

CS 1674 INTRODUCTION TO COMPUTER VISION (Spring 2025)

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Section 1: Tuesday, 8:15 – 11:00, S103
Section 2: Tuesday, 13:50 – 16:25, S103

Office Hours:

Monday, 9:00 – 17:00. Room 524.

Please send an email to schedule a meeting.

Course Description:

This course provides a comprehensive introduction to computer vision. Major topics include image processing, detection and recognition, geometry-based vision and video analysis. Students will learn basic concepts of computer vision as well as hands on experience to solve real-life vision problems.

Course Objectives:

- Recognize and describe both the theoretical and practical aspects of computing with images or videos. Understand the basics of 2D and 3D Computer Vision.
- Become familiar with the major tasks and technical approaches involved in computer vision, including advanced concepts for discriminative or generative tasks based on deep learning techniques.
- Connect issues between Human Vision and Computer Vision. Build computer vision applications.

Prerequisites:

CS1501 Algorithm Implementation

Textbook:

Computer vision: algorithms and applications (2nd edition). Szeliski, Richard. Springer Nature. 2022.

Assessment:

Attendance	10%
Assignments	40%
Project	50%

List of Topics:

- Introduction
- Low-Level Vision:
 - (1) Image Filtering and Resampling.
 - (2) Feature Detection.
 - (3) Feature Description and Matching.
 - (4) Geometric Transformations and Multiple Views.
 - (5) Motion and Tracking.
- Deep Learning Basics:
 - (1) Introduction to Deep Learning.
 - (2) Training Deep Learning Models.
 - (3) Encoder-Decoder for Latent Analysis.
 - (4) Convolutional Layers and Recurrent Layers.
 - (5) Vision Transformer.
 - (6) Generative Models: Generative Adversarial Networks and Diffusion Models.
- High-Level Vision:
 - (1) Image/Video Classification, Detection, Recognition and Segmentation.
 - (2) Image/Video Generation.
 - (3) Vision for Surveillance: Anomalous Behavior/Event Detection.

Mitigating Circumstances:

If you have a medical situation or any personal circumstances that substantially affect your study or exam. You are encouraged to contact the department or the instructor as soon as possible. With valid proof, mitigation may be applied when assessing your assignments, coursework or exam sheets.

Course Policies:

- Please regularly check the announcements on Blackboard
- We can not assure instant respond to emails, we suggest bring urgent questions to face-to-face sessions.
- Google skill is one of the most important skills in Computer Science study, try Google your questions first.
- Treat ChatGPT as an auxiliary tool only. Use your brain first because it is much more powerful.
- Zero-tolerance to both two persons in plagiarism. Checks will be done to detect plagiarism.
- Late submissions cause penalties, unless due to approved mitigating circumstances, prior to the deadline.
- Students with documented emergencies, after careful evaluation, may jump to the make-up exam.
- All course materials or any recordings are for your personal use and for educational purposes only.

Learning Outcomes:

- Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.
- Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
- Apply computer science theory and software development fundamentals to produce computing solutions.
- An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.