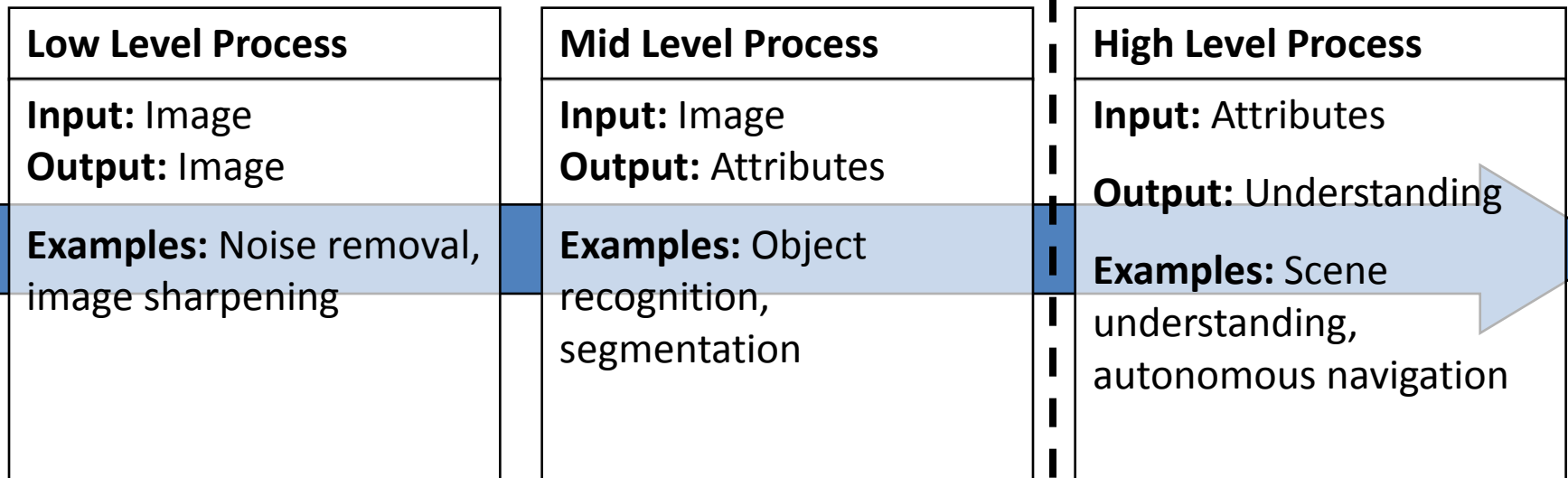
**Digital image processing involves the manipulation and interpretation of digital image with the aid of computer**

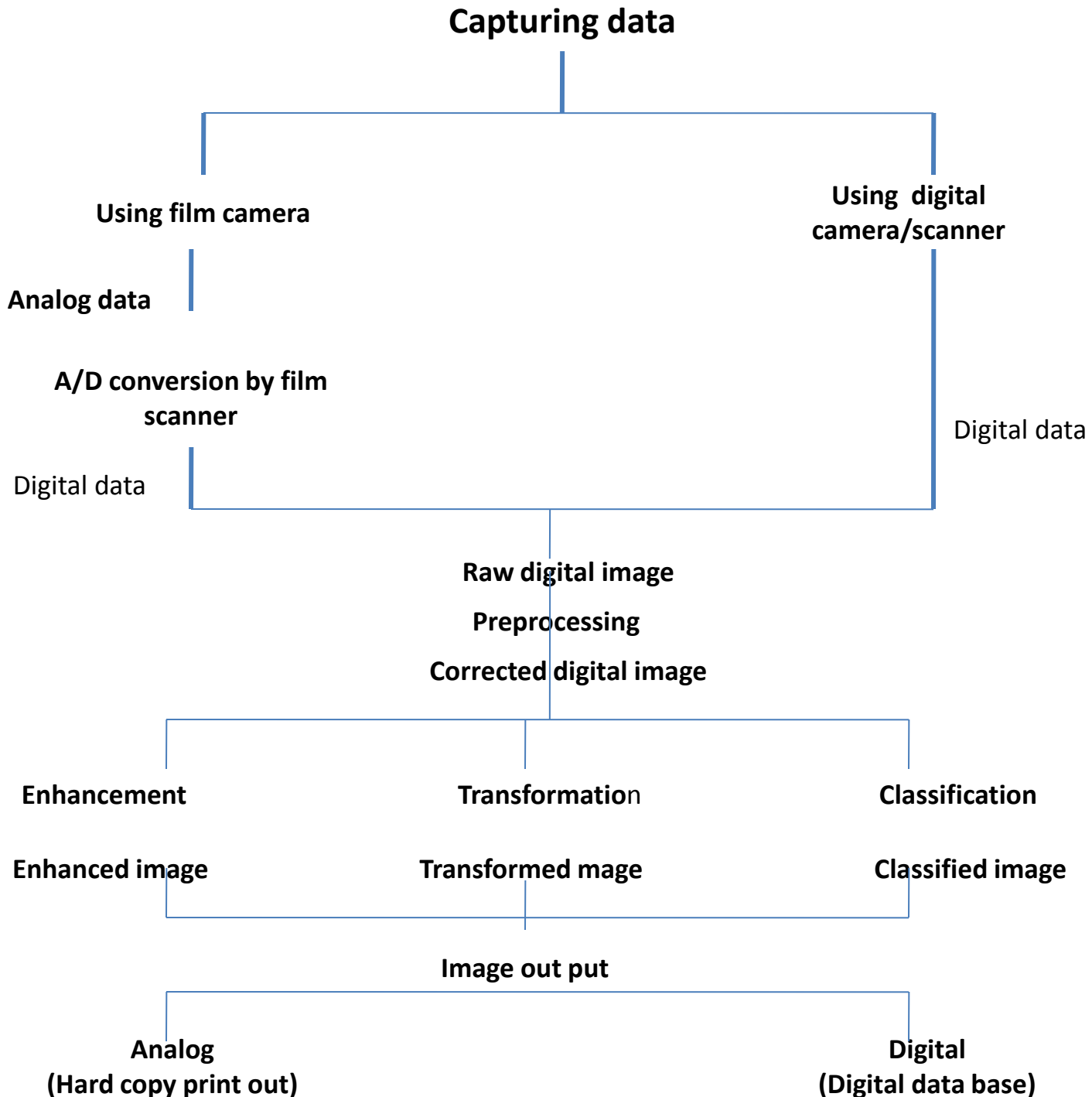
**Digital image processing focuses on two major tasks**

- Improvement of pictorial information for human interpretation
- Processing of image data for storage, transmission and representation for autonomous machine perception

# What is DIP? (cont...)

The continuum from image processing to computer vision can be broken up into low-, mid- and high-level processes





# Major image processing techniques

## Image rectification and restoration

### Radiometric correction

Detector response calibration

Sun angle and topographic correction

Atmospheric correction

De-stripping

Missing scan line removal

Random noise removal

### Geometric correction

Systematic errors

Non Systematic errors

Image to ground

Image to image

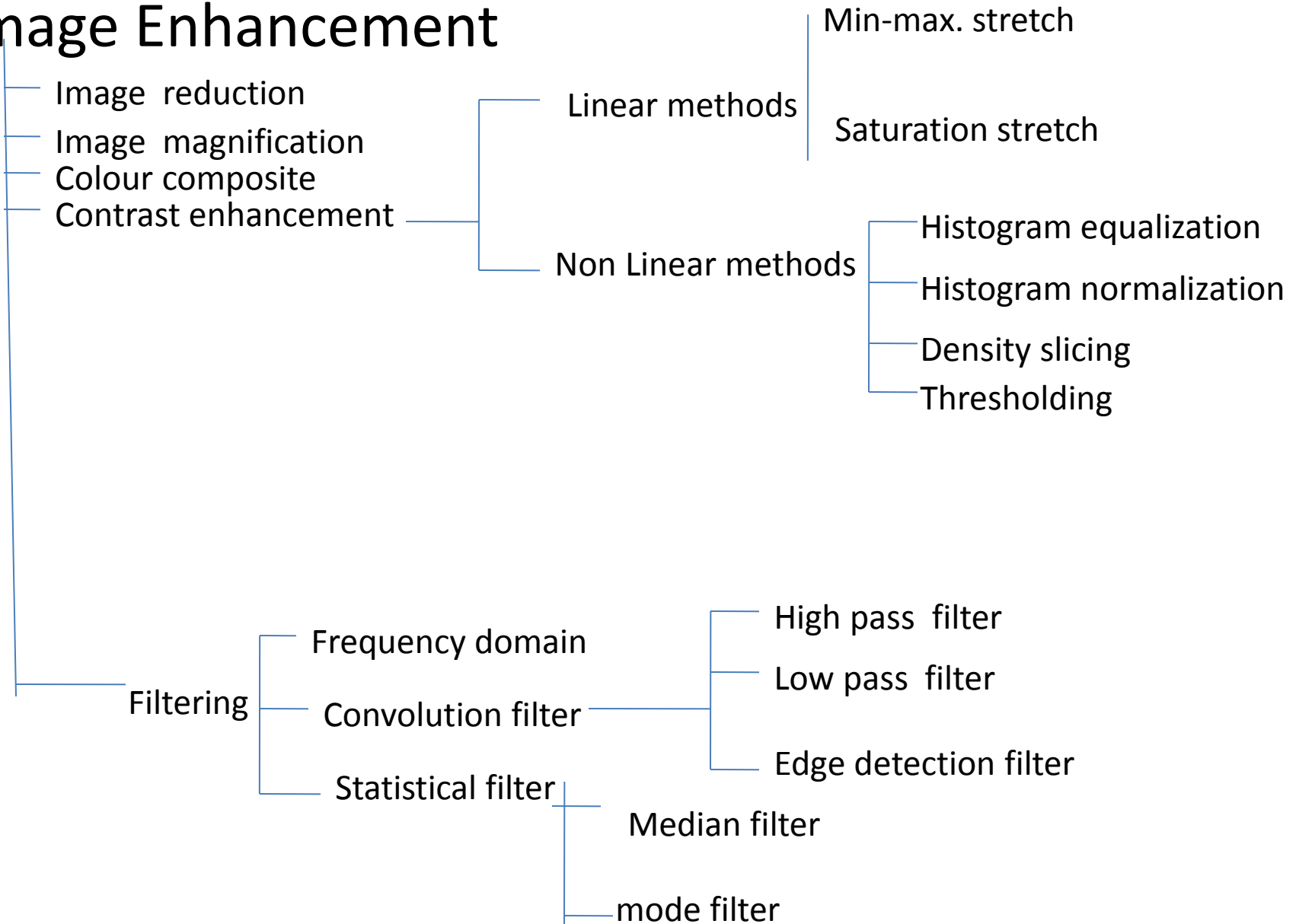
Miscellaneous

sub setting

Mosaicking

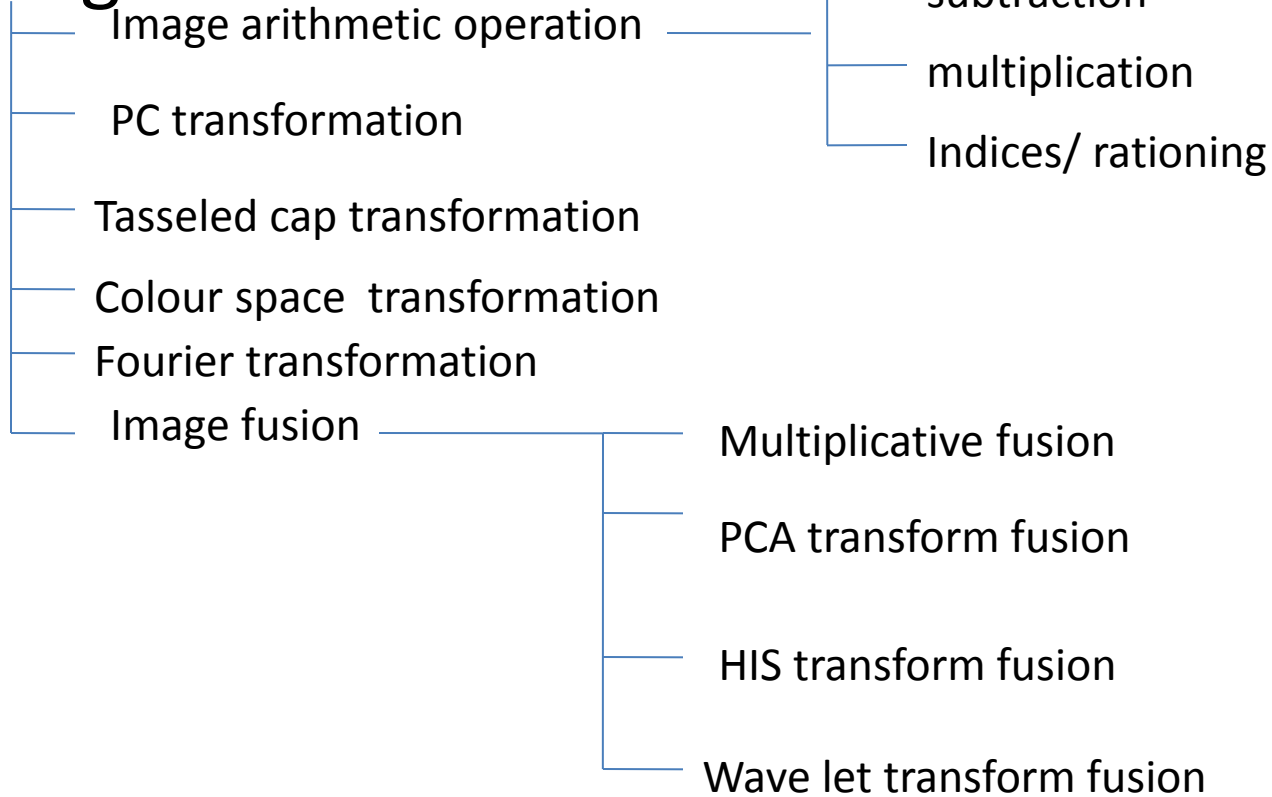


# Image Enhancement



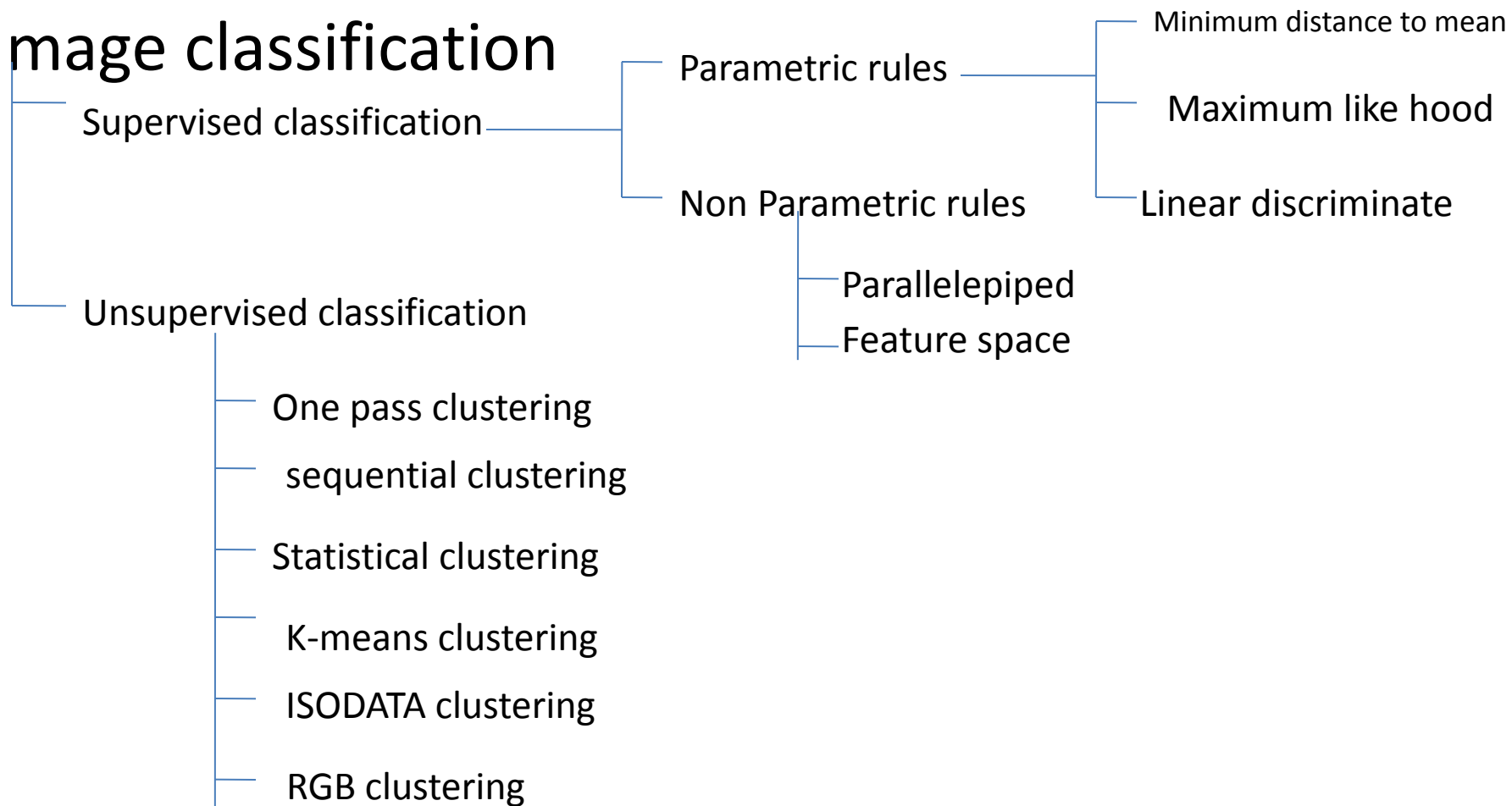
**Major image processing techniques continued.....**

# Image transformation



**Major image processing techniques continued.....**

# Image classification



# Image processing system

## **Hard ware**

- Main framed based
- Minicomputer based
- Microcomputer based

## **Peripherals**

- Input device-To enable analog-to-digital conversion
- Image out put devices-For displaying
- Printer-produce hard copy
- Image recording equipment-establish for data archives

# Software

- ERDAS Imagine
- PCI Geomatica
- TNT mips
- ENVI(Environment for Visualizing Images)
- GRASS
- ERIPS
- EMPIS
- ELAS
- GYPSY
- LINUS
- WINDOWS

# **Media for digital data recording ,storage and distribution**

- HDDT(High density digital tapes)
- Transferred to CCT/ Floppy disk-for distribution
- Magneto-optical disk with erasable function
- CD-ROM
- DVD

# Data formats of digital image

- Images are available in two forms photo graphic and digital form
- In 1982 common format LTWG(*Landsat Technical Working Group*)
- CEOS( Committee on earth observation satellite)
- GeoTIFF, HDF(*Hierarchical Data Format* )

## File interleaving formats

- 1. Band interleaved by pixel(BIP) A set of multiband data with respect to each pixel arranged spatially by the pixel number and line number**
- 2. Band interleaved by line(BIL) Line data are arranged in the order of band number and repeated with respect to line number**
- 3. Band sequential (BSQ) image data(pixel no and line no) of each band are separately arranged**

# Display of digital image

- VDU
- LCD
- CRT

## **ADVANTAGES OF DIP**

Low cost

Efficient computer hardware and software

Data storage

Easy to assess

Accuracy