
Computer vision

Computer Vision

Lecture 1: Introduction

Dr. Dina Khattab

dina.khattab@cis.asu.edu.eg

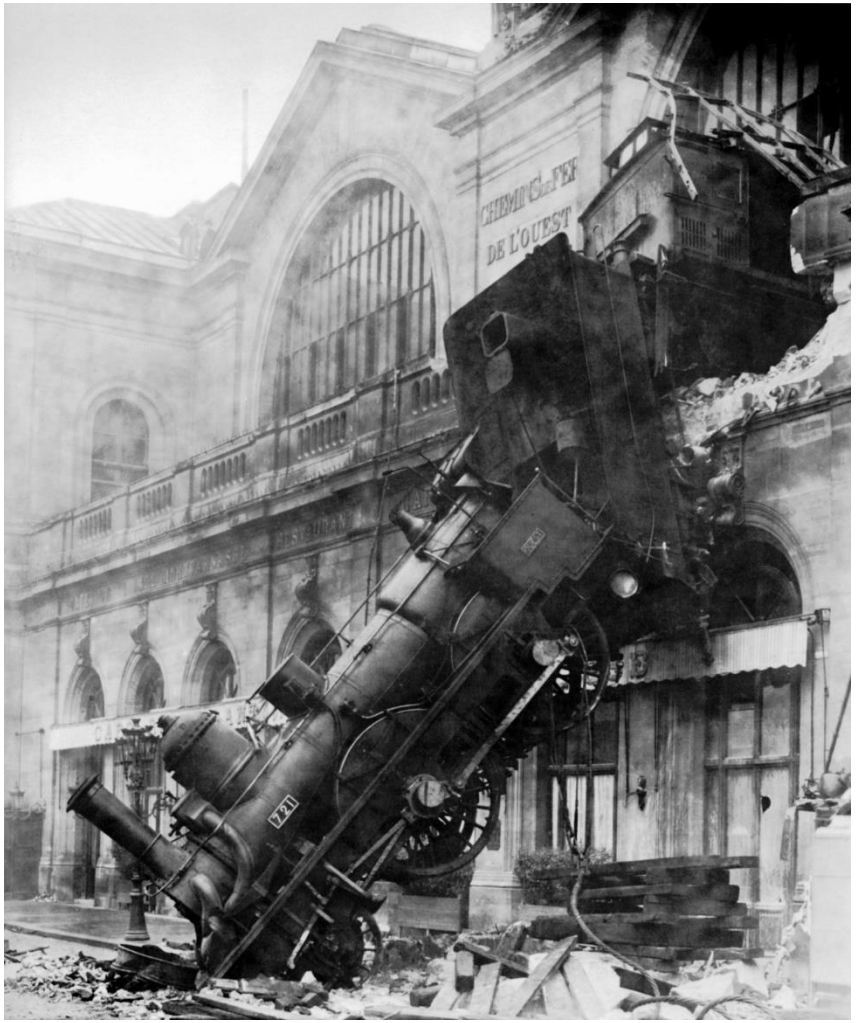
Scientific Computing Department

Instructor:	Dr. Dina Khattab
Email:	dina.khattab@cis.asu.edu.eg
Office:	Main Building – 4th floor – Room 302
Office Hours:	Monday 12:00 - 2:00 PM Thursday 10:00 AM to 12:00 PM

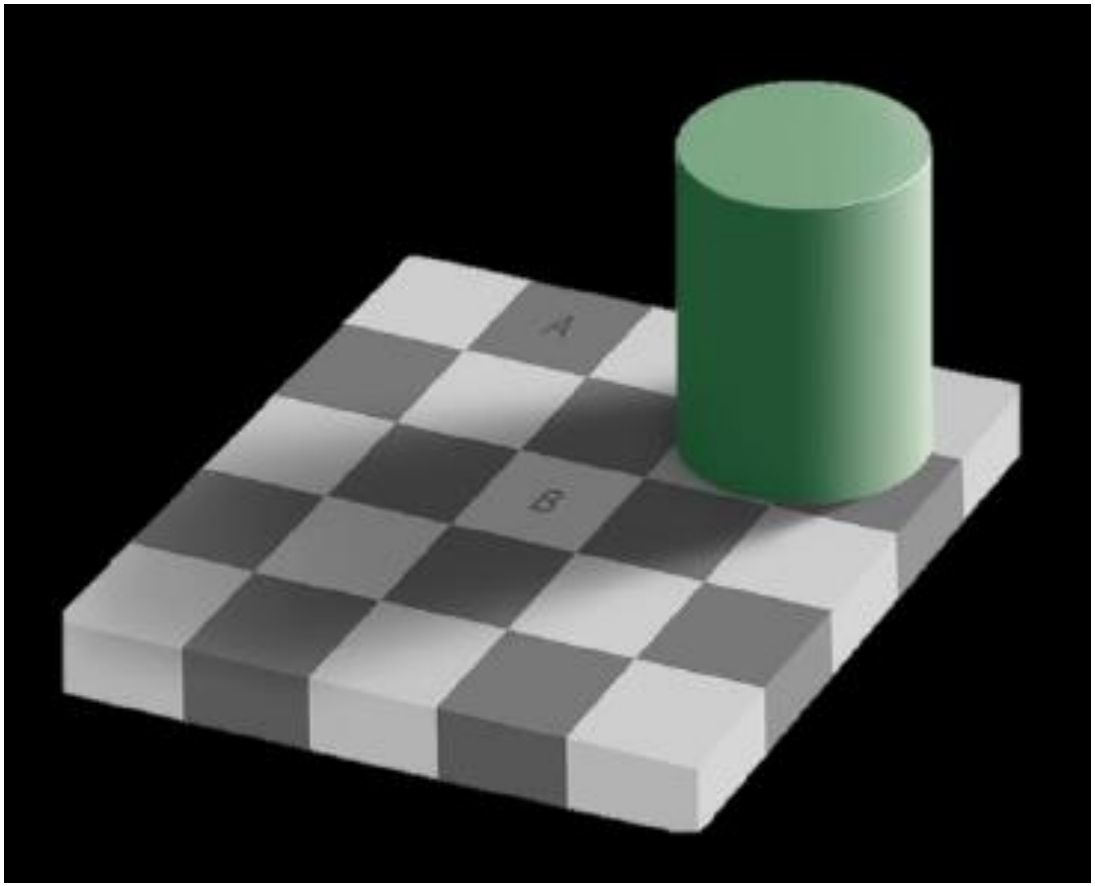
What is Computer Vision

- It is about interpreting and analyzing the scene

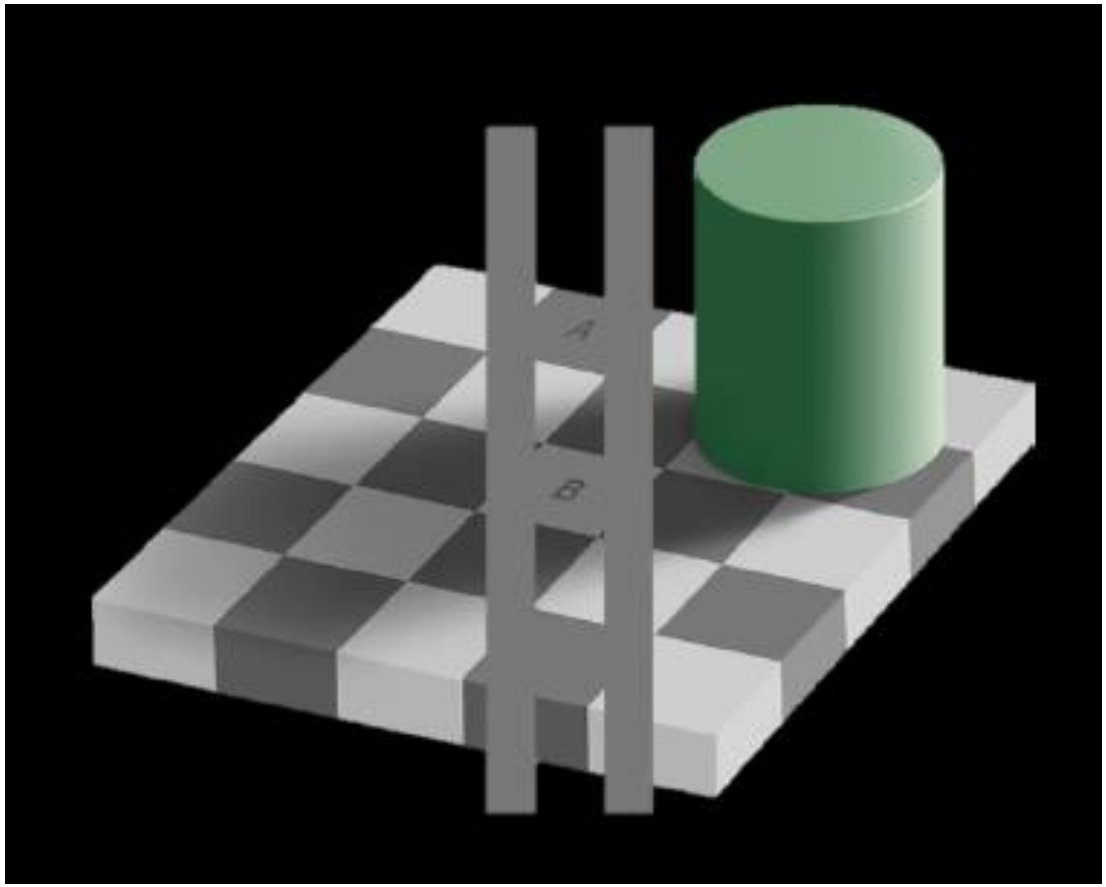
  (Scene Understanding)



Why is this hard?



Why is this hard?



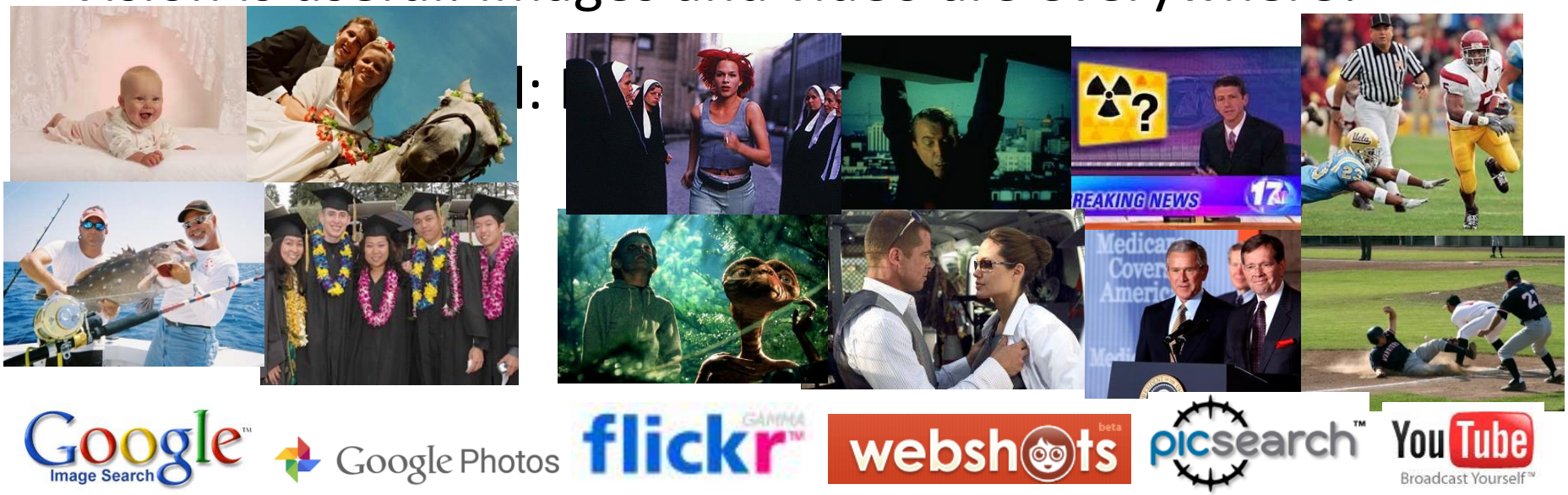
Why is this hard?

Vision is NOT Image Processing

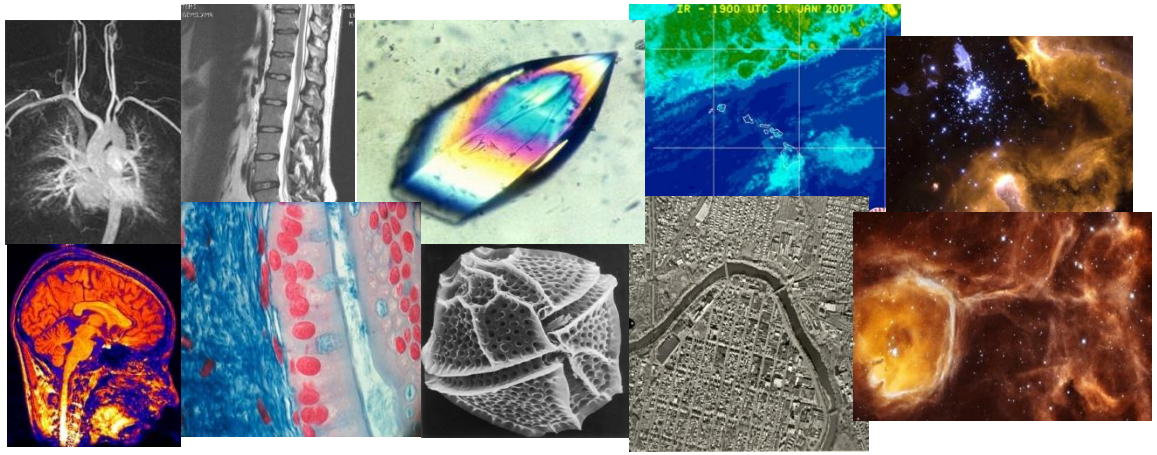
- In the previous example, the two squares have exactly the same *measurement* of intensity.
- So, seeing is not the same as measuring properties in the image.
- Rather, “seeing” is building a *percept* of what is in the world based upon the measurements made by an imaging sensor.

Why study Computer Vision?

- Vision is useful: Images and video are everywhere!



Surveillance and security



Medical and scientific images

What CV is for?

Optical Character Recognition (OCR)

License plate readers

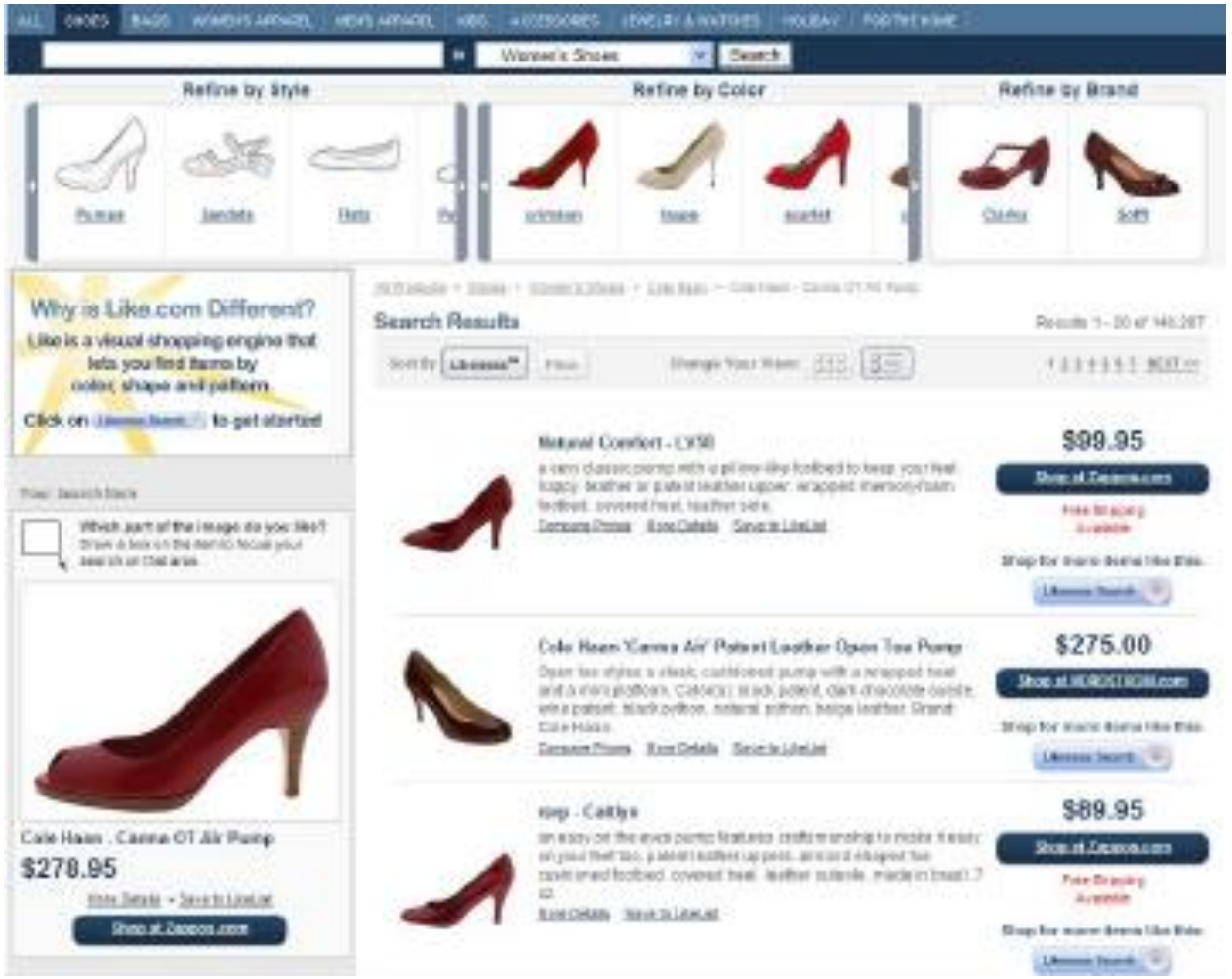
Handwritten Digit recognition

Face Detection

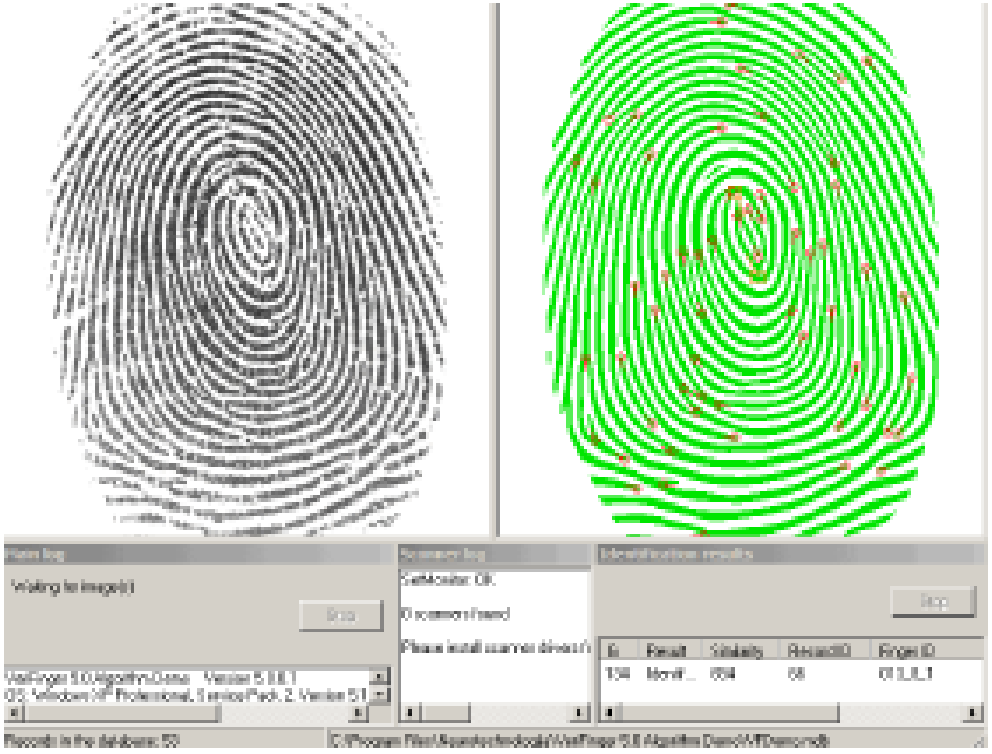
Face Recognition

Posing Visual Queries

Finding Visually Similar Objects



Finger Print Recognition



Object Recognition (in supermarkets)

Amazon Go

Object Recognition (in mobile devices)

Special Effects

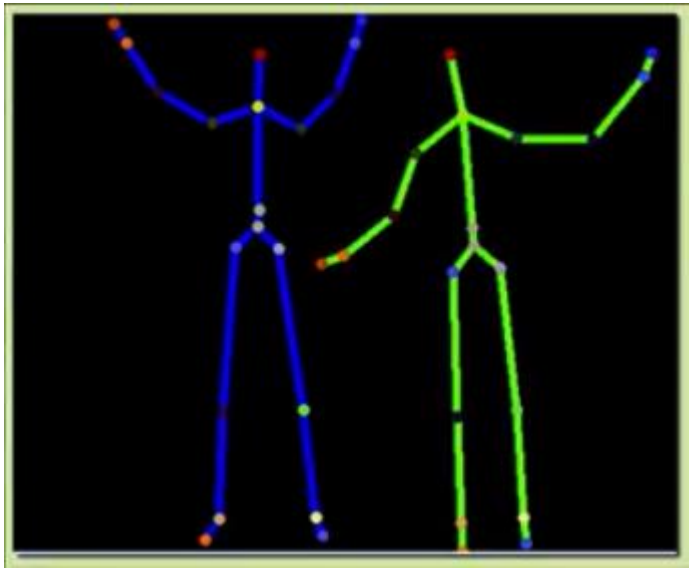
Shape Capture

The Matrix movies, ESC Entertainment

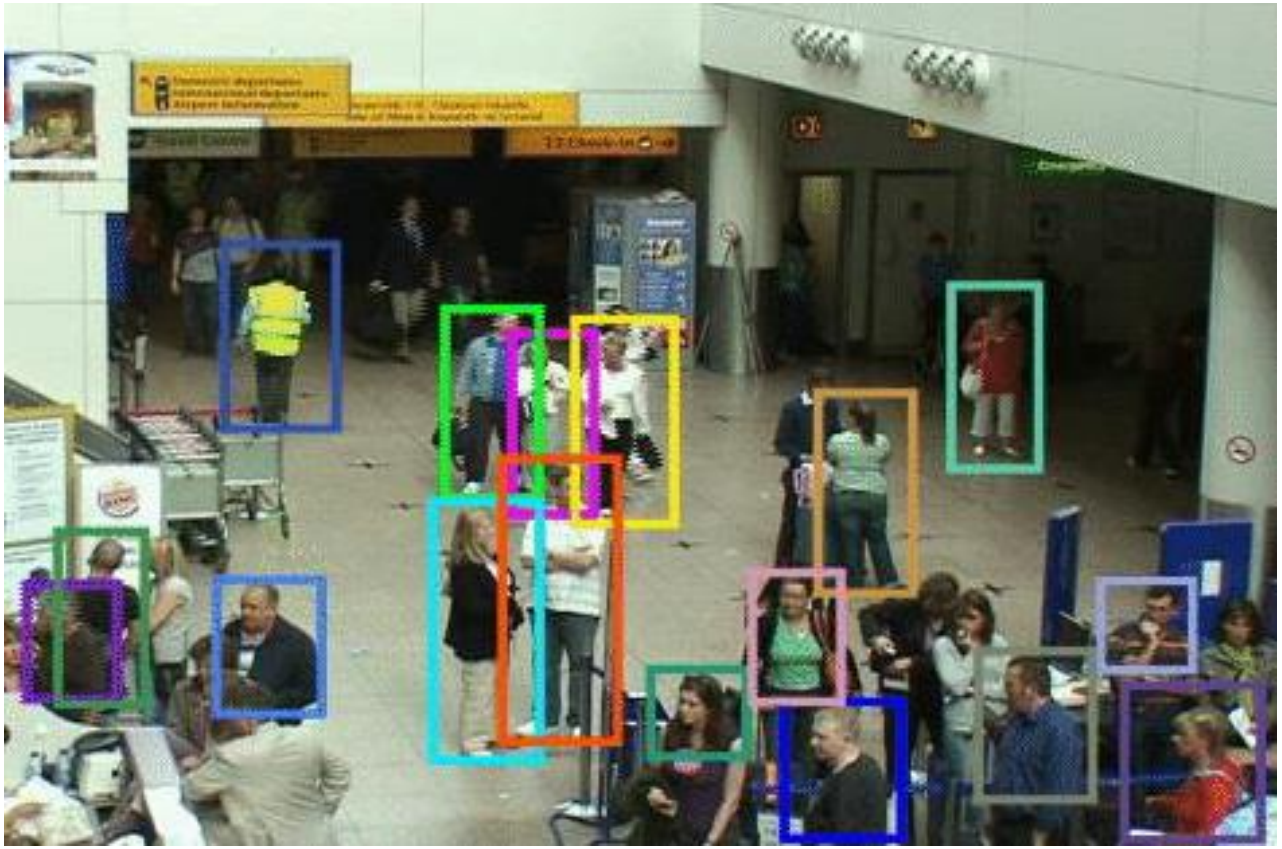
Motion Capture

Pirates of the Caribbean
Industrial Light and Magic

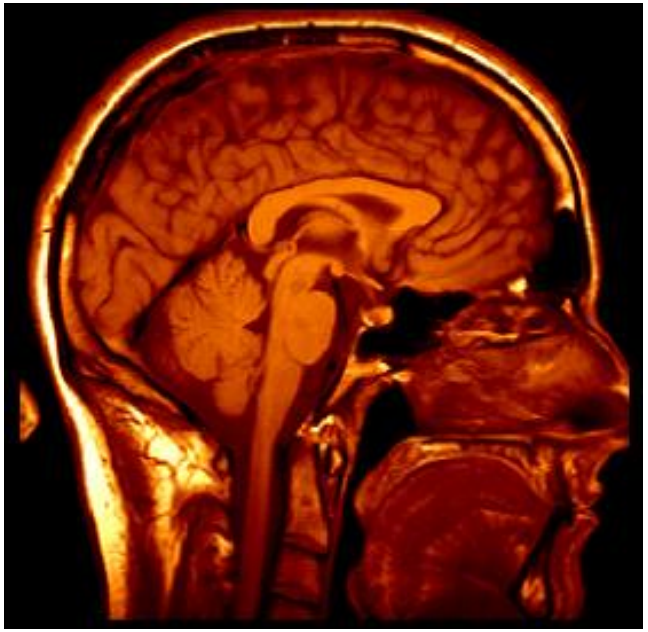
Vision-based Interaction (and games)



Security and Surveillance



Medical Imaging



3D imaging
MRI, CT

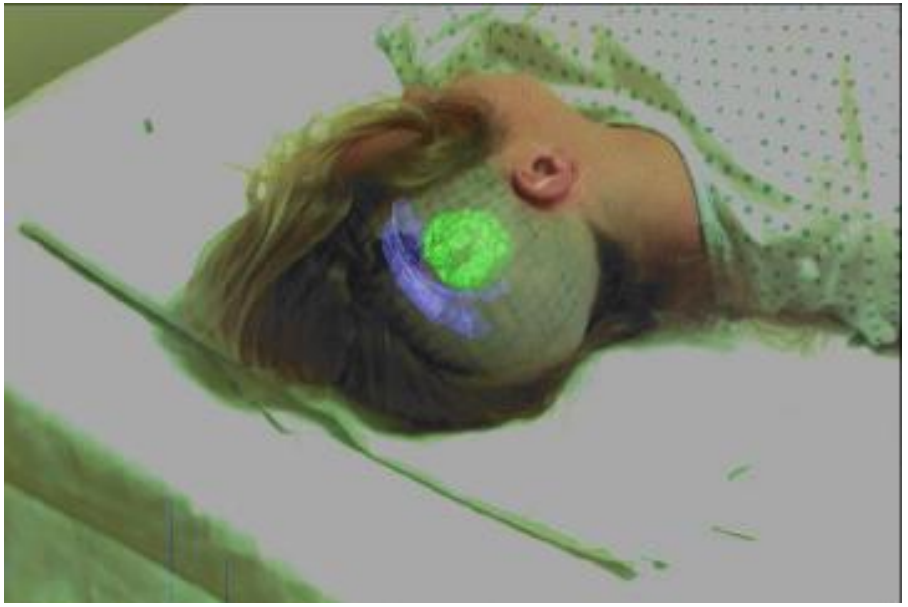
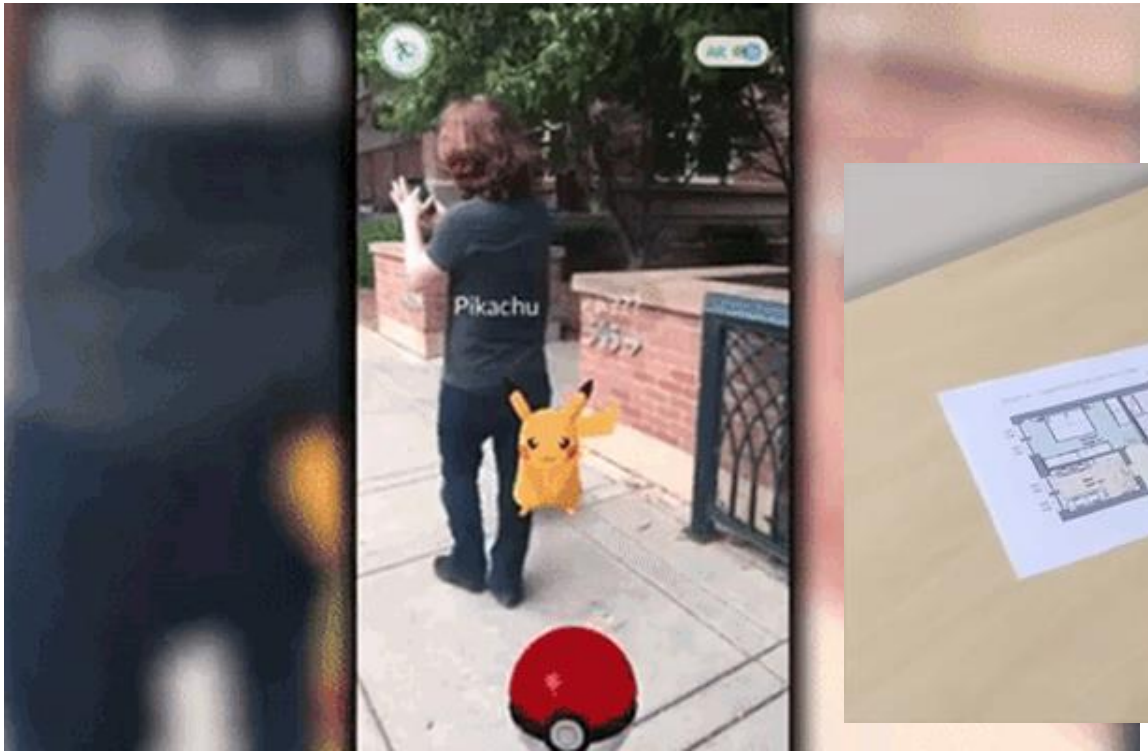


Image guided surgery
Grimson et al., MIT

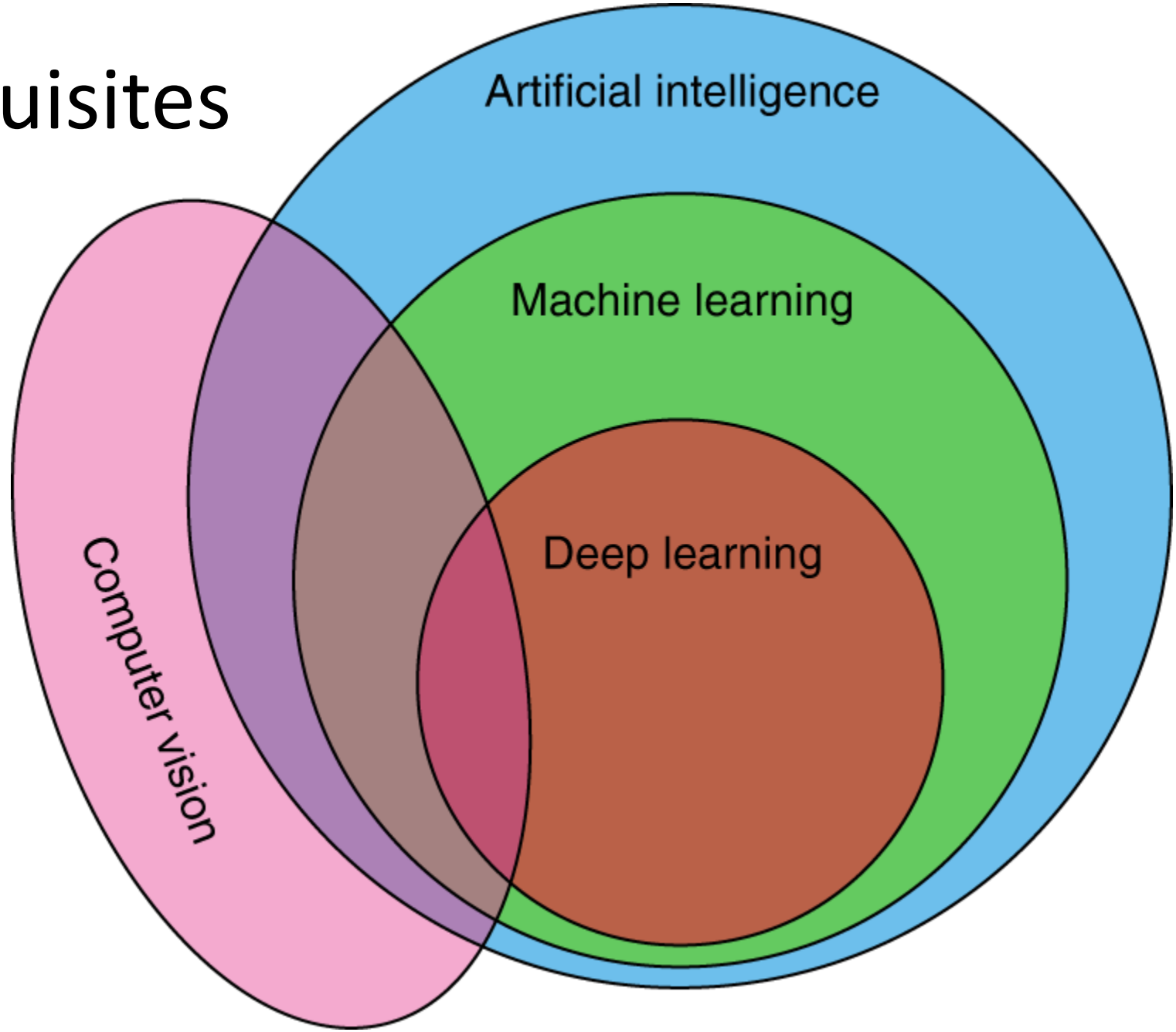
Augmented Reality



Virtual Reality

Self-driving Cars

Perquisites



Material

- Basic Courses:
  - CS 6476 "Introduction to Computer Vision" by University of Georgia Tech - (Udacity) https://www.udacity.com/course/introduction-to-computer-vision--ud810
  - CS131 "Computer Vision: Foundations and Applications" by University of Stanford (Fall 2019) http://vision.stanford.edu/teaching/cs131_fall1920/

Material

- Advanced Courses:
  - "Advanced Machine Learning Specialization" by National Research University Higher School of Economics, Russia – (*Coursera*)

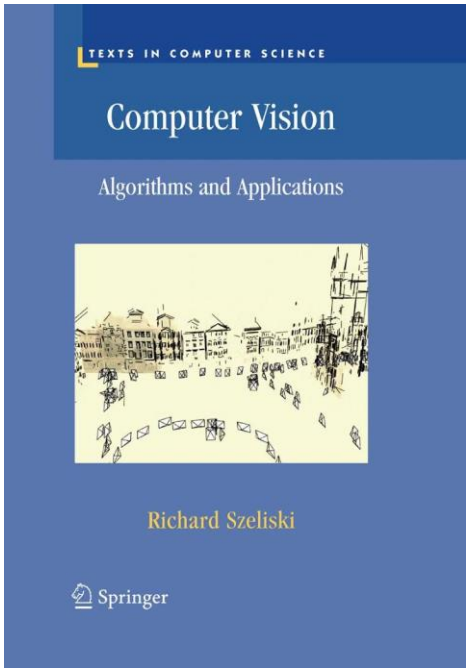
    Course 5: Deep Learning in Computer Vision – (5 weeks)

    https://www.coursera.org/specializations/aml

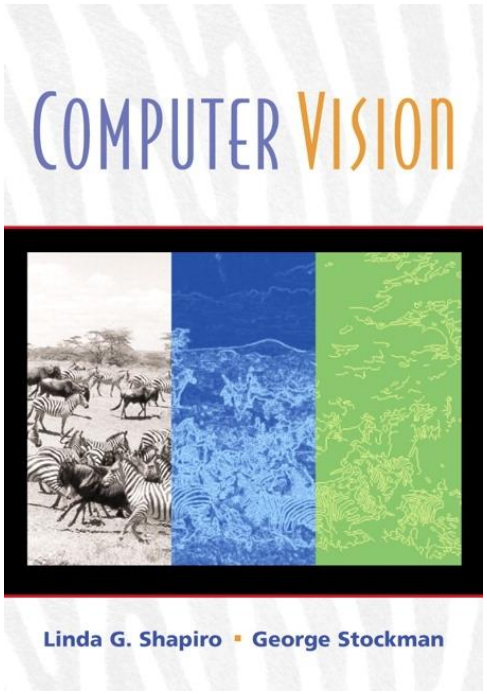
  - CS231n "Convolutional Neural Networks for Visual Recognition" - University of Stanford
    - http://cs231n.stanford.edu/
    - https://www.youtube.com/playlist?list=PLC1qU-LWwrF64f4QKQT-Vg5Wr4qEE1Zxk

  - CAP5415 " Computer Vision " University of Central Florida, Center of Research in Computer Vision (UCF CRCV), Fall 2020
    - https://www.crcv.ucf.edu/courses/cap5415-fall-2020/schedule/?fbclid=IwAR3xx4xKMCJPtdXLu0ahM8xBtojMYux9eSjJT1vhvG3oSM1hIx-wUWUS9CQ
    - https://www.youtube.com/watch?v=LLRx2anvn1E&list=PLd3hlSJsX_Ikm5il1HgmDB_z62BeoikFX

Source Books



- http://szeliski.org/Book/drafts/SzeliskiBook_20100903_draft.pdf
- **Szeliski, Computer Vision, Algorithms and Applications, 2010.**



- ftp://91.193.236.10/pub/docs/linux-support/computer%20science/computer%20vision/Computer%20Vision%20-%20Linda%20Shapiro.pdf
- **Shapiro and Stockman, Computer Vision, 2001.**

Course Syllabus

1. Introduction
2. Features
3. Object Recognition
4. Object Detection
5. Image Segmentation
6. Video Analysis
   - Motion Estimation (Optical Flow)
   - Object Tracking & Activity Recognition
7. Image Generation

Grades

- Year Work 35%
  - Midterm (10)
  - Lab Hands-on + Assignments
  - Practical/Project

} (25)

- Final 65%