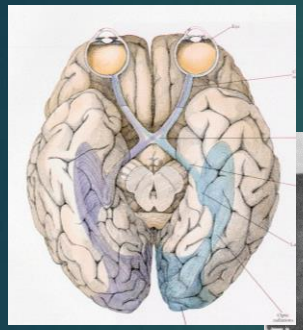
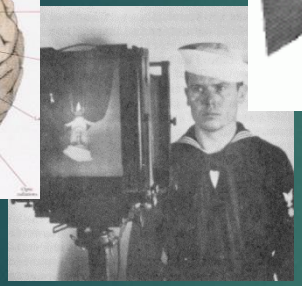
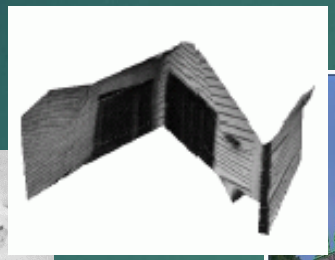
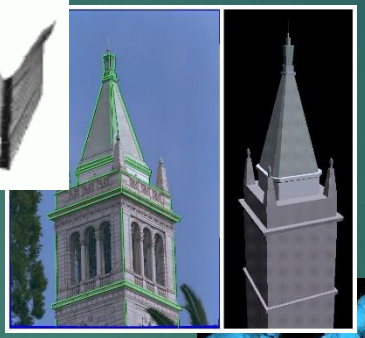
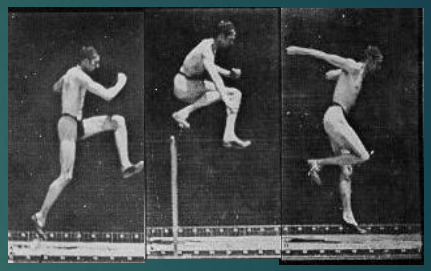
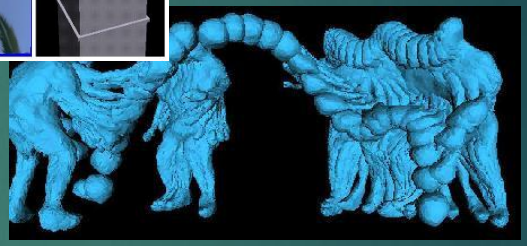
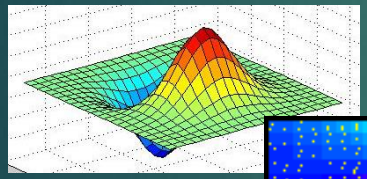
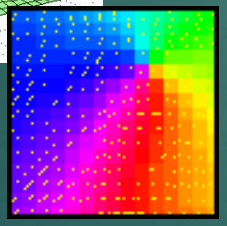
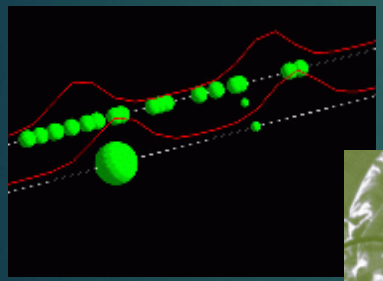
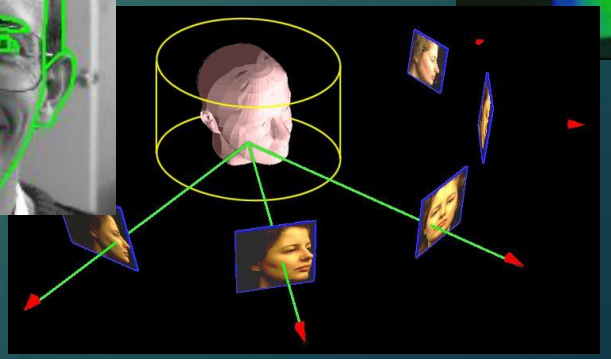
CS 231: Computer Vision





Slide credit: Princeton Univ,

What is Computer Vision?

- *Input: images or video*
- *Output: description of the world*

What is Computer Vision?

- *Input: images or video*
- *Output: description of the world*
  - *Many levels of description*

Low-Level or "Early" Vision

- *Considers local properties of an image*

"There's an edge!"

Mid-Level Vision

- *Grouping and segmentation*

"There's an object and a background!"

High-Level Vision

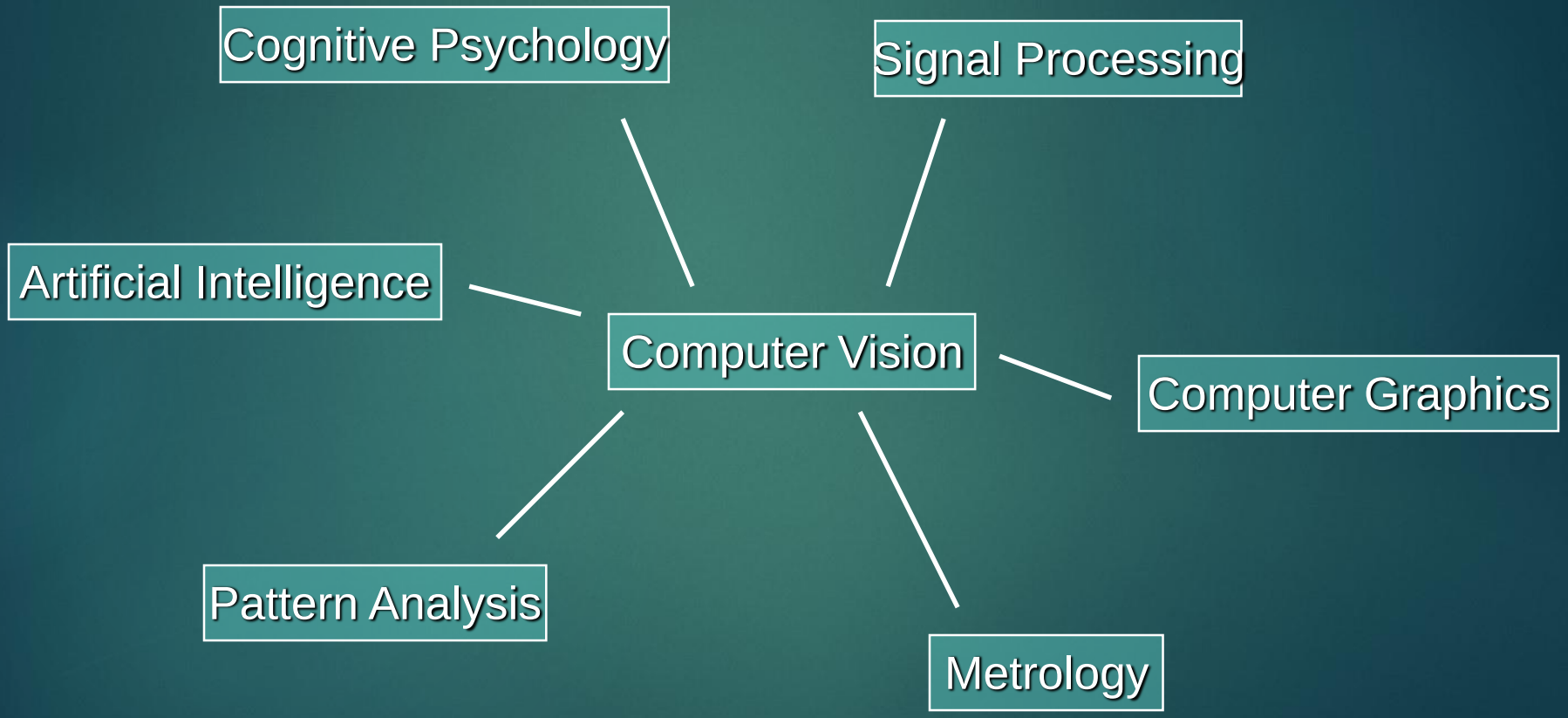
- *Recognition*

"It's a chair!"

Big Question #1: Who Cares?

- *Applications of computer vision*
  - *In AI: vision serves as the "input stage"*
  - *In medicine: understanding human vision*
  - *In engineering: model extraction*

Vision and Other Fields



Big Question #2: Does It Work?

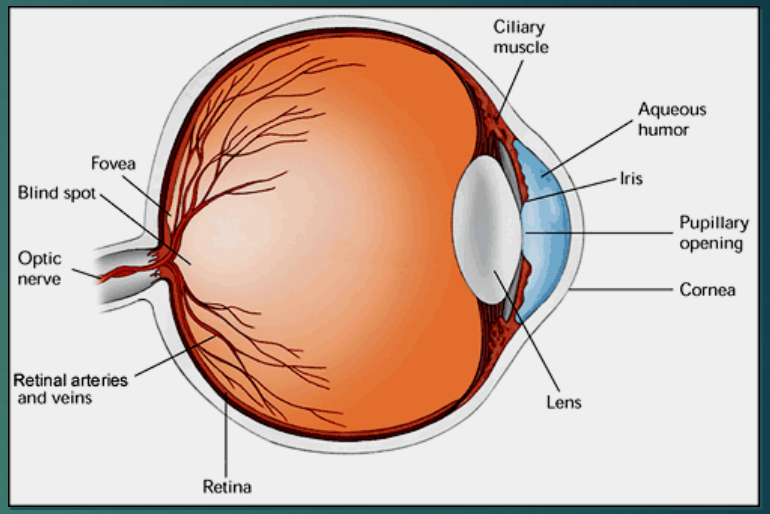
- *Situation much the same as AI:*
  - *Some fundamental algorithms*
  - *Large collection of hacks / heuristics*
- *Vision is hard!*
  - *Especially at high level, physiology unknown*
  - *Requires integrating many different methods*
  - *Requires reasoning and understanding: "AI completeness"*

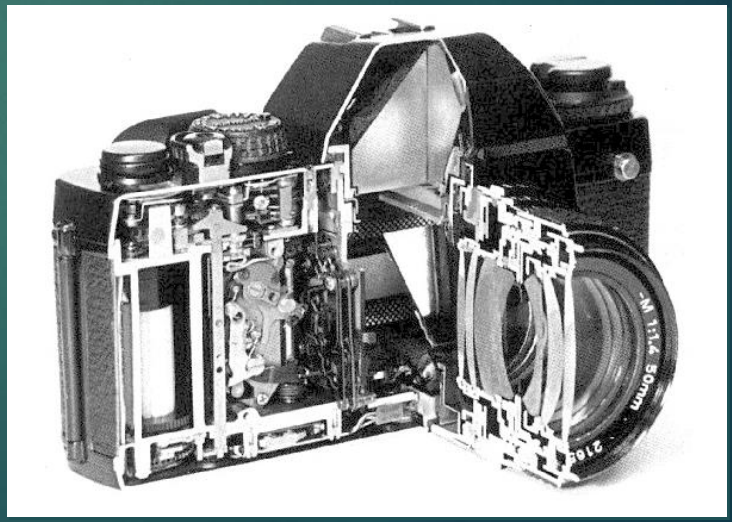
Computer and Human Vision

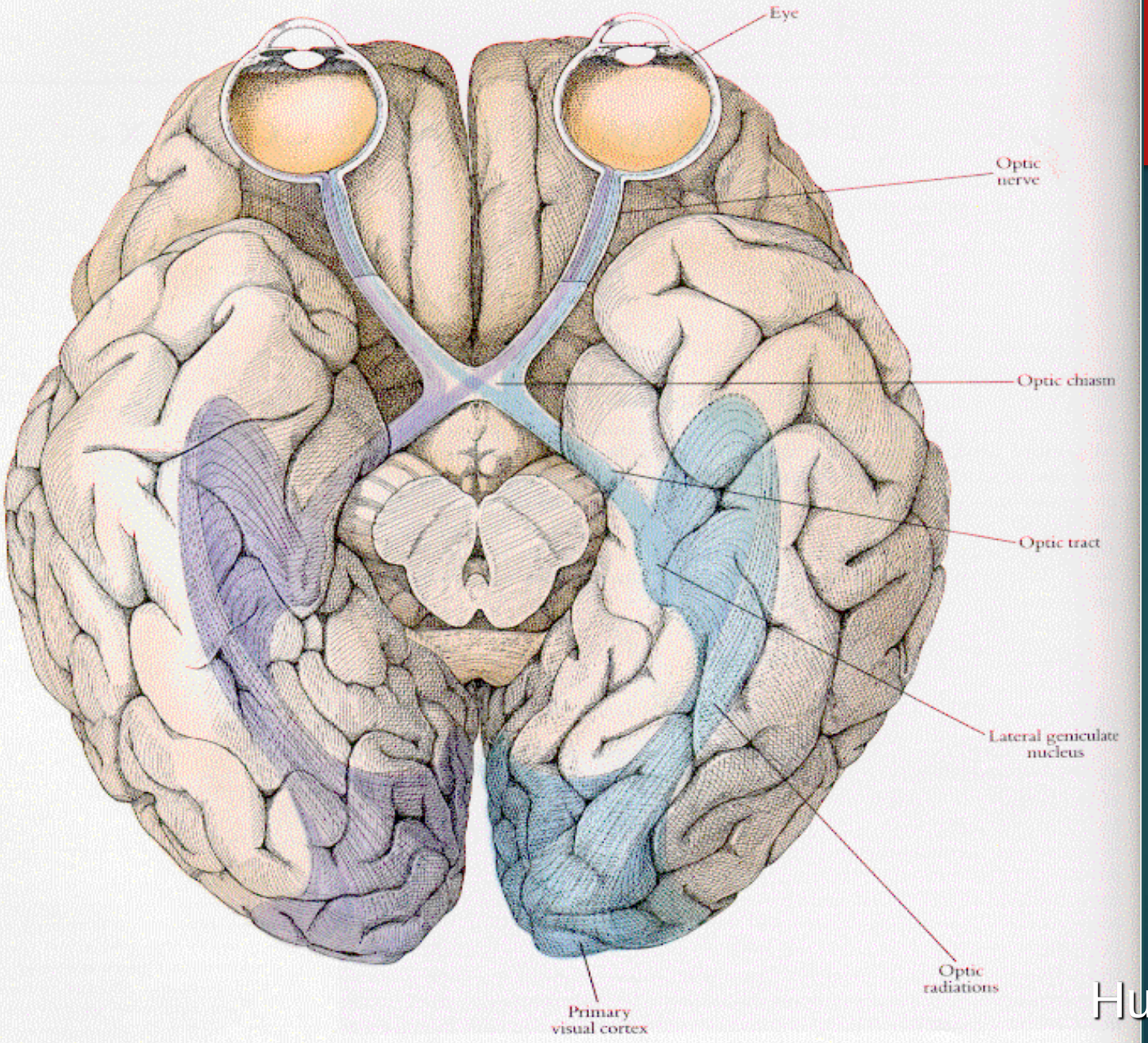
- *Emulating effects of human vision*
- *Understanding physiology of human vision*

Image Formation

- *Human: lens forms image on retina, sensors (rods and cones) respond to light*
- *Computer: lens system forms image, sensors (CCD, CMOS) respond to light*






Eye
Optic nerve
Optic chiasm
Optic tract
Lateral geniculate nucleus
Optic radiations
Primary visual cortex

Hubel

Real-world Applications

Osuna et al:

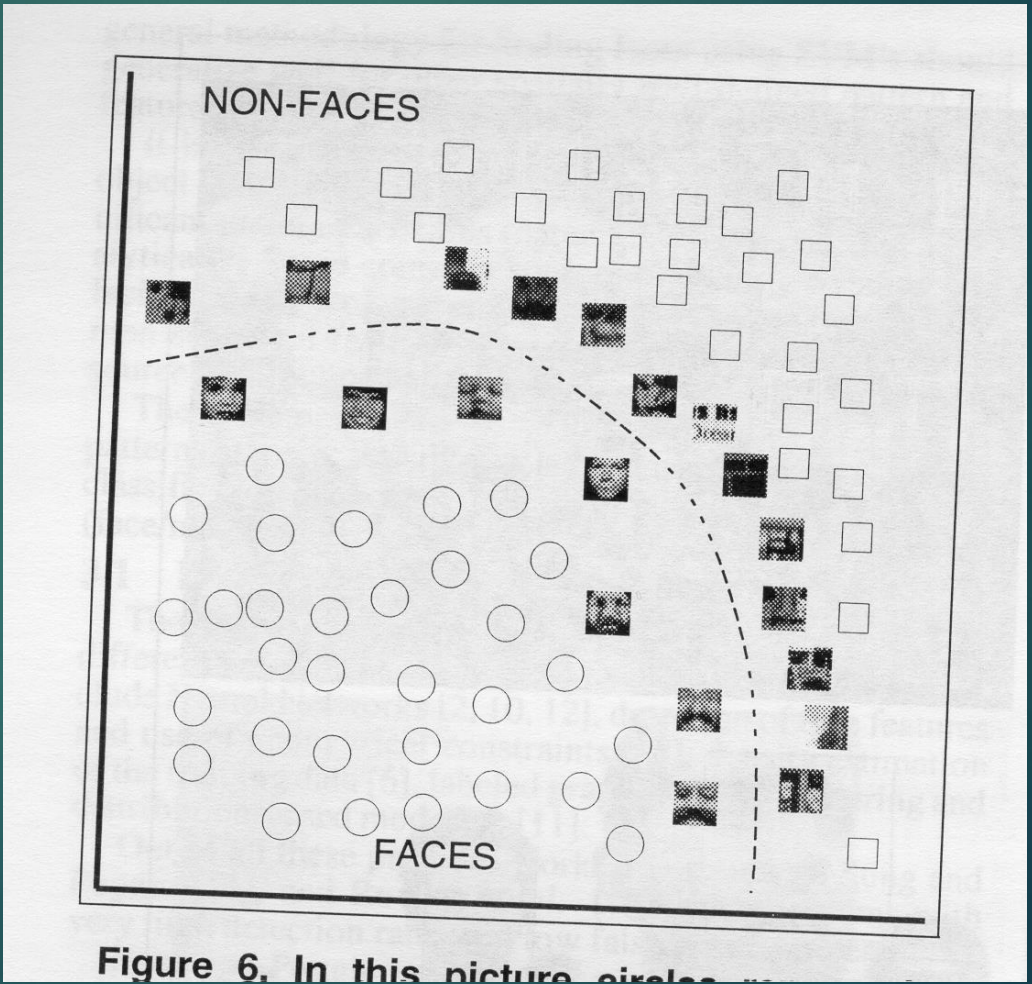


Figure 6. In this picture circles

Real-world Applications

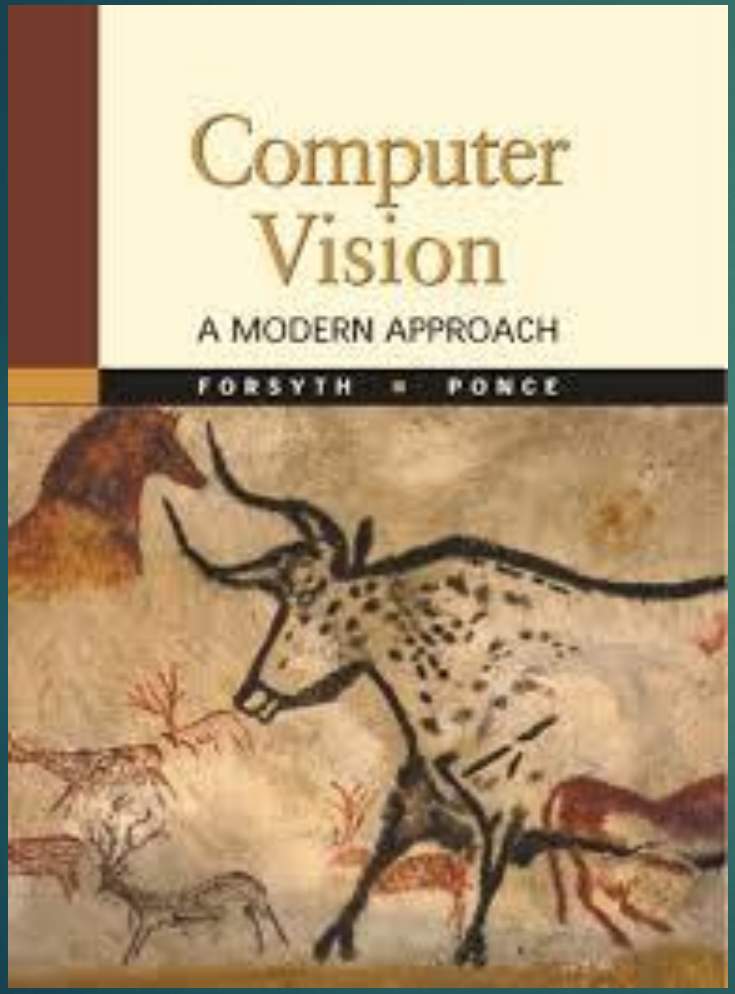
Osuna et al:

Figure 5. Results from our Face Detection system

Outline

- *Image formation and capture*
- *Filtering and feature detection*
- *Optical flow and tracking*
- *Segmentation and clustering*
- *Recognition*

Textbooks


Computer
Vision
A MODERN APPROACH
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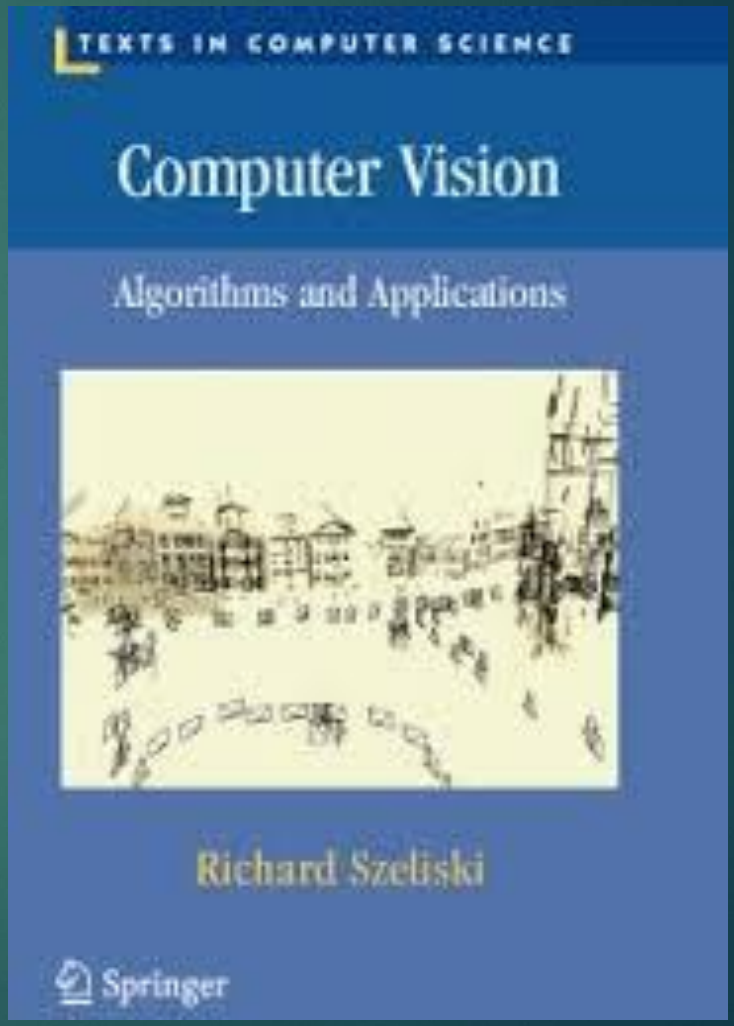
TEXTS IN COMPUTER SCIENCE
Computer Vision
Algorithms and Applications
Richard Szeliski
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