Fall 2017 – CIS 5543: Computer Vision
http://www.dabi.temple.edu/~hbling/Teaching/17F_5543/index.html

Course Description
The objective of the course is to introduce the theory and application of computer vision. The theoretic part introduces the analysis of visual patterns and the generative models behind them. The application part uses real world tasks to help students to learn practical computer vision technologies. The course covers the following topics: image formation, low level vision processing, popular tools in computer vision, matching and registration, recognition, image and category classification, scene understanding, object detection, visual tracking, activity and action analysis, and selected advanced topics. In addition to course lectures, the course uses homework assignments, in-class discussions and course projects.

Basic Course Information
- Instructor: Haibin Ling (hbling AT temple.edu, SERC 382)
- Lecture Time: 17:30-20:00 Tuesday, TTLMAN 0402
- Office Hours: 15:00-17:00 Tuesday, SERC 382
- Credits: 3

Prerequisites
A general familiarity and basic level of comfort with matrix operation, probability and statistics is essential, and will be assumed. The following courses are prerequisites: CIS [2033 Statistics and 3223 Algorithms] OR 5526 Machine Learning OR 5603 Artificial Intelligence OR permission of the instructor.

Textbook
- Papers assigned in the class.

Lecture Topics
1. General Introduction
   - Background and topics in visual information analysis
   - Applications and related fields
2. Foundations of computer vision
   - Image formation (camera model, color space, illumination model, etc.)
   - Low level vision processing (edge detection, intensity based segmentation, etc.)
3. Review of popular research tools used in computer vision
   Note: this part briefly reviews popular technologies used in computer vision. It takes one to two lectures.
4. Visual matching and registration
   - Point set matching and registration
5. Visual Recognition
   o Without appearance information
     ▪ Shape modeling
     ▪ Shape analysis and recognition
   o With appearance
     ▪ Appearance modeling
     ▪ Face recognition
   o Image classification
     ▪ Category classification (no foreground segmentation)
     ▪ Scene understanding

6. Visual Detection
   o Holistic approach
     ▪ Face detection
     ▪ Human detection
   o Part-based model
     ▪ Articulated part model
     ▪ Contour-based model
     ▪ Combined shape and appearance model

7. Video analysis
   o Visual tracking
   o Action and activity analysis

8. Advanced topics
   *Note: contents in this part will be selected from the emerging new topics in related fields. The purpose is to keep the students updated with the latest development and trends in the field. This part takes one lecture.*

Grading
- Class participation and homework assignment: 20%
- Paper presentation: 20%
- Project: 20%
- Exams: 40% (quiz 5%, midterm 15%, final 20%)

Final Project: A list of project ideas will be suggested during the course of the semester, but students are free to suggest their own, especially if they relate to their current research. Course projects will be undertaken in small teams (two students) or individually. Each team member will receive the same grade for the project; it is up to the team members to divide the work fairly.

Course Policy
- Homework: should be submitted at the beginning of the class on the corresponding due date. Late submission is NOT allowed.
- Final project: project reports (including middle and final reports) deadlines will be at 11:59pm of the corresponding due date. Late submission will be punished at 10% per day and up to 7 days.
- Class participation: students are expected to attend all classes.
- Cheating: cheating in assignment may result in a grade of F in the course.
- Plagiarism: plagiarism is strictly forbidden.