CMPSCI 670: 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, single-student final projects should involve approximately as much work as two homework assignments. For groups of more than one person, 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 27th	Abstract due
Dec 1st, 3rd	Project presentations
Dec 13th	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 can be sent to me by email.

Towards the end of the class each team will make a short presentation 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.

The final project (research version) will be weighted as two homework assignments, with the lowest passing grade of the 7 units (5 HWs and 2 project) being dropped from your final grade. Therefore your project will be either 1/6th or 1/3rd of your total grade for homework and project, depending on your relative scores.

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, I'll help you pick a good set of papers. This alternative only counts as a single unit of work, so will be 1/6th of your grade. 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 ($\rightarrow$ 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`

- **Opportunity:** A computer vision startup is trying to analyze customer behavior and attributes from videos taken from overhead cameras in stores. Some tasks include gender detection (very useful), detection and localization (this is challenging due to the non-standard view), tracking people over time, i.e., matching people entry and exit events. If you are interested in this, I can put you in touch with the lead technical developer there who has kindly agreed to provide actual data collected from these cameras to train and evaluate algorithms.