CMPSCI 670, Fall 17: Computer Vision
Final project guidelines

Final projects: Final projects will entail original investigation into any area of computer vision defined very broadly, or a focused literature review in a topic from such an area. That means that machine learning over visual data, HCI, computational photography, computer graphics, language-vision interfaces, computer vision applied to domains such as medical images, and so on, are all acceptable topics, in addition to the core computer vision topics.

Scope: As a broad target, the final project should involve approximately as much work as two homework assignments for each student in the group. Thus, the total work should scale roughly linearly with the group size, and be distributed roughly equally. Similarly, multi-purpose projects which are being submitted for multiple classes should scale with the number of classes involved. An ambitious, well-done project from a group of two or more (or shared between two or more classes) should be on the order of a conference paper in depth of experimentation. I encourage you to tackle large problems in groups, for multiple classes, or both.

Grading and Milestones: The milestones will be:

Oct 25	Abstract due
Dec 12	Presentations (tentative)
Dec 20	Final reports due

The abstract is just a short paragraph telling me who is in your group, describing the problem you've chosen, sketching the general approach you intend to take, and stating the kinds of data you're using. If you haven't already spoken to me about project ideas, you may want to stop by my office hours or to make an appointment before this point. The abstract mainly serves to give me a chance to make sure you're on a good path and to help me get a sense of who is doing what. Abstracts will have to be uploaded to Moodle as a single pdf file.

Towards the end of the class each team will make a short presentation or a poster describing their preliminary results. An important skill in research is to be able to tell in a week or two whether your ideas are basically going to work, well before you've fully done all engineering and experiments.

The final write-up should be on the order of 6-8 pages, describing your approach, results, data analysis, and so on. The initial abstract is a required checkpoint, but you will only receive a grade at the end, based on your final write-ups. Under normal circumstances, all group members will receive the same grade for the final project. Late days will not apply to the final reports. I have to get your grades in to the university, and I'm already giving you as long as I possibly can.

Ideas: You are welcome to come up with your own topics – some of you already may have done so. Take a look at the the resources listed at the end of this page for potential topics. You are also welcome to come by my office hours to get ideas from me.

Literature review as an alternative: If you wish, you can instead write a literature review paper summarizing and comparing 3-5 papers on an advanced topic. If you are interested in this option, discuss this with me, I'll help you pick a good set of papers. Literature reviews are to be done solo.

Project resources

- Some ideas:
  - Organizing personal photo collections. Think of all the photos you take on your mobile phone. What is a useful way of browsing and searching such a collection?
  - Better field-guides to categorize animals and plants using computer vision. Here is one for identifying tree species `http://leafsnap.com`.
  - Detecting interesting events in ego-centric cameras, e.g., GoPro. How can you tell when something interesting happens in the video stream?
  - Analyzing architecture – what cities are similar to Chicago in terms of the style of buildings?
  - Analyzing 3D dataset collections – how can you retrieve a 3D model from a computer graphics database using a photo? There are many 3D models available for download at `https://3dwarehouse.sketchup.com`. You might want to focus on a sub-category, say, airplanes.
- List of computer vision datasets: `http://www.cvpapers.com/datasets.html`.
- List of projects from a computer vision course taught at UIUC by Svetlana Lazebnik: `http://web.engr.illinois.edu/~slazebni/spring14/project_topics_2014.html`.
- A list of project ideas from Serge Belongie at UCSD (→ Cornell Tech.) `http://cseweb.ucsd.edu/classes/wi06/cse190a/projects.html`
- There are a number of computer vision startups with wide range of applications. These include sports replays, such as the "Goal-line" technology used this year in the FIFA world cup, medical applications, robotics, industrial inspections, etc. David Lowe maintains a (somewhat outdated) list of computer vision applications in the industry: `http://www.cs.ubc.ca/~lowe/vision.html`
- A sample of projects from a prior course offering:
  - Scene text recognition
  - Improving object detection using depth estimation
  - Dust removal from images
  - Fast face-retrieval using vocabulary trees on deep features
  - Hyperspectral image classificaiton
  - Character recognition in movies
  - Could motion analysis
  - Analysis of medical images
  - stereo reconstruction survey
  - Counting heads in images
  - Implementation of a VR engine
  - Poselet based person identification
  - gaze tracker
  - Photo stitching across seasons/day-night
  - Segmentation using CNNs
  - 3D Sketching
  - Survey (robotics + affordances)