CSC2503: Foundations of Computer Vision

Object Recognition

Slides are modified from the excellent course notes and tutorials by Antonio Torralba, Fei-Fei Li and Rob Fergus.
Where do we go from here?

- Single class recognition
- Multi-class recognition
- Scene Recognition and Context
- Parsing, Recognition and Segmentation
Multi-class category recognition

Does the approach to single object/category recognition scale?

How many categories are there?
“Muchas”
How many categories are there?

~10,000 to 30,000

To acquire ~20K categories by age 10, children need to learn ~5 new categories per day

Biederman 1987
Can we transfer knowledge from one object category to another?
Scene recognition and context

Is local information enough?
If we have 1000 categories (detectors), and each detector produces 1 false alarm every 10 images, we will have 100 false alarms per image… pretty much garbage…
Geometric context

(b) $P(\text{person}) = \text{uniform}$

(d) $P(\text{person} \mid \text{geometry})$

(f) $P(\text{person} \mid \text{viewpoint})$

(g) $P(\text{person} \mid \text{viewpoint, geometry})$

[Hoiem, Efros and Hebert, 2006]
Parsing, recognition and segmentation

Contains a motorbike
Datasets

Language

Character Recognition (MNIST)

Visual Object Recognition
The Columbia Object Image Library (COIL-100): colour images of 100 objects taken at pose intervals of 5 degrees (72 poses per object).

Collecting $10^6$-$7$ Examples

- ESP game (CMU)
  Luis Von Ahn and Laura Dabbish 2004

- LabelMe (MIT)
  Russell, Torralba, Freeman, 2005

- StreetScenes (CBCL-MIT)
  Bileschi, Poggio, 2006

- WhatWhere (Caltech)
  Perona et al, 2007

- PASCAL challenge
  2006, 2007, 2008, 2009, ...

- Lotus Hill Institute
  Song-Chun Zhu et al 2007
Labeling with games

Figure 1. Partners agreeing on an image in the ESP Game. Neither player can see the other’s guesses.

Figure 2. Peekaboom. “Peek” tries to guess the word associated with an image slowly revealed by “Boom.”

Pascal Visual Objects Challenge

20 object classes selected are:

*Person*: person

*Animal*: bird, cat, cow, dog, horse, sheep

*Vehicle*: aeroplane, bicycle, boat, bus, car, motorbike, train

*Indoor*: bottle, chair, dining table, potted plant, sofa, tv/monitor

M. Everingham, Luc van Gool, C. Williams, J. Winn, A. Zisserman 2007
Went online July 1st, 2005 (290,000+ object annotations)
B. Russell, A. Torralba, K. Murphy, W.T. Freeman. IJCV ‘08
Labelme.csail.mit.edu
LabelMe: Polygon quality
LabelMe: Not all data is reliable

Most common labels:

test
adksdsa
woiieieie
...


LabelMe: Online hooligans