CSCE 5222 Feature Engineering

Instructor: Dr. Xiaohui Yuan
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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. 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 features detected, the computational complexity, and the repeatability in applications. In this course, we will explore key aspects of image feature extraction: color features, spatial features, frequency features, points and shape, and feature selection techniques. Students will gain knowledge and skills in literature surveys, algorithms, and scientific writing.

Course Outcomes

By the end of this course, you will

- Gain experience with problems and methods in image feature extraction.
- Develop skills of analyzing problems in the fields of image processing, implementing and evaluating methods, and summarizing the results.
- Improve scientific analysis and presentation skills.

Text Book

Research articles and books

Course Organization

1. Assignments (400 points)
   - Discussions are allowed. However, duplicating or copying is prohibited, which is considered plagiarism, and the involved parties will receive zero points for the assignment or an F grade for the course. Each assignment is evaluated based on the correctness, formatting, comments, evaluation, and documentation.
   - Correctness: The program that achieves the 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 poorly 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.
- Updated programming assignments that address the issues stated in the feedback are acceptable and grades will be updated accordingly. The re-submission cannot be later than two weeks after the feedback is provided. In addition to the updated assignment, a clear statement of how each issue is addressed must be included as a separate file.

2. Project (300 points)
   - Each student will be in a group on a project. The project report will be evaluated based on technical details and experiments.
   - Technical details: The report needs to clarify the details of the method.
   - Experiments: The report needs to present the data used for the experiments, explain the parameters used in the evaluation, and discuss the implications of the results.

4. Bonus points are available in the form of quizzes and completion of the SPOT evaluation.

5. Cheating
   - Cheating will NOT be tolerated. Students guilty of cheating will be given an F in the course.
   - Allowing others to copy your work is also considered cheating. For further details and clarifications regarding collaboration and cheating, view the University Student Rights and Responsibilities web page.

Absenteeism Policy

1. Attendance is not required.
2. Students who are absent from any class are responsible for any missing course materials, including but not limited to slides, notes, homework, and exam.
3. No make-up exams will be accommodated except for extreme circumstances, e.g., a medical emergency. Written evidence is required no later than 5 days after the absence.

Course Evaluation

At the end of the semester, you will be asked to participate in two evaluations of this course: SPOT evaluation. Taking this survey is strongly encouraged and bonus points will be granted to the ones who complete the survey with email proof.

ADA

UNT complies with all federal and state laws and regulations regarding discrimination including the Americans with Disability Act of 1990 (ADA). If you have a disability and need a reasonable accommodation for equal access to education or services please contact the Office of Disability Accommodation.