A Computer Vision Sampler

COMPSCI 527

Today:
- Introduction to computer vision
- Course logistics
Tian Lan et al. ICCV 2013
• Detect: Is there one or more instance of x in this image?

• Localize: Where are the instances?

• Segment: Where are the boundaries of each instance?

• Track: How is this instance moving from one image to the next?

• Recognize = classify: What is this?

• Reconstruct: Given two or more 2D images of a scene, compute a 3D model of it
History of Recognition

- Up to mid Nineties: Feature extraction and recognition algorithm engineered by hand
  - No data needed, intuition, lots of special-case programming
- Mid Nineties to *circa* 2010: Feature extraction by hand, and recognition algorithm with machine learning
  - With carefully designed features, recognition can be learned from modest-size training sets
- Last decade: Entire pipeline by machine learning (deep convolutional neural networks)
  - Massive amounts of data needed to train the system
History of Tracking

• Up to \textit{circa} 2000: Search for most similar window in second frame
• Last decade: repeatedly detect object of interest through recognition
History of 3D Reconstruction

- Still mostly geometry: Model the image formation process, 3D -> 2D:

  \[ \text{images} = f(3D \text{ shape, camera position}) \]

- Solve for 3D shape, camera position, given images, 2D -> 3D

- Starting to see first deep neural networks