A Computer Vision Sampler

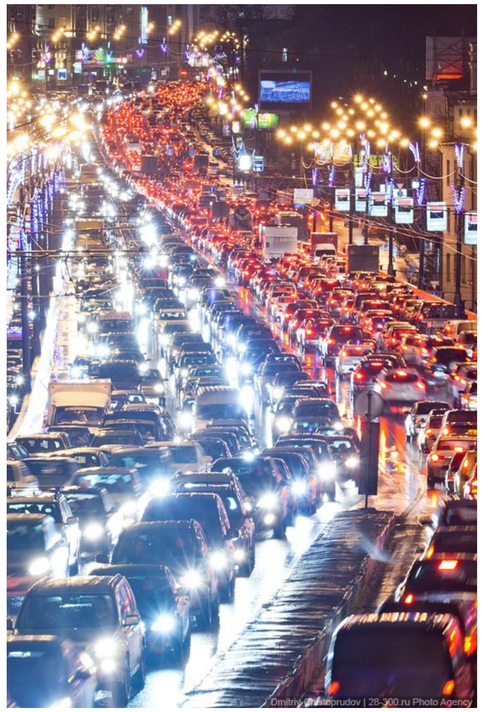
COMPSCI 527

Today:

- Introduction to computer vision
- Course logistics

A Penny for your Thoughts

- What single word best describes how you are feeling today?
- What is your main concern as you start your semester?
- Tell us all in the chat window

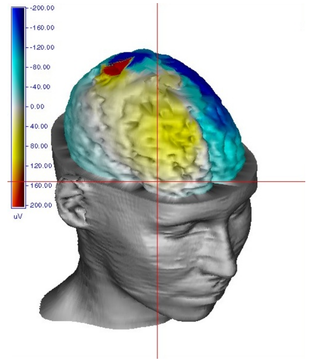

Dmitry Chistyprudov | 28-300.ru Photo Agency


iPhoto
All Faces
Allyson 3 photos
Photos
Faces
LIBRARY
Events
Photos
Faces
Places
RECENT
Summer Vacation
Last Import
Last 12 Months
Flagged
Trash
ALBUMS
Unnamed
Recovered Photos
WEB
PROJECTS
Plants Book
SLIDESHOWS
Plants Slideshow
Short Slideshow
Long Slideshow
Allyson may be in 1 additional photo
Confirm Additional Faces...
Full Screen
Search
Zoom
Slideshow
Info
Edit
Create
Add To
Share


ASIMO
HONDA


Google
self-driving car


eSSL
Security at Fingertips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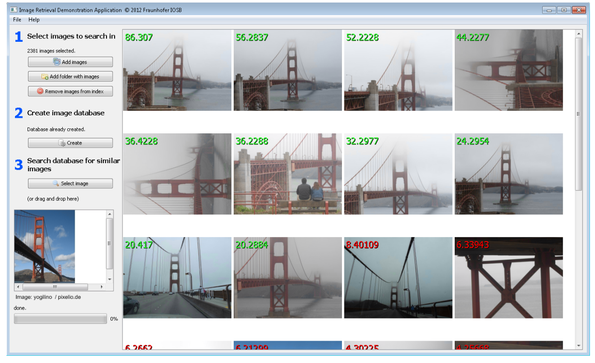
Image Retrieval Demonstration Application © 2012 Fraunhofer IOSB
File Help
1 Select images to search in
2381 images selected.
Add images
Add folder with images
Remove images from index
2 Create image database
Database already created.
Create
3 Search database for similar images
Select image
(or drag and drop here)
Image: yogiline / pixelio.de
done.
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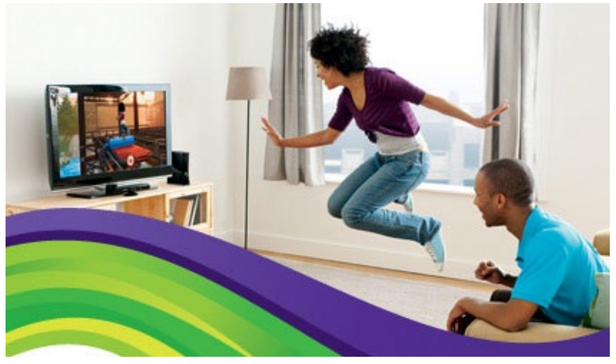


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DWARSPORT
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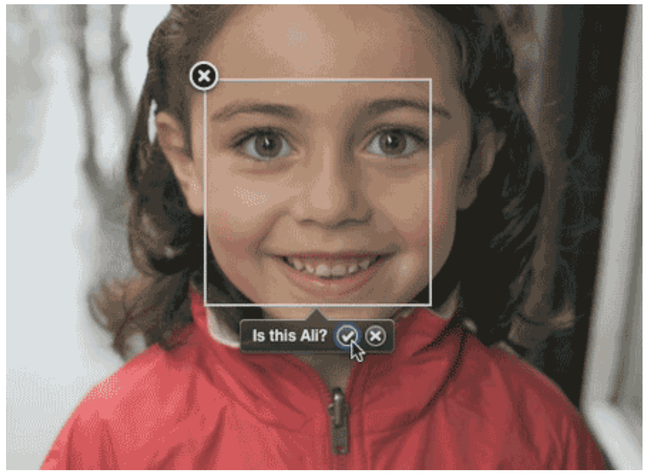
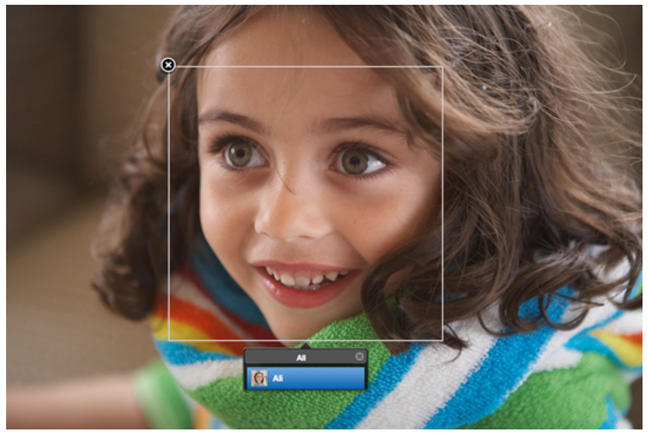
One Image, Many Questions

Recognition and Re-Identification

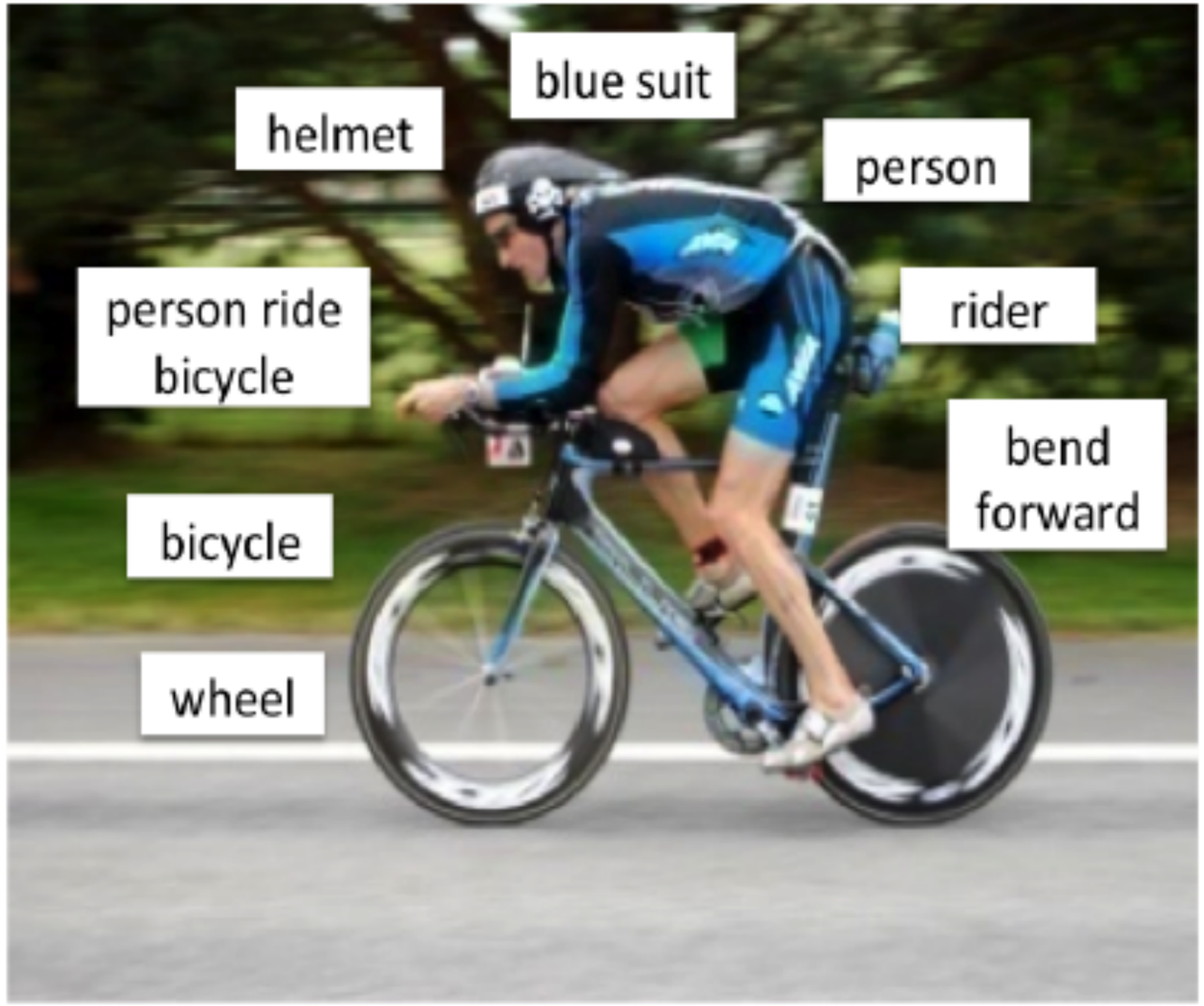




Apple Computers 2010

- Recognition: Who is this? What does this image depict (face, pedestrian crossing)?
- Re-Identification: Are these two people the same?
- Also recognize activities in video (“crossing” now becomes a verb)

What does “Recognition” Mean Anyway?

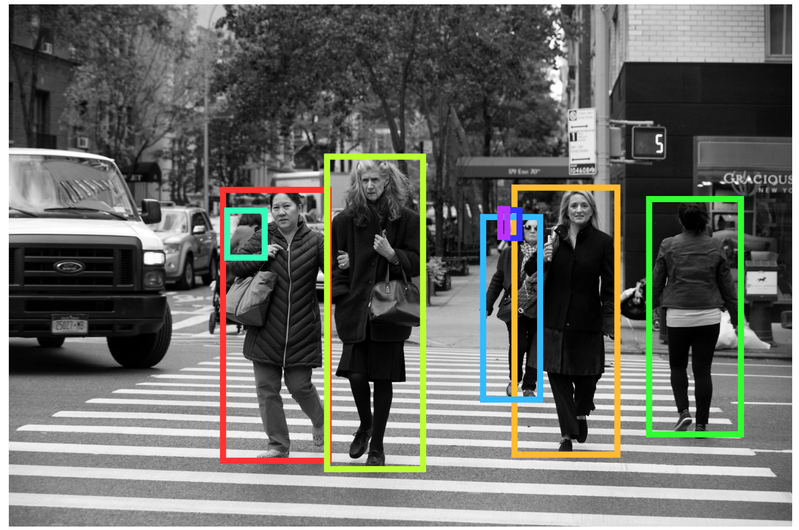


Tian Lan *et al* ICCV 2013

Detection and Segmentation

- Detection: Find instances of class x
- Class-Level Segmentation: Which pixels belong to class x?
- Instance-Level Segmentation: Which pixels belong to each instance of class x?

Detection

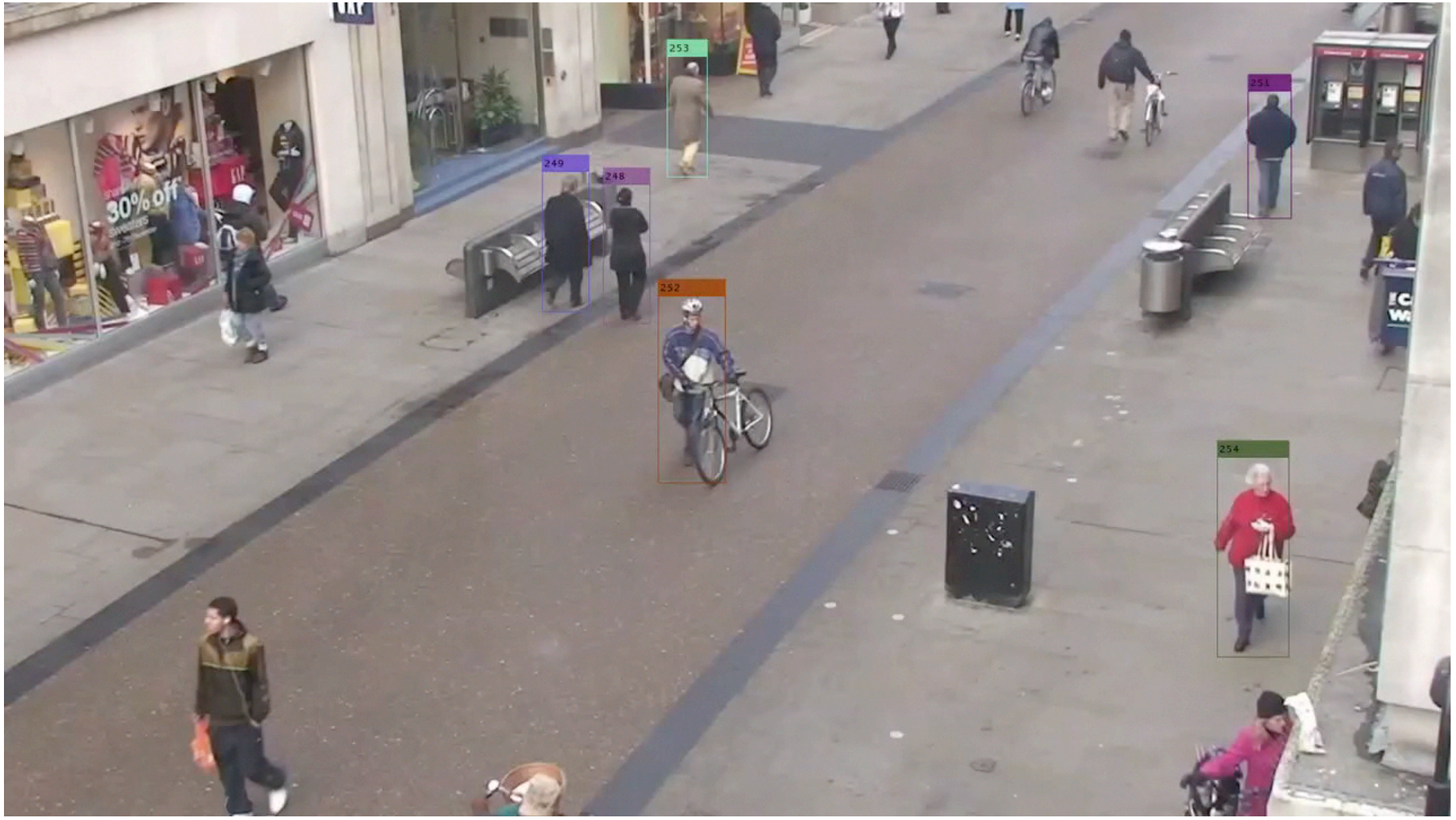


Class-Level Segmentation

Instance-Level Segmentation

Tracking

Across two or more video frames



Benfold and Reid CVPR 2011

3D Reconstruction

From two or more images

Sameer Agarwal et al CACM 2011

Appearance is Tricky

Appearance is Tricky



[slide idea by Fei-Fei Li]

Images are Cluttered

Logistics

Academic Integrity

- *Short version: Cheating will be prosecuted*
- Cheating: Using someone else's material or help in your work without giving credit [Lone exception: class materials need not be cited]
- Ditto for making materials available to others
- Giver/receiver are treated the same
- Format for using/making available is immaterial
- Only communication allowed during homework is with your group peers, if any, and with the teaching staff

Videos and Notes

- Videos are full lectures, just edited for brevity
- They will be posted in a media library on Warpwire
- Links to individual videos will also be posted on the syllabus page
- ***Notes on the class Syllabus web page are required reading, and are your main source of information along with the videos***
- ***Slides are lecture props, NOT study materials***
- ***All appendices in the notes are optional reading***
- Feel free to integrate with other sources. See *Resources* web page

Discussion Sessions

- You attend *one* mandatory discussion session per week
  - Thursday at 8:30am if you are in Section 1
  - Thursday at 1:45pm if you are in Section 2
- OK to switch session occasionally, no need to let me know, but try to stick to yours
- Zoom meeting numbers on mechanics page. Must join from a Zoom account linked to a Duke email address
- **Brownie Points:**
  - A Piazza thread will be created every week for your discussion questions
  - The **first question you submit by the rules and by the Tuesday midnight deadline** earns you ***one brownie point***
  - Helping to answer questions during discussion earns you ***three brownie points***
  - You can earn up to 10 brownie points over the semester

Zoom Etiquette

- Please leave your video on if possible
- Please mute yourself to avoid background noise
- Unmute yourself when talking (space bar for brief unmute)
- Resist the strong temptation to sit on your hands: Engage!

Homework

- Homework 0 is on prerequisites and is due before the add/drop deadline
- 6-8 assignments
- Some math, some text, some programming
- OK to work in groups of one, two, three **from the same Section** [but no division of labor!]
- Jupyter notebooks → HTML → PDF
- Two submissions on Gradescope: PDF, Notebook
- **One pair of submissions per group, remember to list all names!**
- **No late homework accepted** (would be unfair to your peers)
- Worst homework score (including 0 for no homework) is dropped
- Second-worst homework counts half as much as each of the others

Exams and Grades

- Exams:
  - One midterm on March 11, synchronous, at your section's discussion time
  - One final, not cumulative:
    - Section 1: Friday, April 30, 9-11 AM
    - Section 2: Thursday, April 29, 2-4 PM
  - Open book, open notes, submitted via Gradescope
- Grades:
  - Homework: 40% (lowest homework score dropped, second-lowest downscaled)
  - 0.8 max(Midterm, Final) + 0.2 min(Midterm, Final): 40%
  - Participation (brownie points): 18%
  - Class evaluation: 2%

Programming

- All programming will be in **Python 3** (not 2!)
- If you know how to program, picking up Python takes a few hours and Google while you program
- If you don’t know how to program, this class may not be for you
- You will write **Jupyter Notebooks** for homework. They are easy to get used to, and let you intersperse text, math, figures, and code
- A first homework assignment will help you ease into these tools
- The **Anaconda** distribution for everything you need is very strongly recommended
- See the *Resources* web page for tutorials on Python 3, Jupyter, Anaconda
- Specific instructions also given in homework 0

Teaching Staff

- *Graduate TAs*: Haoyu Dong, Xian Sun
- *Undergraduate TAs*: Anmol Warman, Edward Lin, Kunal Upadya, Matthew Robbins, Steven Li, Yuncong Zuo
- If you like this course, please volunteer to TA next year!
- Each of us will have Zoom office hours per week. Office hours can be group or individual as needed
- **Check the online calendar before attending office hours**
- We'll keep listening to Piazza (at reasonable hours)
- **Talk to us!** We are here to help you learn