COMP-5422-FA Computer Vision and Image Analysis

Department of Computer Science

Fall 2023

Instructor Information

Instructor: Dr. Garima Bajwa

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Office Hours: M/W; 1:00 PM - 2:30 PM or by appointment

Course Identification

Course Number: COMP-5422-FA

Course Name: Computer Vision and Image Analysis

Course Location: RB1047

Class Times: M/W; 11:30 am to 1:00 pm

Prerequisites: None

Course Description/Overview

This graduate level course focuses on fundamental concepts of computer vision, image processing and image analysis such as image/video perception, sampling and quantization, transforms, filtering, background and object segmentation, edge detection, feature extraction, shape representation and description, object tracking, classification, and popular machine learning techniques. The outcome of this course is that the students will be able to apply state-of-the-art techniques to some real applications.

Course Learning Objectives

By the end of this course, students will be able to identify basic concepts, terminology, theories, models and methods in the field of computer vision.

Specifically:

- Understand the diverse topics from basic methods of computer vision related to image formation to processing such as convolution, edge detection and detection of other primitives, stereo, motion, and object recognition etc.

- Understand the mathematical and scientific concepts applied in computer vision.

- Understand the new research avenues in computer vision applications.

- Propose and design of a computer vision system for a specific research problem.

Course Resources

*Course Website(s)*

* D2L

*Required Course Text*

* No required text
* Richard Szeliski, Computer Vision: Algorithms and Applications.
* Forsyth & Ponce, Computer Vision: A Modern Approach.
* Gonzalez & Woods, Digital Image Processing.
* Sonka, Hlavac, & Boyle, Image Processing, Analysis, and Machine Vision.
* Strang, Linear Algebra and its Applications.
* Selected research publications and course materials shared by researchers.

Course Schedule/Outline

Week 1 – Sept 6, Introduction

Week 2 – Sept 11-15, Image Formation

Week 3 – Sept 18-22, Image Processing

Week 4 – Sept 25-29, Image Processing/Feature Description

Week 5 – Oct 2-6, Feature Description and Detection

Week 6 – Oct 9-13, *Fall Study Week, No classes*

Week 7 – Oct 16-20, Ransac

Week 8 – Oct 23-27, Exam

Week 9 – Oct 30 – Nov 3, Stereo

Week 10 – Nov 6-10, Optical Flow

Week 11 – Nov 13-17, Machine Learning

Week 12 – Nov 20-24, Project Presentations

Week 13 – Nov 27-Dec 4, Project Presentations

Assignments and Evaluations

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| --- | --- | --- |
| Assignment/Test | Date | Value |
| Assignments (quiz/programs/theory) | bi-weekly | 40% |
| Exam | ~week 8 | 20% |
| Project  Proposal  Interim report  Presentation and demo  Final report and code | ~week 4  ~week 9  ~week 12  Finals week | 40% |

***Late Assignments***

Late submissions will be accepted two days late, with 10% penalty per day and will receive only half credit (50%) after that when turned in. In-class quizzes will not be accepted late.

Submissions will not be accepted after the last class. Any evidence of group participation will be interpreted as academic dishonesty unless it is a group challenge activity/handout.

Course Policies

Submission Policy:

Assignments can be in the form of problem sets or quizzes or programming questions, with a due date posted on D2L.

Email Policy:

Please use only your Lakehead University email for all communication. Include your course title as a prefix in the subject line of your email [Template: COMP-5422-FA: {Subject}]. Send a reminder email if you do not get a response within 48 hours.

Collaboration/Plagiarism Rules

Avoid Plagiarism at all costs. Use citations for ideas that are not yours; Use quoted statements and references; Follow the [Student Code of Conduct - Academic Integrity](https://www.lakeheadu.ca/students/student-life/student-conduct/academic-integrity) - SECTION III: VIOLATIONS OF THIS ACADEMIC INTEGRITY CODE IDENTIFYING OFFENCES (BREACHES OF ACADEMIC INTEGRITY).

If you have any questions, please reach out to me for clarification.

Additionally, posting any course materials (assignments, quizzes, exams, presentations, lecture recording, supplementary resources) to third-party websites without permission is prohibited.

University Policies

Accommodation for Students with Disabilities:

Lakehead University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all their academic activities. If you think you may need accommodations, you are strongly encouraged to contact Student Accessibility Services (SAS) and register as early as possible. For more information, please visit: http://studentaccessibility.lakeheadu.ca