CSCE 5222 Feature Extraction and Image Processing

Instructor: Dr. Xiaohui Yuan
Email: xiaohui.yuan@unt.edu
Phone: (940)565.4256

Course Description
With the development of sensing and computing technologies, image feature extraction became a critical component in many real-world applications in medicine, remote sensing, homeland security, and defense. Feature extraction provides a bridge between raw signals, e.g., images, and higher level data with a concise but informative representation. Hence, this course introduces the fundamental theories, state-of-the-art algorithms, and novel applications of image feature extraction.

Feature extraction takes one of the prime targets of applied computer vision, feature extraction, and uses it to provide an essential guide to the implementation of image analysis techniques. Where many computer vision algorithms use feature detection as the first step, so as a result, a very large number of feature detectors have been developed. These vary in the kinds of feature detected, the computational complexity, and the repeatability in applications. In this course, we will explore four key aspects of image feature extraction: low level feature extraction, high level feature extraction, object description, and feature selection. Students will gain knowledge and experience on spatial and frequency image feature extraction, point operations, shape description, and image texture. They will also expand their skills in literature survey, algorithm implementation, and scientific writing.

Course Outcomes
- Gain experience with problems and methods in image feature extraction.
- Gain experience with non-trivial software design and implementation through programming assignments.
- Develop skills of analyzing problems in the fields of image processing, implementing and evaluating methods, and summarizing the results.

Textbook
- Supplementary materials: articles in the fields of image processing, computer vision, and pattern recognition.

Grading Information
Assignments (700 points)
There are seven (7) programming assignments. Discussions are allowed. However, duplicating or copying is prohibited, which is considered as plagiarism. The involved parties will received zero points for the assignment or an F grade for the course.

Programs must be implemented in MATLAB. Each assignment has a total point of 100 and is evaluated based on the implementation, evaluation, and documentation. Detailed grading criteria are in the following table.

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<tr>
<th>Criteria</th>
<th>Points</th>
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<tbody>
<tr>
<td>Correctness</td>
<td>50</td>
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<tr>
<td>Format and comments</td>
<td>30</td>
</tr>
<tr>
<td>Evaluation and documentation</td>
<td>20</td>
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Correction: The program that achieves expected results will receive full marks. Otherwise, partial credits will be awarded.

 Formatting and comments: Each program must be properly formatted with indentation and line spacing. Comments are required to explain the function of code blocks to make the program readable. In case of improper indentation, 5 points are deducted. If statements are poor placed, 5 points are deducted. If no or few comments are included, 5 points are deducted.

 Evaluation and documentation: Extensive experiments are required to evaluate the program. Multiple repetitions are necessary if non-deterministic results are expected and results as well as
statistics are expected. A brief report is expected to document the implementation details, evaluation results, problems the program may have, etc.

**Policies and Grading Scale**

- **Late Homework**: Late submissions are not accepted. Extension can only be granted for extreme situations prior to the deadlines and cannot exceed 5 calendar days. The penalty for any late submission is 20%.
- **Attendance**: Students are responsible for all material covered in class. If a student misses a class, then it is that student's responsibility to obtain notes or other materials from another student.
- **Grading Scale**:  
  - A: 90% - 100%  
  - B: 80% - 89%  
  - C: 70% - 79%  
  - D: 60% - 69%  
  - F: below 60%  
- Any disagreement on the grades shall be discussed with the instructor within 5 calendar days from the date the papers/homework are returned to the students.
- Students who anticipate the necessity of being absent from class due to the observation of a major religious observance must provide notice of the date(s) to the instructor, in writing, in the first week of the class. For other reasons, students must provide substantial documented evidence for skipping classes.

**Academic Dishonesty**

All students are expected to do their own work. Discussions of concepts are encouraged, but all assignments should be done individually. If sources other than the course textbook and presentations are used for reference—including the Internet, other books, and other people—they should be clearly cited in the submitted work. Violating these policies will result in a zero for the assignment and possibly failing the course. The UNT Center for Students Rights and Responsibilities has more information about university policies for academic dishonesty (http://www.unt.edu/csrr/cat_of_misconductx.htm).

**American with Disabilities Act**

The Department of Computer Science and Engineering cooperates with the Office of Disability Accommodation (http://www.unt.edu/oda/) to make reasonable accommodations for qualified students (cf. Americans with Disabilities Act and Section 504, Rehabilitation Act) with disabilities. If you have not registered with ODA, we encourage you to do so. If you have a disability for which you require accommodation please discuss your needs with me and submit your written Accommodation Request on or before the fourth class day.

**Caveat**

I reserve the right to modify the course contents, change the method of assigning grades, including changing the number of assignments or exams, etc. outlined in this syllabus, subject to extenuating circumstance.