CS 415 Final Project

The goal of the final projects, which are open research projects, is to let you apply the techniques we have discussed in classes and obtain a comprehensive and profound understanding of them. You are also encouraged to try something new. Projects should be done individually or in groups of up to 3 students. Feel free to discuss your ideas with the instructor during office hours. Here are some ideas for getting started on projects:

- Find a problem that interests you and design and implement a solution to it.
- Take some publicly available code, apply it to an interesting dataset and explore various extensions and modifications. You may also want to compare two or more systems. Merely running existing code on the data provided by the authors is not enough.
- Select a paper from the computer vision literature, implement and test the approach described in that paper.

1 Example projects

For inspiration, I list a few example problems below.

The *FingerCursor* Project. In this project, the index fingertip can be used to control the mouse, i.e., the mouse moves with your fingertips. You are supposed to make your own testing video.

The idea of a *FingerCursor* is to detect, locate and track a fingertip through a video sequence accurately and robustly. You can design a set of specific finger actions, and use them for command and control (of the cursor or other things). You can use any tool we have studied in class, and make things work. The creativity of your projects will be reflected on how you design your project. You can also design other fancy applications.

The *ImageGoogle* Project. In this project, you are creating an image database system for managing a fairly large set of images collected during your travel. You may have hundreds or even thousands of images when you come back from several trips. I bet they are pretty much un-organized (i.e., you don't have to sort, categorize, and annotate them). So, you end up with a large set of images sitting in a folder. Each time when you want to find some photos to share with your friends, you may have to browse and search them one by one from the very beginning. This is so frustrating. And we need a smart way for this purpose.

This is indeed an image retrieval system, in which you can do googling on images (over your own image databases). The problem can be stated as follows: given an image of interest (i.e., the query image), find a set of similar images in the database, and sort them. A very critical research issue here is to define the similarity between images.

The *ImageMosaic* Project. In this project, you are expected to create an image panorama by stitching a set of images together. These set of images are on the same scene, but from a set of overlapping field of view (i.e., various view points). For example, you can take several photos of the downtown Chicago, and put them together. The core technical component is image registration: geometrically aligning image pixels from different images.

2 Your talk and report

Each group should present a 7-9 minutes talk, and each student should submit an individual 12-page (double space) report on the project you've done. You can partner with other students for the project. But collaboration on the report is **prohibited**. Each group cannot have more than 3 students.

The Presentation. All the presentations will be scheduled on 12/01/2020 and 12/03/2020 during class. Each talk will have up to 9 minutes. What you must talk about are:

1. The goal you want to achieve;
2. Your approach and your design;
3. Your results;

The Report. Each student should hand in an individual 12-page report (double space). The due date is 12/11/2019. This is a hard deadline. Late submissions are not acceptable. During the report, I expect at least the followings:

1. Your personal views about the fields and its applications, a brief description of what you have learned in this course, and what you want to study more;
2. Project description including the goal and the problem statement;
3. Your design which describes all the details of your approach and implementations;
4. The result and analysis of your design;
5. Remarks and future work, which describes what you think the most important things to improve the results, what topic you think we should learn more;