Computer Vision & Pattern Recognition

Introduction

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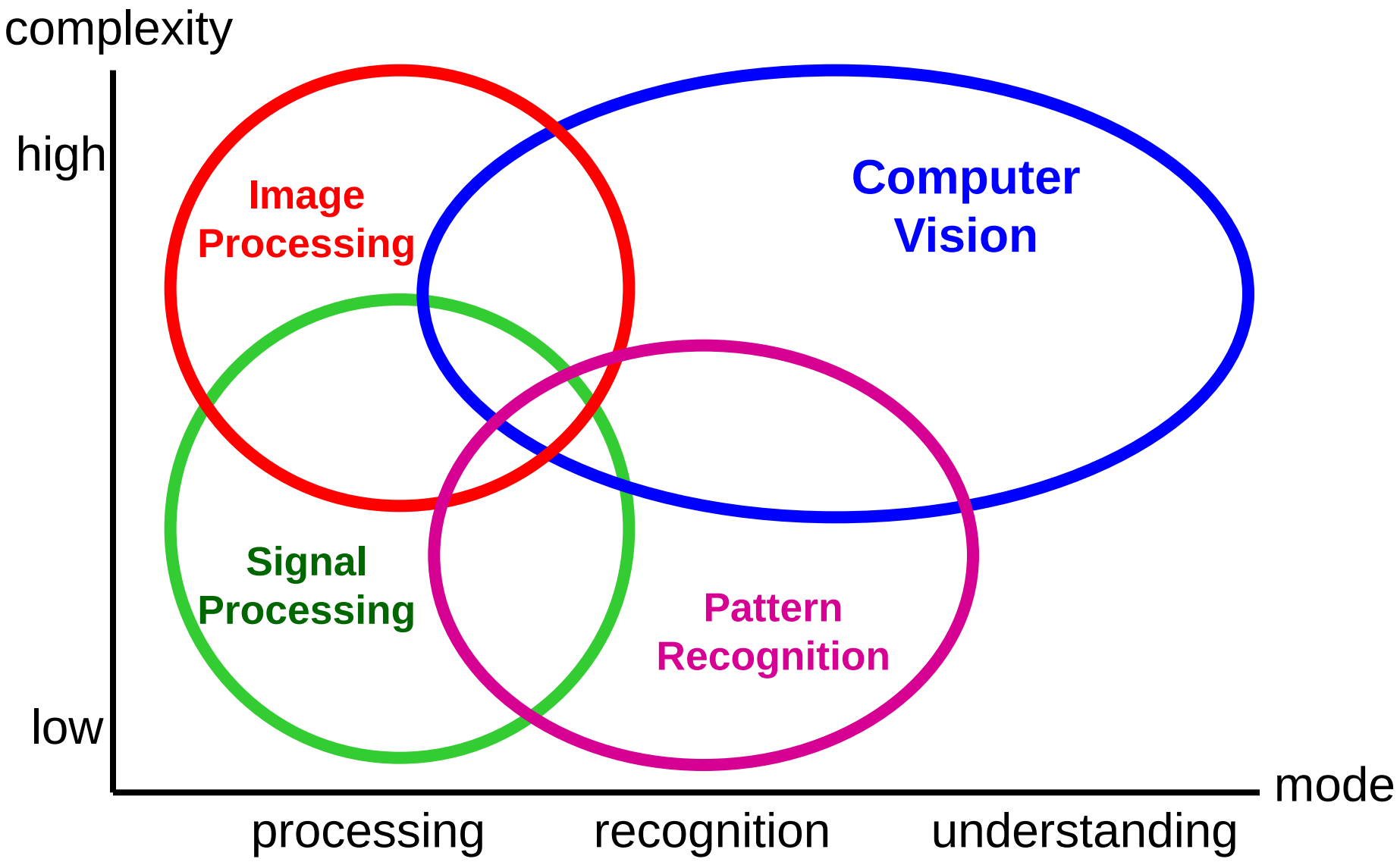
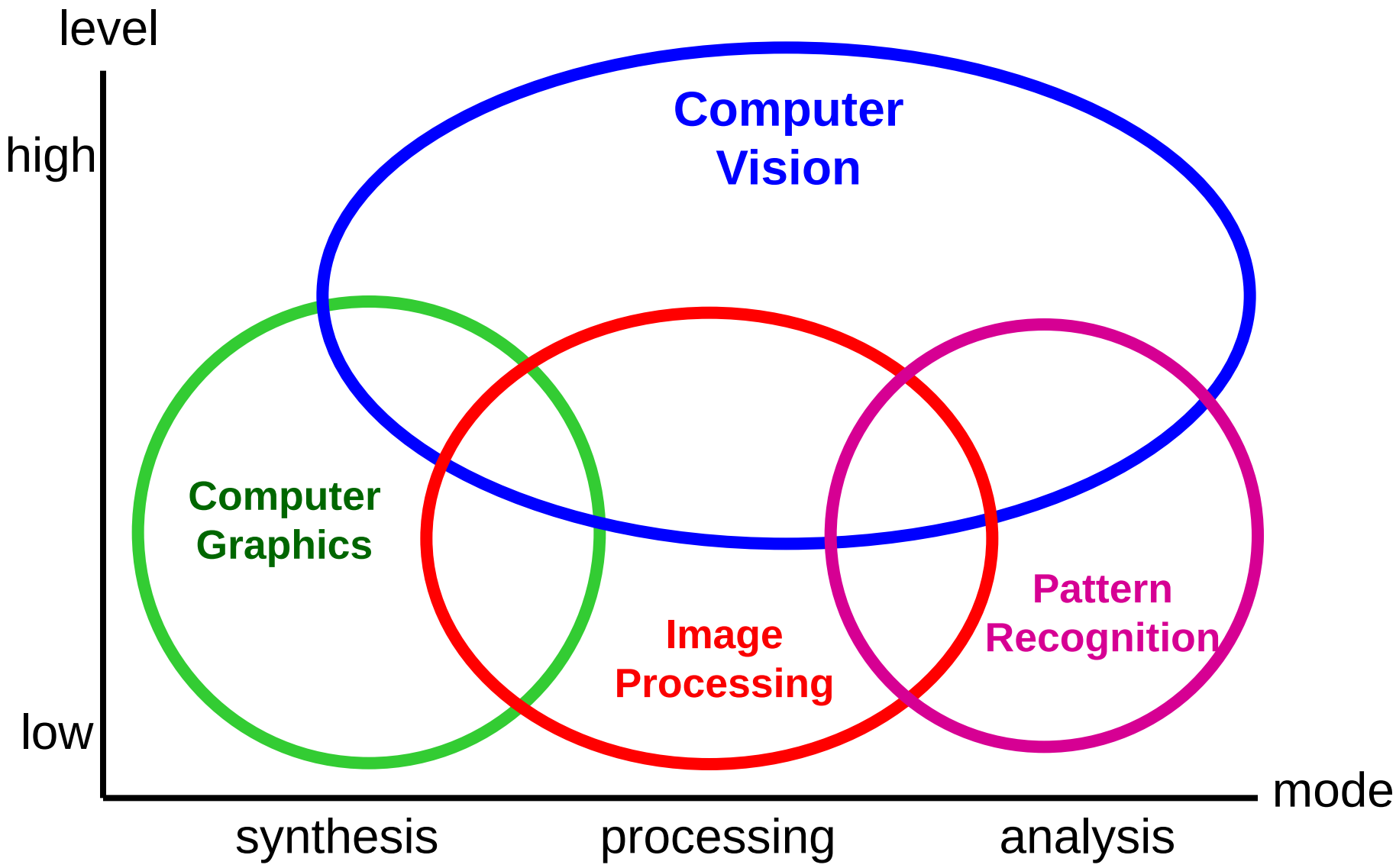
What is CVPR?


complexity
high
low
Image Processing
Computer Vision
Signal Processing
Pattern Recognition
mode
processing
recognition
understanding

What is CVPR?

Area	Input	Function	Output
Signal Processing	Temporal signal	Processing	Processed signal
Image Processing	Images	Processing	Images
Pattern Recognition	Many forms	Classification	Pattern categories
Computer Vision	Images	Analysis	Image contents

What is CVPR?


level
high
low
Computer Vision
Computer Graphics
Image Processing
Pattern Recognition
mode
synthesis
processing
analysis

What is CVPR?

Area	Input	Function	Output
Computer Graphics	2D/3D models	Synthesis	Rendered models
Image Processing	Images	Processing	Images
Pattern Recognition	Many forms	Classification	Pattern categories
Computer Vision	Images	Analysis	Image contents

CV Example: Image Mosaicking

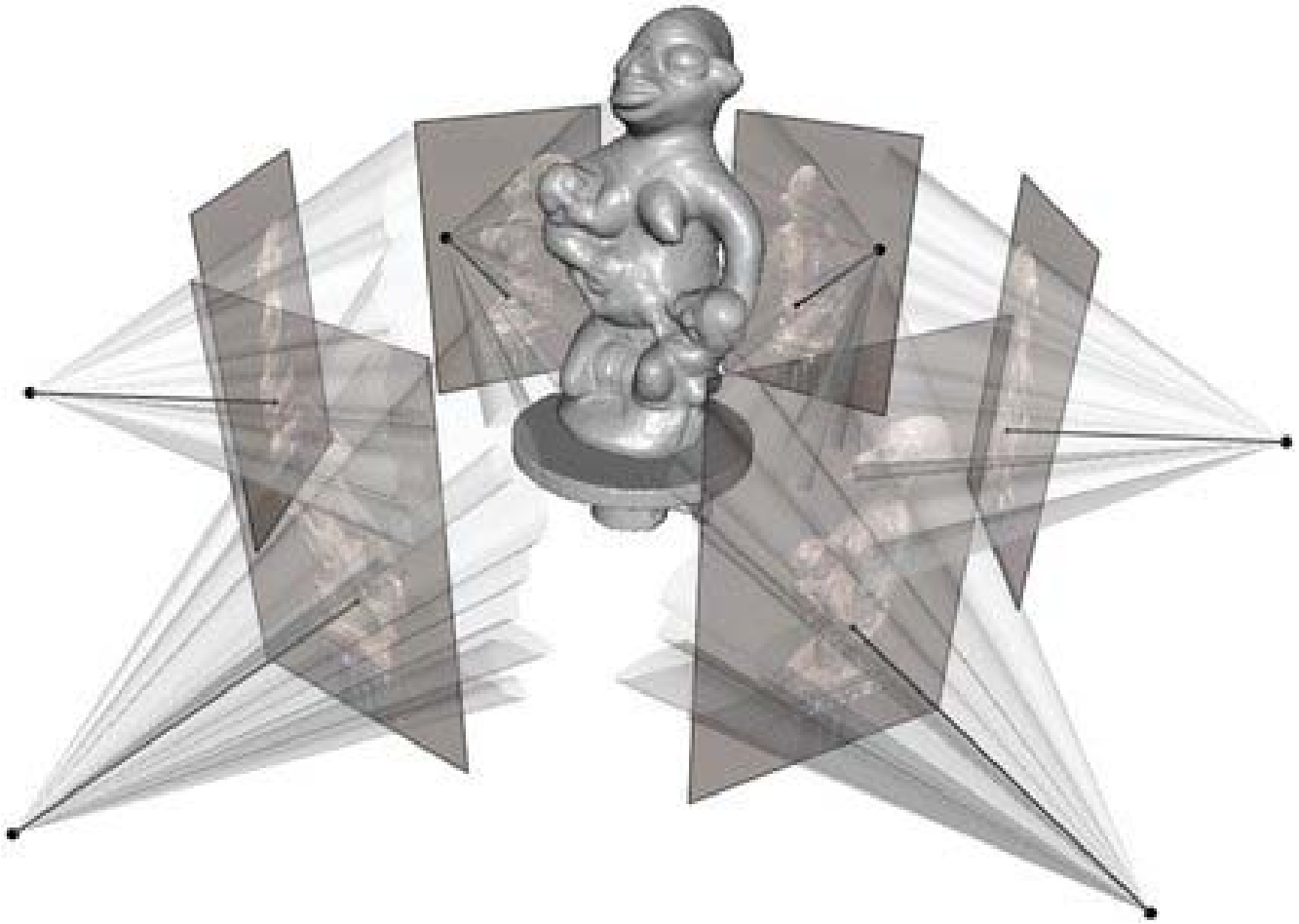
- Combine images into a large image.

CV Example: Vehicle Tracking

- Track vehicles on the road.

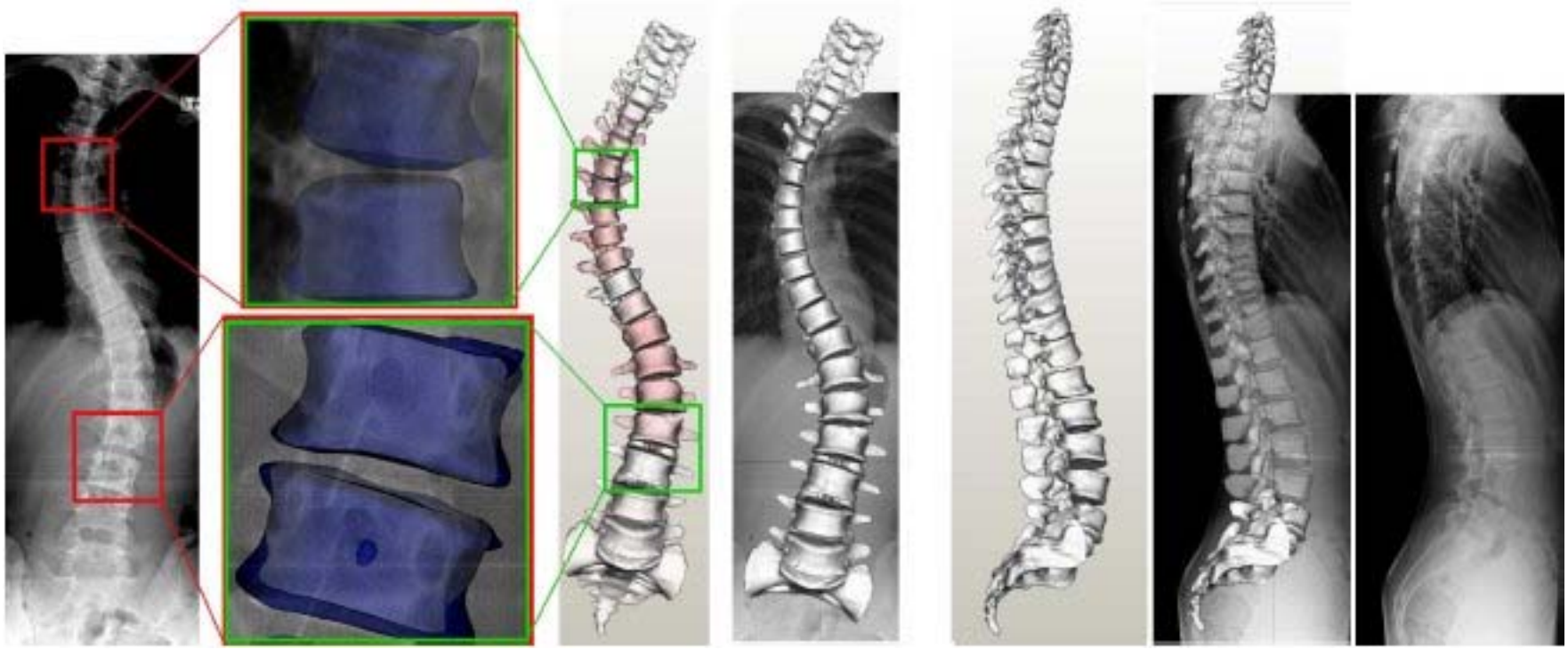
CV Example: 3D Reconstruction

- Reconstruct 3D object model from multiple views.



CV Example: 3D Reconstruction

- Reconstruct 3D object model from x-ray images.



input frontal view side view

CV Example: 3D Motion Capture

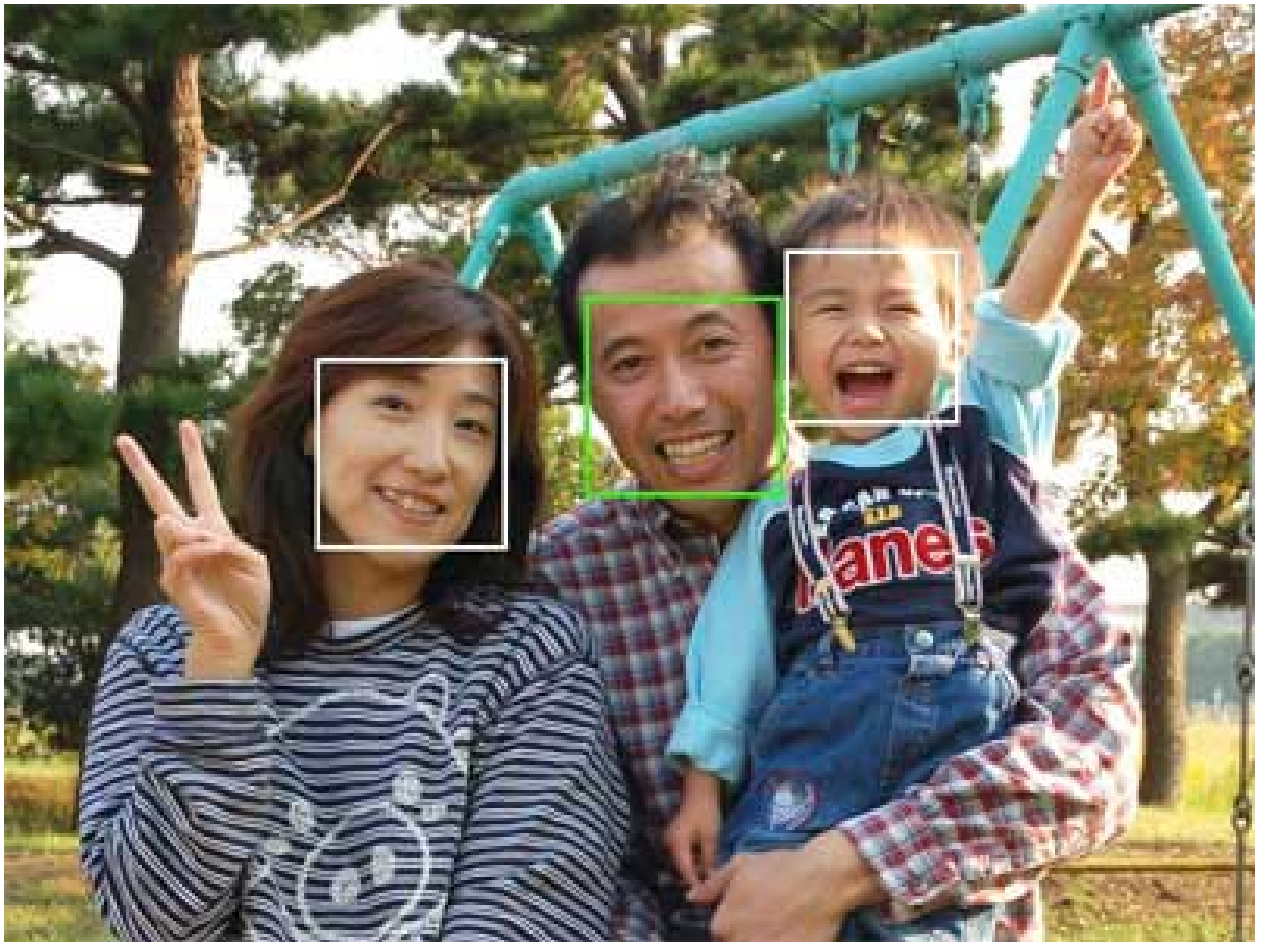
- Capture 3D motion of actor with multiple cameras.

CV Example: Image Understanding

- Input: image
- Output: description of image content, relationships, characteristics, etc.

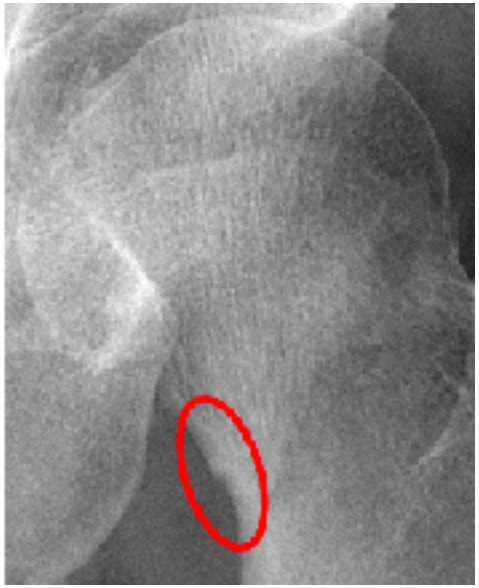
CVPR Example: Face Detection

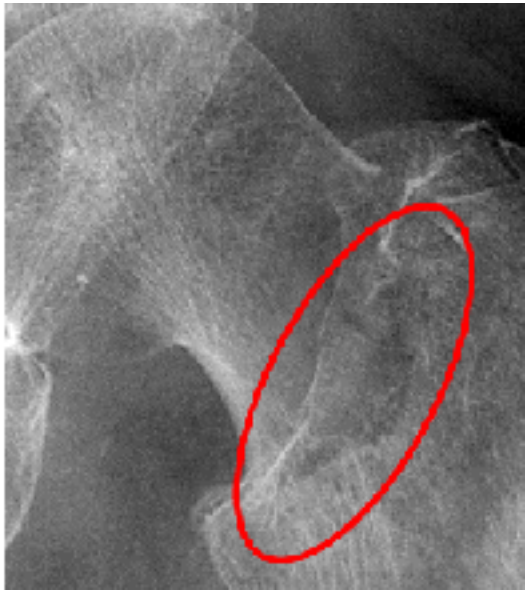
- Many cameras have this feature
  - Canon
  - Nikon
  - Fujifilm
  - Sony
  - Panasonic
  - etc.

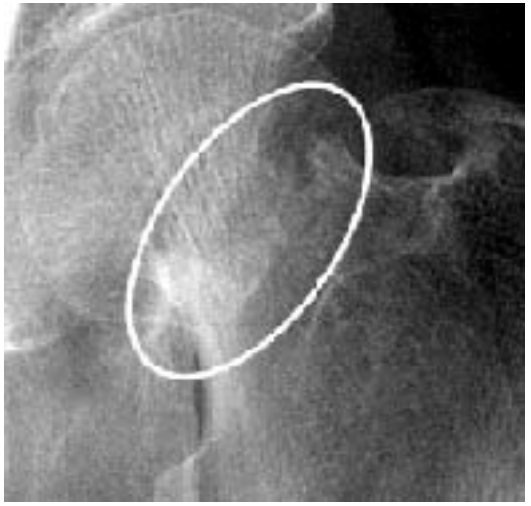


CVPR Example: Fracture Detection

- Can also apply to medical images.
- Detect fractures of femurs in x-ray images.

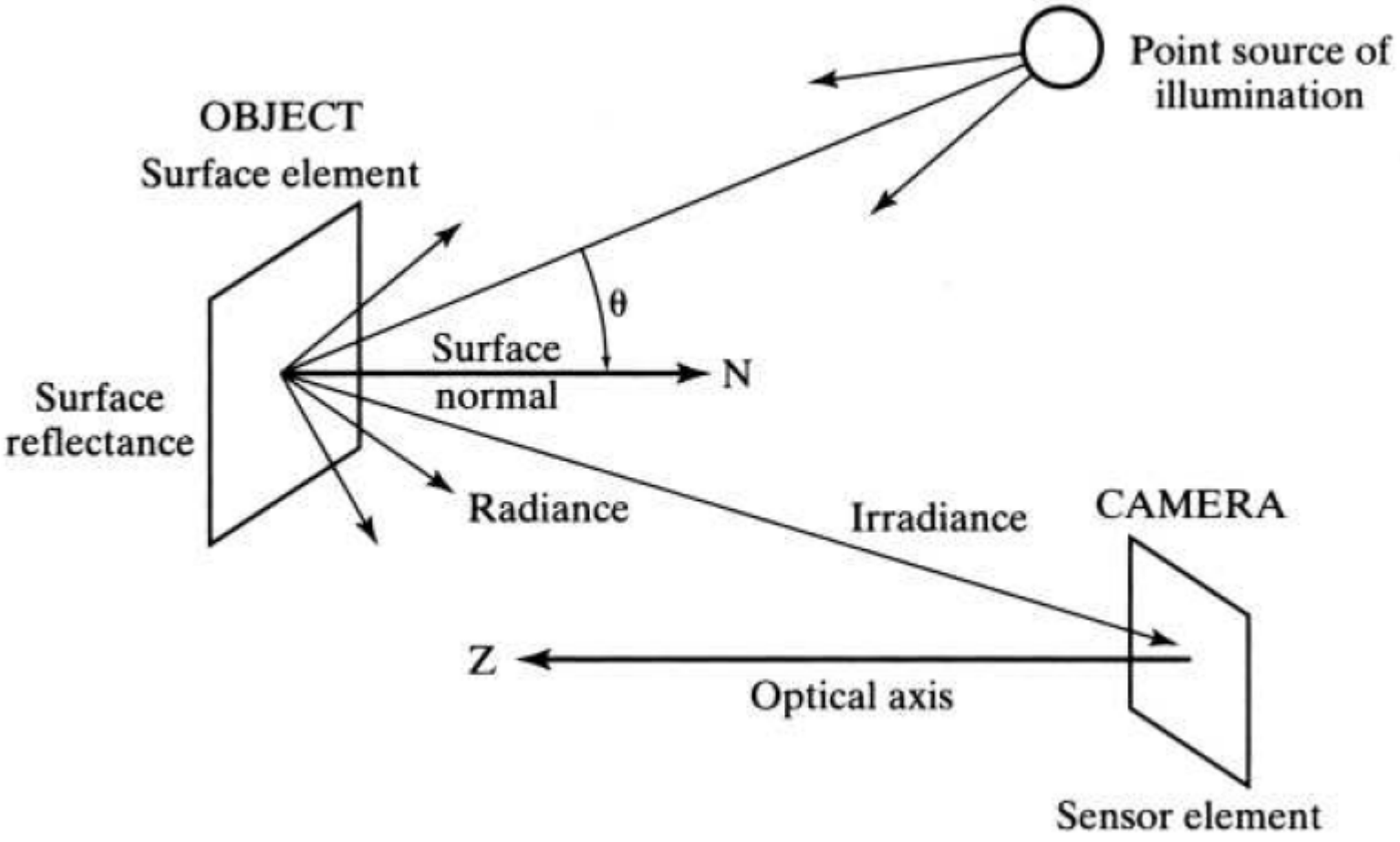






Imaging

- Object reflects light, camera capture light.



Imaging

- Camera encodes image as pixels of intensity or color.

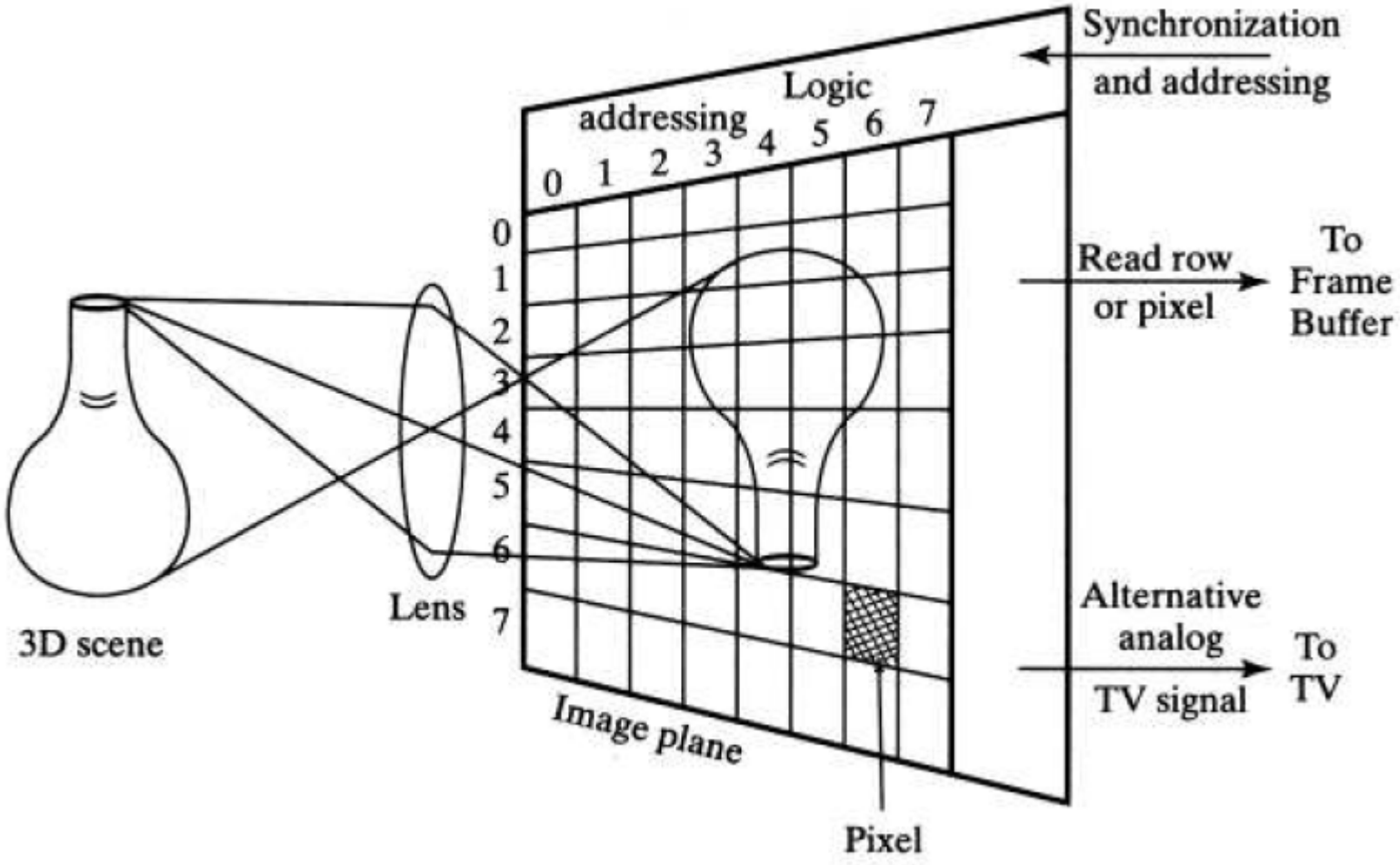
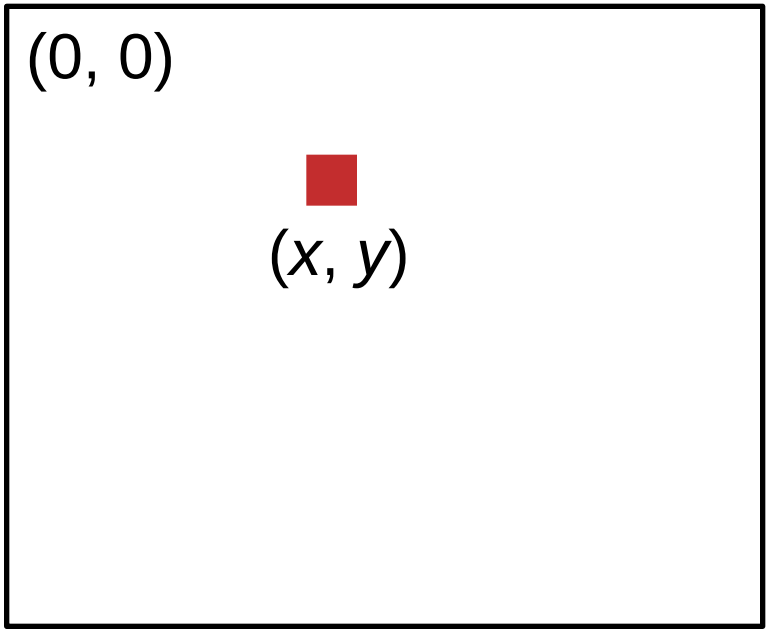


Image Representation

- Image is typically denoted as $I(x, y)$.
- Digital image:
  - x, y: integer values denoting column and row.
  - Gray-scale image
    - I: integer-valued intensity, typically 0 to 255.
  - Color image
    - I has three components, e.g., R, G, B.
- Mathematical image:
  - x, y, I are real-valued.



Further Readings

- Computer Vision in Wikipedia
  - en.wikipedia.org/wiki/Computer_vision
- Color spaces
  - en.wikipedia.org/wiki/Color_space