Summer 2020: Outline of CSE Standard Course Syllabi

- **Course number**: EECS 490
- **Course title**: Digital Image Processing
- **Prerequisites**: Familiar with Matlab/C/C++/Java programming.
- **Course description**: Digital images are introduced as two-dimensional sampled arrays of data. The course begins with image enhancement which contains materials on contrast manipulation, histogram modification, noise cleaning and color image enhancement. Basic filters such as the gradient and Laplacian in the spatial domain are used to enhance images. It is shown how filtering techniques can be used to remove noise and other image degradation. Then image analysis, concentrates on the extraction of information from an image. Specific topics include morphological image processing, edge detection, image feature extraction, image segmentation, object shape analysis and object detection. One or more advanced topics such as GPU acceleration and parallel computing using CUDA will be covered as time permits. To equip students with fundamental knowledge of theory, algorithms and applications of modern digital image processing techniques and the programming skills for their implementation, programming assignments using software such as MATLAB/C will illustrate the application and implementation of digital image processing.
- **Time and day of class meetings**: MWF 2:30pm – 4:10pm
- **Class meeting location**: Online (Zoom)
- **Instructor name**: Ming-Chun Huang
- **Instructor phone number and email and office location**:
  TEL) 216.368.0397
  Email) ming-chun.huang@case.edu
  Office) Glennan 514B
- **Instructor office hours**: Virtually by appointment
- **TA information**: TBD
• Grading policy (homework, tests, quizzes, number, dates, percentage contribution to grade, etc.)

Total 100 points (Late policy: 1pt deduction every hour late. 50 hours late at most.)

• Homework (3 Projects, All require programming in C/Matlab/Java.) – 75%
• Final Exam – 25% (Open Book, 300 minutes in 24hrs window)

• Planned topics

• Topic 1: Image Enhancement and Noise Removal (Chapter 10).
• Topic 2: Edge Detection (Chapter 15).
• Topic 3: Geometrical Modification (Chapter 13).
• Topic 4: Morphological Processing (Chapter 14).
• Topic 5: Digital Halftoning and Inverse Halftoning (Additional Notes)
• Topic 6: Texture Analysis (Chapters 16).
• Topic 7: Segmentation (Chapters 17).
• Topic 8: Shape Analysis and Document Processing (Chapters 18).
• Topic 9: Image Compression and Coding (Additional Notes)
• Topic 10: Selected Advanced Topics (GPU Acceleration, CUDA Programming).

• Recommended readings:

• OpenCV http://opencv.org/ This is an open source optimized C++ library which has nearly 50,000 users and is being incorporated in interactive art, mines inspection, stitching maps on the web and advanced robotics to name just a few applications.
• Digital Image Processing, 3nd Ed., Rafael C. Gonzalez and Richard E. Woods
• Computer Vision: Algorithms and Applications, Richard Szeliski, draft copies of the book can be downloaded from http://szeliski.org/Book/. This is a great bargain and everyone should have this book.
• **Course Website**
  You will need to download your slides, assignments, final projects, and any other necessary information (such tutorials and miscellaneous supplements) from the course website. **It is your responsibility to check the course website for any important announcement.**

• **Cheating**
  Cheating in no form will be tolerated. All students found to be cheating will be reported.

• **CSE Academic Integrity Statement**

  **Academic Integrity Policy:** All students in this course are expected to adhere to University standards of academic integrity. Cheating, plagiarism, misrepresentation, and other forms of academic dishonesty will not be tolerated. This includes, but is not limited to, consulting with another person during an exam, turning in written work that was prepared by someone other than you, making minor modifications to the work of someone else and turning it in as your own, or engaging in misrepresentation in seeking a postponement or extension. Ignorance will not be accepted as an excuse. If you are not sure whether something you plan to submit would be considered either cheating or plagiarism, it is your responsibility to ask for clarification. For complete information, please go to

  https://students.case.edu/community/conduct/aiboard/policy.html

  **Disability Resources:** ESS Disability Resources is committed to assisting all CWRU students with disabilities by creating opportunities to take full advantage of the University's educational, academic, and residential programs. For further information, please go to

  https://students.case.edu/academic/disability/