CSCE 5222 Feature Engineering

Instructor: Dr. Xiaohui Yuan
Office Hours: Mon. 11:30 AM - 12:30 PM or by appointment
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Email: xiaohui.yuan@unt.edu
Graders: TBA

Special information for COVID-19
Call COVID hotline (844-366-5892, COVID@unt.edu) if you meet any of the following:
1. Have one or more new or worsening symptoms of possible COVID-19 but have not been tested yet.
2. Have tested positive for COVID-19.
3. Do not have any symptoms but someone you live with (roommate, parent, etc.) has tested positive for COVID-19.
4. Do not have any symptoms but recently spent time with someone (at work, home, etc.) is now exhibiting symptoms of, or is being tested for, COVID-19.

Resources for information: https://healthalerts.unt.edu/symptoms-monitoring
Student Health and Wellness Center (SHWC) (940)565-2333:
1. Contact SHWC immediately if having symptoms and need to be seen
2. SHWC has capacity to conduct a rapid COVID-19 antigen test for UNT students
3. If you are positive, you will be interviewed to determine close contacts
4. The SHWC works with public health officials to inform UNT community
5. Do not share health information of others within class

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 feature 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 survey, 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
Course Organization

1. Online discussions
   o Students form groups of two and each group work on writing a report on a topic.
   o A report includes three main sections: a description of the techniques, an application scenario of the techniques, and summary of the key points.
   o Each student reviews the reports and make comments or ask questions in the online forum. The group that prepares the report answers the questions and responds to the comments.
   o Online discussions are individual assignments. Each student, except those who prepare the report, must ask at least one question to a report.

2. Report
   o The report is a group assignment.
   o Groups revise the reports according to the comments and deliver them as the final report.
   o Each report must include sufficient details of the techniques. The report must be drafted in the provided format (template). The minimum length of each report is 15 pages including graphics, equations, and tables, and excluding any references.
   o All figures are saved in png format and in a resolution of 300ppi.
   o A final report with duplication rate exceeding 20% will be penalized with a deduction of 25% of the total points of the report.

Grading

The grade will be determined based on the online discussion and the report. The following policies apply to all discussions/assignments (unless stated otherwise):

1. Grade points are allocated as shown in the graph and details are the following
   o (individual) Ten (10) points for each discussion forum.
   o (group) One hundred (100) points for the report.
   o (group) Thirty (30) points for responding to questions/comments.
   o (individual) Twenty (20) bonus points for the best scholar (number of insightful/constructive questions/comments made, early engager, etc.).

2. Report
   o A description of the technique with references and a discussion that highlights your understanding are expected.
   o Grading rubrics:

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<th>Point</th>
<th>Aspect</th>
<th>Very Good 85%-100%</th>
<th>Good 70%-84%</th>
<th>Fair 50%-69%</th>
<th>Poor 0%-49%</th>
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<td>Score</td>
<td>Structure</td>
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<td>20</td>
<td>Presentation is clear and logical. Reader can easily follow the line of reasoning. Logical connection of points. Level is appropriate for presentation of results. Writing is free of errors in grammar, punctuation, and spelling. Flows smoothly.</td>
<td>Generally shows critical thinking skills. Able to provide some critical evaluation/discussion. Generally, appropriate conclusions are drawn from it. Some assertions may lack support. May contain some minor mistakes, no significant errors are made.</td>
<td>Introduction contains pertinent information. Given tasks and questions are thoroughly analyzed and elaborated. Results and conclusions are logically constructed and summarized. Information is consistently accurate.</td>
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<td>Presentation is generally clear. Sentence flow is generally smooth. A few minor points confusing or not clearly connected. Level is generally appropriate. Writing is generally error-free, but some errors in language or grammar may occur.</td>
<td>Show some critical thinking. Lack of consistency in the critical evaluation of information and viewpoints. Discussion and independent conclusions are inadequate. Significant logical errors are present.</td>
<td>Gives general information about the topic, but some relevant information may be missing, or significance is not clearly explained. Description is generally clear. No significant errors made.</td>
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<td>Reader can follow the presentation with effort. Structure not well thought out. Points are not clearly made. Enough errors in style or grammar occur that they become distracting. Voice may change randomly. May appear disjointed.</td>
<td>Significant lack of critical thinking and perspective. Little independent thinking and conclusions. Authors accept the viewpoints of others without critical consideration. Abundant logical errors.</td>
<td>Insufficient information on the techniques, relevance, and significance is given. Some information is accurate, but enough errors are made to be distracting.</td>
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<td>Presentation is very confused and unclear. Reader cannot follow it or deduce the main points presented. Writing style is consistently at an inappropriate level. Errors are frequent and distracting so that it is hard to determine the meaning. No logical connection of ideas or flow of sentences.</td>
<td>Provides little or no information on the techniques and significance. Information is inaccurate or with many errors. Discussion is very difficult to follow. Reader learns little.</td>
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3. Cheating
   - Cheating will NOT be tolerated. Students guilty of cheating will be given an F in the course.
   - Duplicating an existing work including any online resources without proper citation is considered cheating. The duplication rate of a report beyond 20% will be penalized by deducting 25% of the total points. A report with a duplication rate more than 35% is given a zero grade.
   - 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.

Absenteism Policy
1. Attendance is required for all students without exception.
2. Absence is only allowed in extreme circumstances, e.g., medical emergency. A written evidence is required no later than 5 days after the absence. Exceptions are stated in COVID-19 impact on attendance
3. If a student misses four (4) classes, he/she will be administratively withdrawn from the course or receiving an F grade.
4. Online discussion is considered as attendance. Missing four (4) online discussions is considered as equivalent to four absences.

COVID-19 impact on attendance
1. While attendance is expected as outlined above, it is important for all of us to be mindful of the health and safety of everyone in our community, especially given concerns about COVID-19. Please contact me if you are unable to attend class because you are ill, or unable to attend class due to COVID-19 including symptoms, potential exposure, pending or positive test results, or if you have been given specific instructions to isolate or quarantine from a health care provider or a local authority. It is important that you communicate with me prior to being absent so I may make a decision about accommodating your request to be excused from class.
2. If you are experiencing any symptoms of COVID-19 please seek medical attention from the Student Health and Wellness Center (940-565-2333 or askSHWC@unt.edu) or your health care provider PRIOR to coming to campus. UNT also requires you to contact the UNT COVID Hotline at 844-366-5892 or COVID@unt.edu for guidance on actions to take due to symptoms, pending or positive test results, or potential exposure. While attendance is an important part of succeeding in this class, your own health, and those of others in the community, is more important.

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 ten bonus points will be granted for the ones who complete the survey with an 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.