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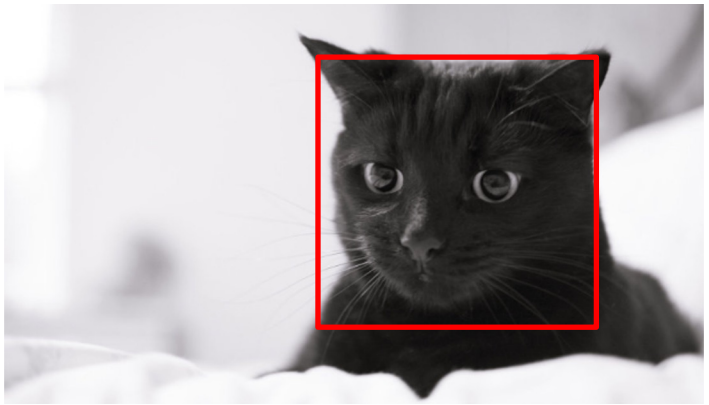
Education

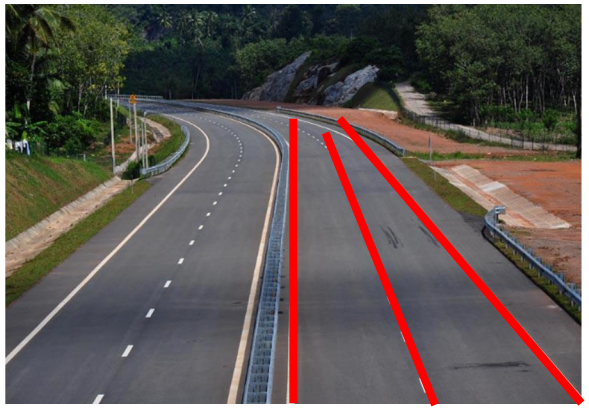
# What is Computer Vision?

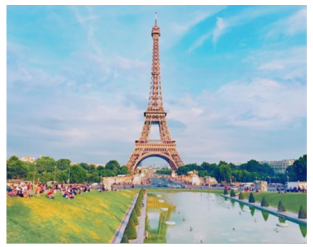
Sung Soo Hwang

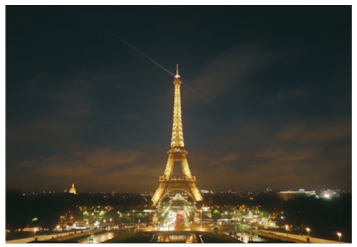
# What is Computer Vision?

- What is computer vision?
  - It is a research field that deals with how computers can understand digital images or videos
  - It seeks to automate tasks that the human vision system can do



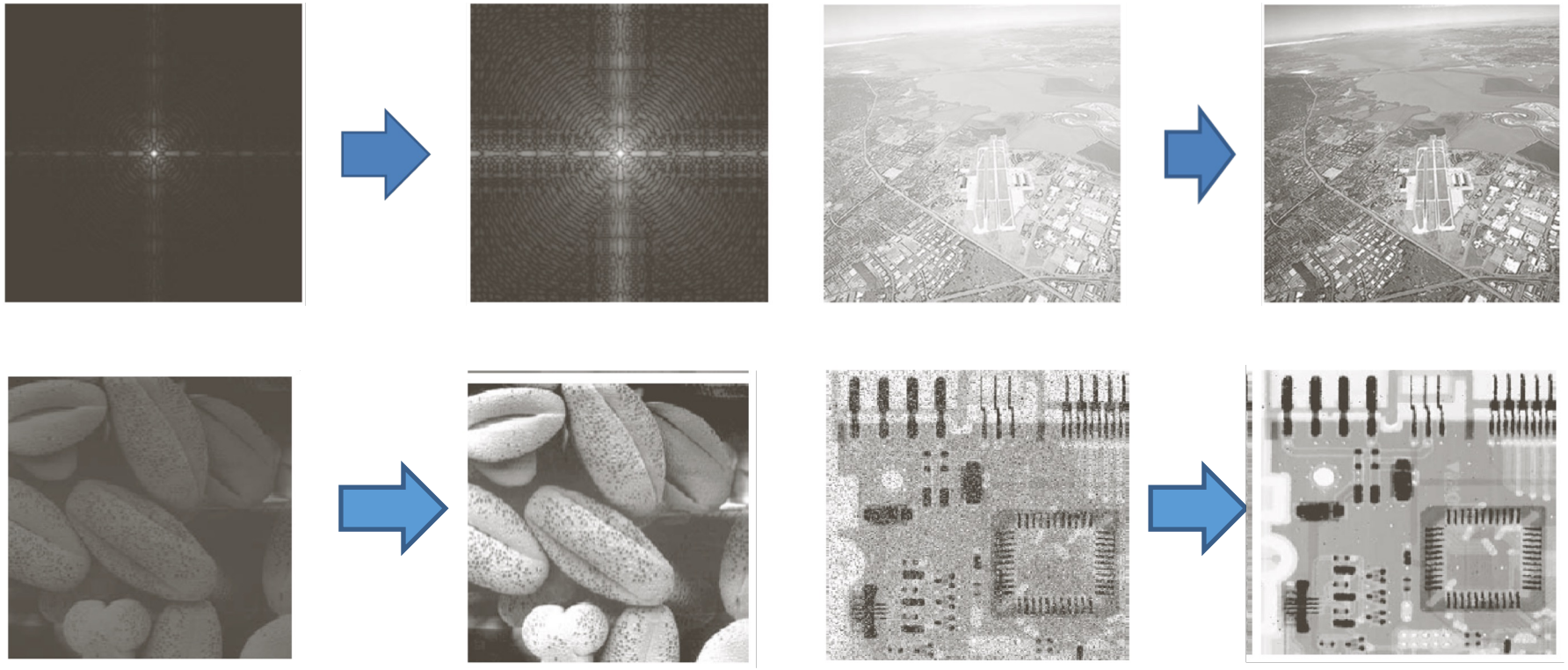






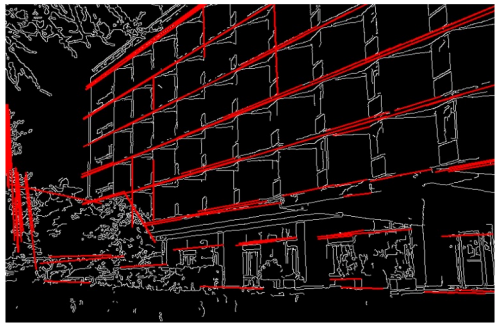
# What is Computer Vision?

- In this class, we will learn...
  - preprocessing



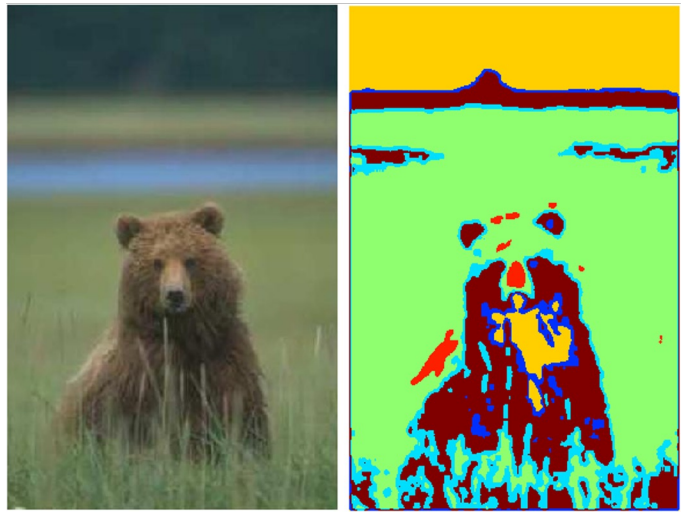
# What is Computer Vision?

- In this class, we will learn...
  - Edge extraction/Line detection



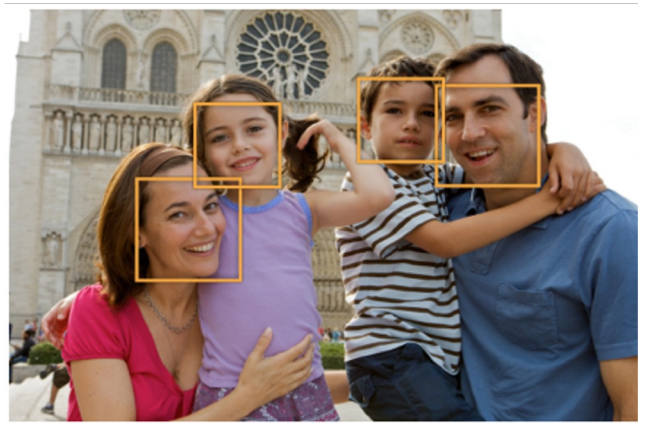
# What is Computer Vision?

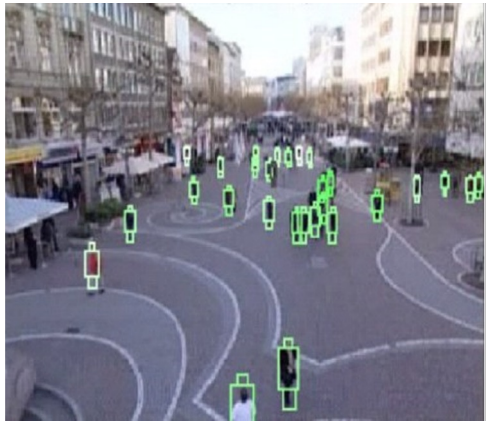
- In this class, we will learn...
  - Image/Video segmentation

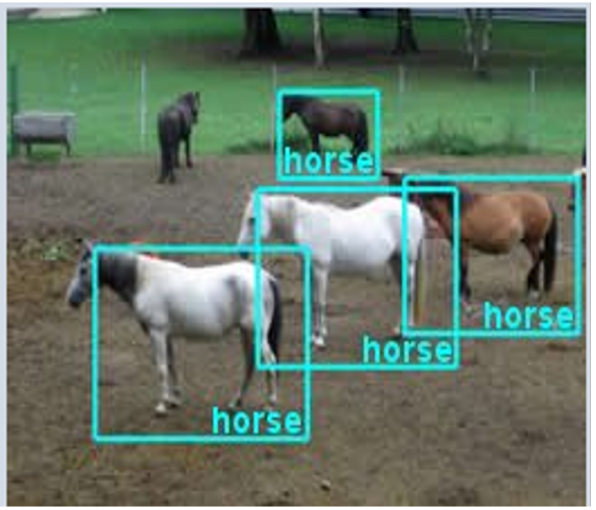


# What is Computer Vision?

- In this class, we will learn...
  - Object Detection/Tracking

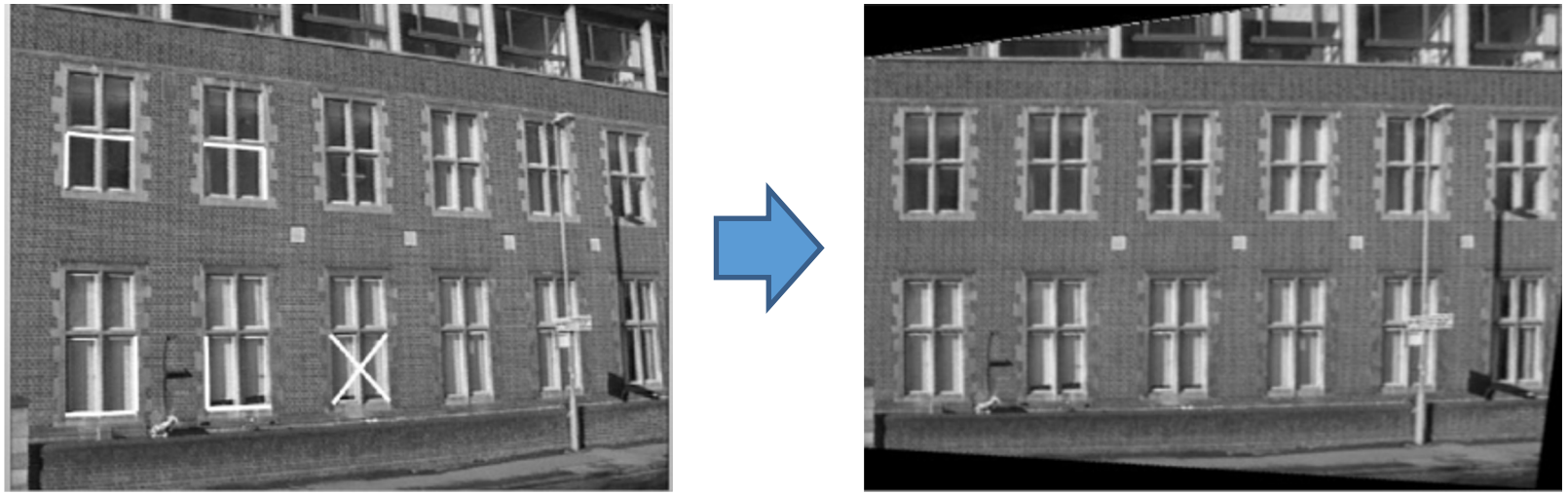




# What is Computer Vision?

- In this class, we will learn...
  - Image Transformation



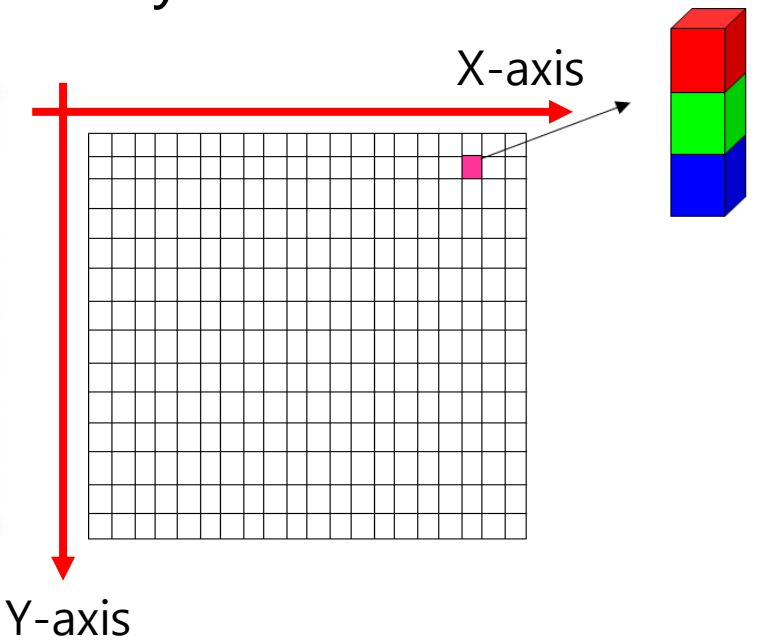
# Pixel, FPS, Intensity Level, Resolution

Sung Soo Hwang

# Basics of a Digital Image/Video

- Every digital image is made up of pixels
  - Pixel means picture element
  - Pixels are the smallest unit of information that make up a picture
  - Each pixel may have multiple values
  - The location of a pixel is represented by 2D coordinates

https://www.ultimate-photo-tips.com/what-is-a-pixel.html



# Basics of a Digital Image/Video

- A digital video is made up of images
  - Images are taken with very short interval
    - Normally 33ms
- Frame rate
  - The number of images(frames) of a video per second

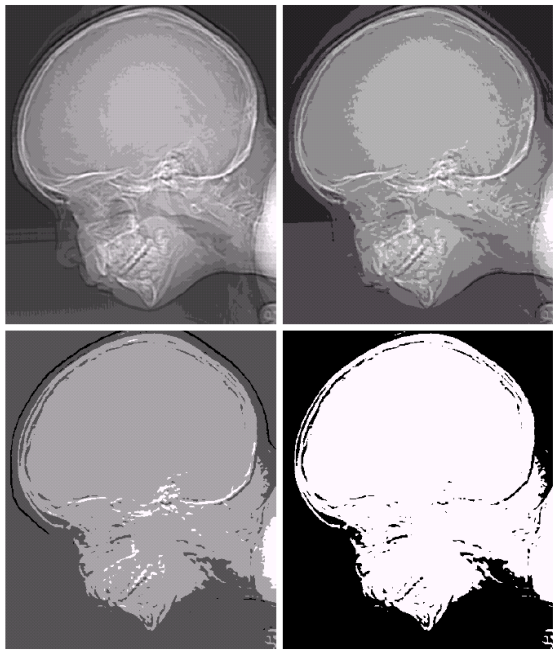
Low frame rate

High frame rate

https://www.mediacollege.com/video/frame-rate/

# Basic of a Digital Image/Video

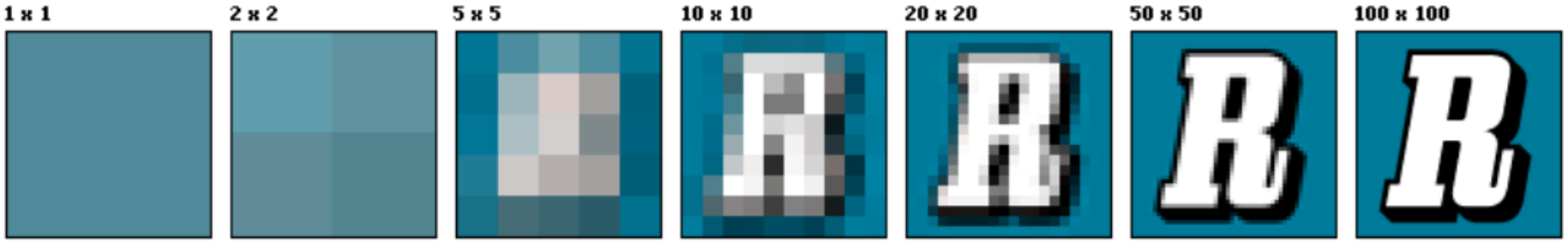
- Intensity level
  - Intensity level is typically an integer power of 2 ➔ $L = 2^k$
  - The continuous range of light intensity is quantized to L gray levels
  - Normally L=256



Images with different intensity levels(16,8,4,2)

# Basic of a Digital Image/Video

- Pixel resolution
  - The number of pixels in an image




| | |
|---|---|
| VGA | 640X480 |
| HD | 1280X720➔1k |
| FHD | 1920X1080➔2k |
| QHD | 2560X1440 |
| UHD | 3840X2160➔4k |

# Basics of a Digital Image/Video

- Total number of bits to store a digital image
  - M : the number of rows(height)
  - N : the number of columns(width)
  - k : the number of bits

➔ $b = M \times N \times k$

# Basics of a Digital Image/Video

- Assume that you have a video that is
  - Intensity level: 256
  - Color video
  - FHD pixel resolution
  - 1 Hour
  - 30 fps
  - What is the total amount of bits?

➔ 8bits/color X 3colors/pixel X (1920X1080 pixels)/frame X30 frames/second X 3600 seconds/hour = 5,374,771,200,000 bits = 625.70 GB