

02:04

## Introduction to Image Segmentation

Segmentation is the process of **partitioning** a digital image into multiple regions and extracting the meaningful region which is known as **Region of Interest (ROI)**



03:03

## Introduction to Image Segmentation

Segmentation is the process of **partitioning** a digital image into multiple regions and extracting the meaningful region which is known as **Region of Interest (ROI)**

- ✓ ☐ Region of Interest (ROI) vary with applications
- ✓ ☐ In fact no single universal segmentation algorithm exists for segmenting the ROI in all images
- ✓ ☐ Therefore many segmentation algorithms need to apply and pick that algorithm which performs the best for given requirement



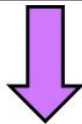
05:04

## Introduction to Image Segmentation

Image Segmentation Algorithms are based on:

✓ **Similarity Principle**  
(Region Approach)

✓ **Discontinuity Principle**  
(Boundary Approach)



Objective is to group pixels based on common property to extract a coherent region



05:37

06:35

## Introduction to Image Segmentation

### Definition of Image Segmentation

An image can be portioned into many regions  $R_1, R_2, R_3, \dots, R_n$

$R =$

$R_1$	$R_{21}$	$R_{22}$
	$R_{23}$	$R_{24}$

$R_3$  $R_4$ 

08:44

09:33

## Introduction to Image Segmentation

### Characteristics of Segmentation Process

Let  $R$  represent the entire image region and  
Segmentation is partitioning  $R$  into  $n$  subgroups  $R_i$



12:06

## Introduction to Image Segmentation

### Characteristics of Segmentation Process

Let **R** represent the entire image region and  
**Segmentation is partitioning R** into **n** subgroups  $R_i$

- ✓  $\square \bigcup_{i=1}^n R_i = R$   $i=1, 2, \dots, n$  Ⓜ
- ✓  $\square R_i$  should be connected region :  $i=1, 2, 3, \dots, n$
- ✓  $\square R_i \cap R_j = \emptyset$  (for all  $i$  and  $j$ ):  $i \neq j$
- $\square P(R_i) = TRUE$  for  $i = 1, 2, 3, \dots, n$



12:52

## Introduction to Image Segmentation

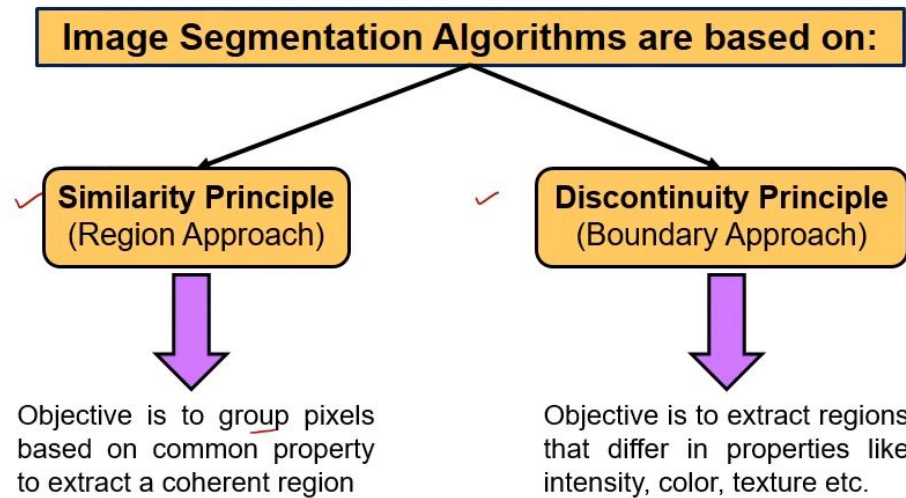
### Characteristics of Segmentation Process

Let **R** represent the entire image region and  
**Segmentation is partitioning R** into **n** subgroups  $R_i$

- ✓  $\square \bigcup_{i=1}^n R_i = R$   $i=1, 2, \dots, n$  Ⓜ
- ✓  $\square R_i$  should be connected region :  $i=1, 2, 3, \dots, n$
- ✓  $\square R_i \cap R_j = \emptyset$  (for all  $i$  and  $j$ ):  $i \neq j$
- ✓  $\square P(R_i) = TRUE$  for  $i = 1, 2, 3, \dots, n$
- $\square P(R_i \cup R_j) = FALSE$  for  $i \neq j$



# Introduction to Image Segmentation



13:13

# Introduction to Image Segmentation

## Characteristics of Segmentation Process

Let **R** represent the entire image region and **Segmentation is partitioning R** into  $n$  subgroups  $R_i$

- ✓  $\square \bigcup_{i=1}^n R_i = R$   $i=1, 2, \dots, n$   $\textcircled{R}$
- ✓  $\square R_i$  should be connected region  $i=1, 2, 3, \dots, n$
- ✓  $\square R_i \cap R_j = \emptyset$  (for all  $i$  and  $j$ ):  $i \neq j$
- ✓  $\square P(R_i) = \text{TRUE}$  for  $i = 1, 2, 3, \dots, n$
- ✓  $\square P(R_i \cup R_j) = \text{FALSE}$  for  $i \neq j$

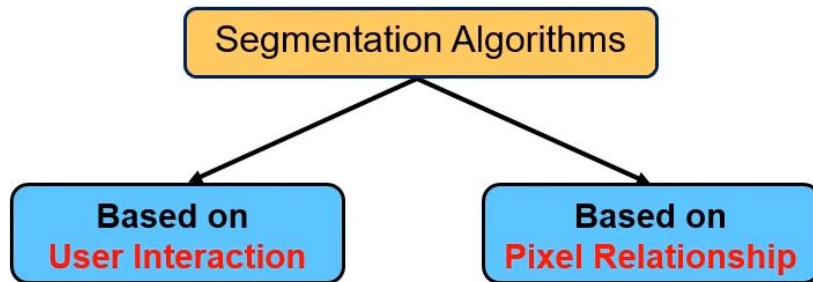
Here  $P(R_i)$  is a predicate that indicates some property over the region



13:51

# Introduction to Image Segmentation

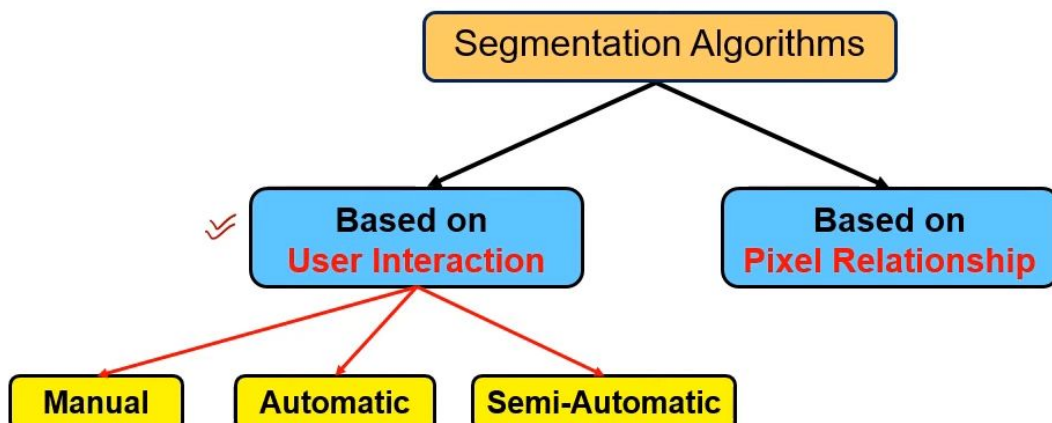
## Classification of Image Segmentation Algorithms



14:50

# Introduction to Image Segmentation

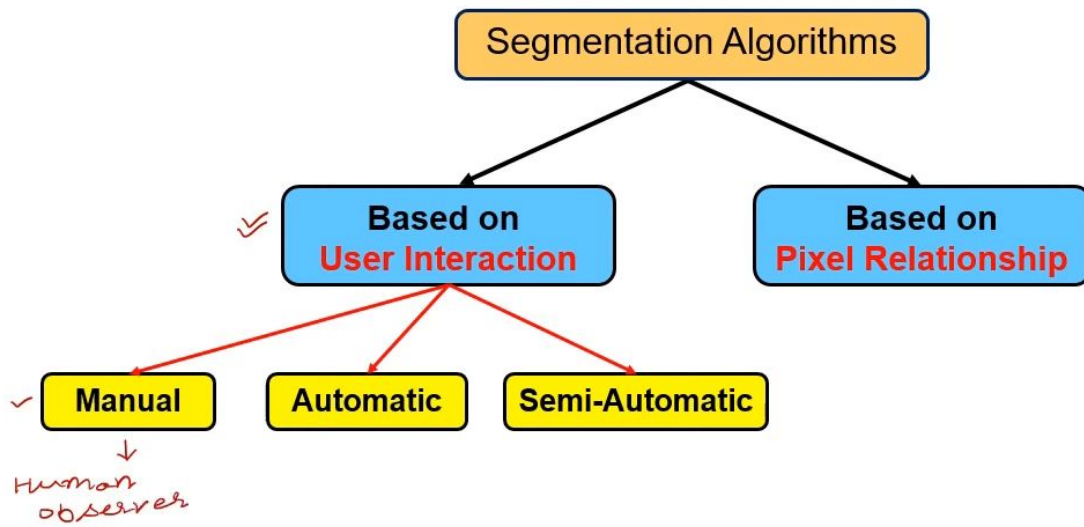
## Classification of Image Segmentation Algorithms



15:47

# Introduction to Image Segmentation

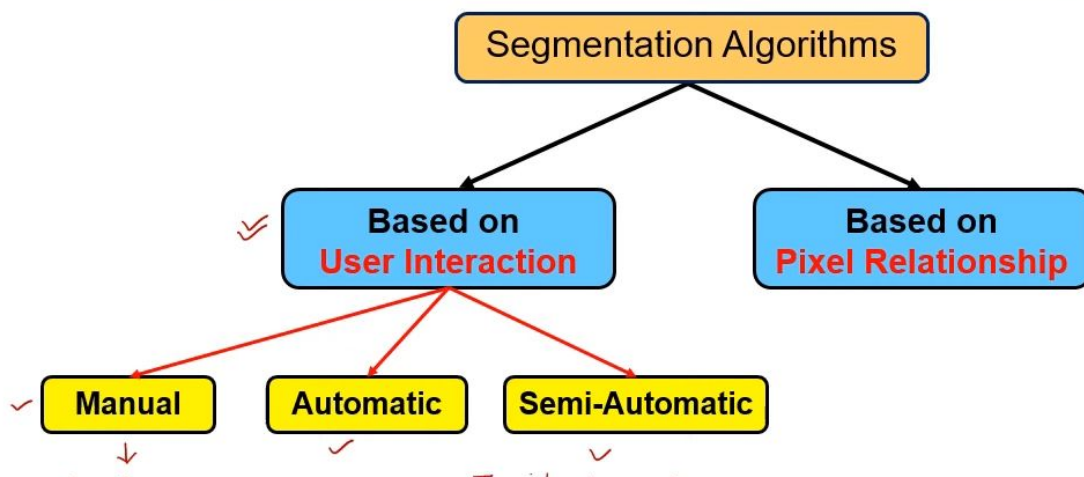
## Classification of Image Segmentation Algorithms



18:31

# Introduction to Image Segmentation

## Classification of Image Segmentation Algorithms



human  
observer

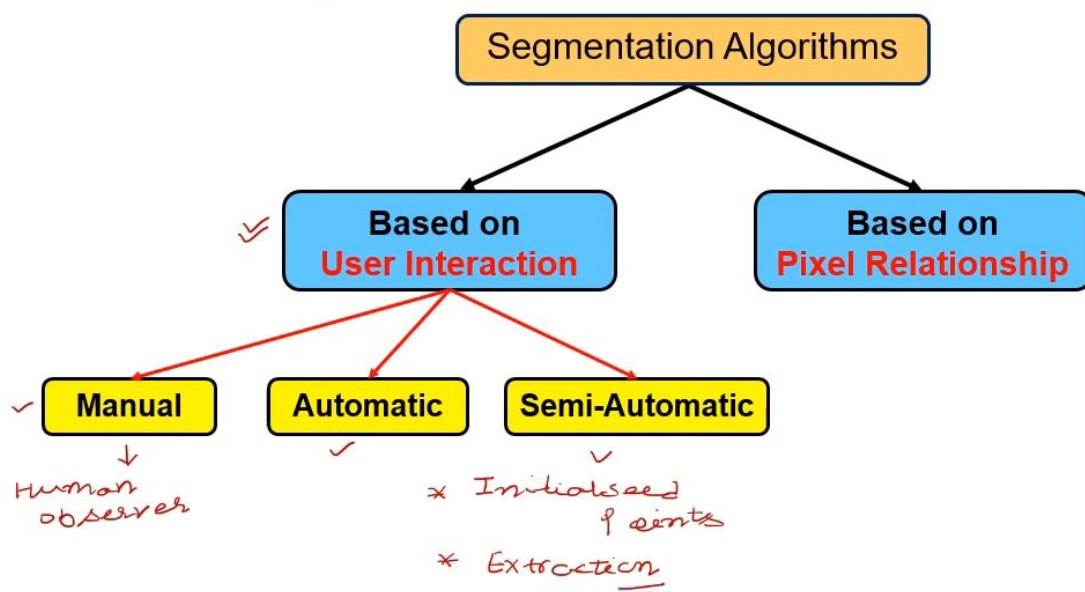
\* Initialised  
points



18:43

## Introduction to Image Segmentation

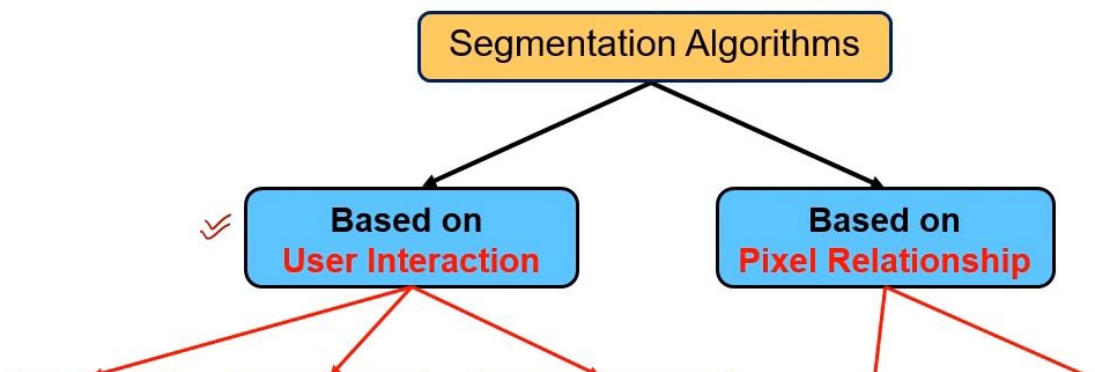
### Classification of Image Segmentation Algorithms



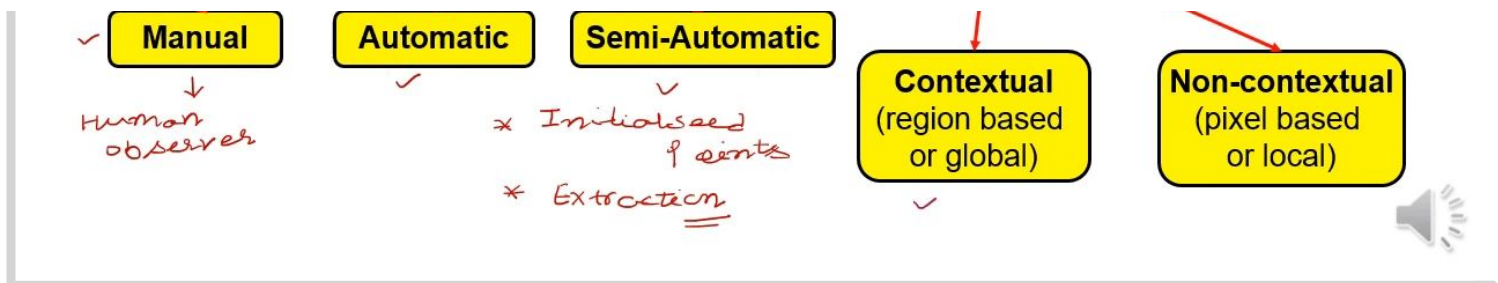
19:02

## Introduction to Image Segmentation

### Classification of Image Segmentation Algorithms

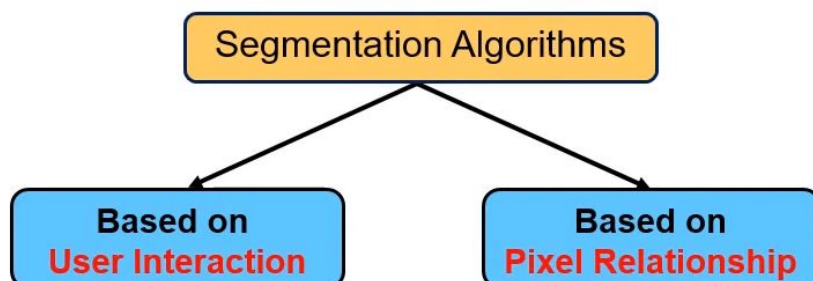






## Introduction to Image Segmentation

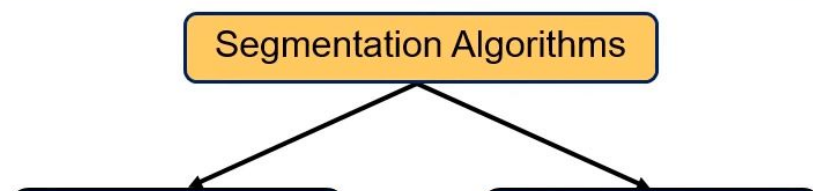
### Classification of Image Segmentation Algorithms

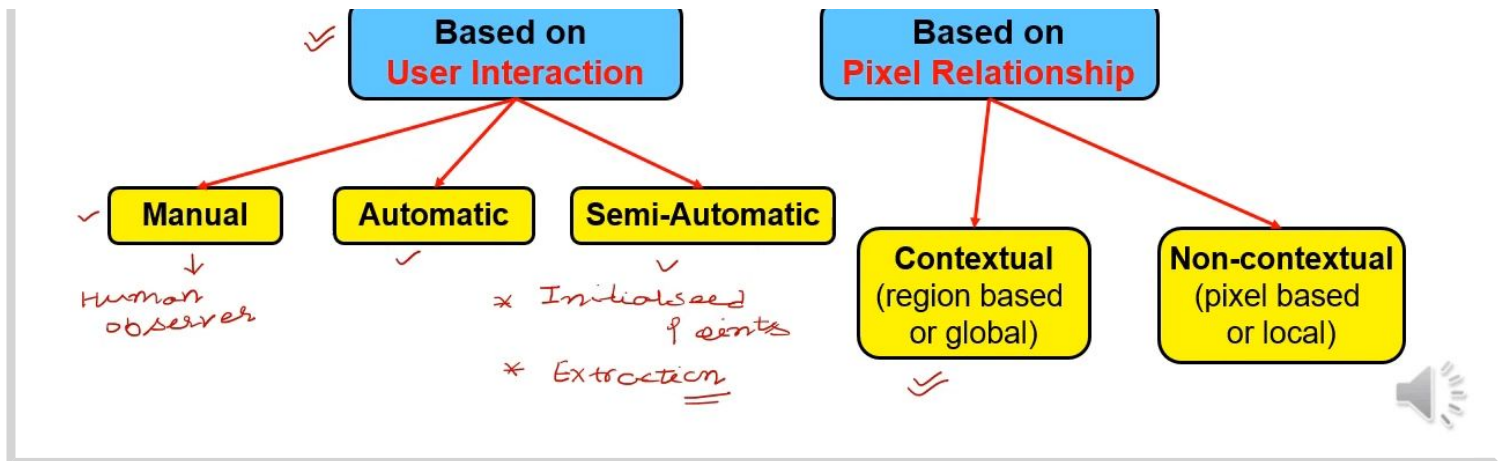


19:15

## Introduction to Image Segmentation

### Classification of Image Segmentation Algorithms





## Introduction to Image Segmentation

### Classification of Image Segmentation Algorithms

#### Segmentation Algorithms

