

MET CS790 Computer Vision in AI

Instructor Name: Ming Zhang

Course Dates: check online

Office Location: 1010 Commonwealth Ave, RM324

Course Time & Location: check online

Contact Information: mzhang2@bu.edu

Course Credits: 4

Grader:

Office Hours: TBD

Course Description

This course offers an in-depth exploration of fundamental and advanced topics in computer vision, with a focus on integrating artificial intelligence and deep learning techniques. Students will study core principles, including image processing, feature extraction, object detection, and visual recognition, while engaging with modern deep neural architectures that power today's vision systems. Through hands-on projects and real-world applications, students will develop the ability to design, train, and evaluate computer vision models for diverse domains, including autonomous systems, healthcare, and multimedia analysis. By the end of the course, students will possess both the theoretical foundation and practical skills necessary to apply computer vision methods effectively in research and industry settings

Prerequisite:

CS566 Analysis of Algorithms or equivalent, or Instructor consent

Textbooks (Recommended):

- “Digital Image Processing” 4th Edition, Rafael Gonzalez and Richard Woods, Pearson Prentice Hall, 2017, ISBN 97801333356724. [E-book](#)
- “Advanced Applied Deep Learning: Convolutional Neural Networks and Object Detection” 1st Edition, Umberto Michelucci, Apress, ISBN 9781484249758

Course Objectives:

By successfully completing this course, students will be able to:

- **Understand** the key concepts, methods, and challenges in modern computer vision.
- **Design, implement, and evaluate** deep learning models to address real-world computer vision problems.
- **Apply** state-of-the-art computer vision techniques to diverse domains such as object detection, image segmentation, and scene understanding.
- **Communicate** technical findings effectively through presentation, report, and project documentation.

Instructional Format, Course Pedagogy, and Approach to Learning

This course will combine traditional lecturing with hands-on assignments that reinforce the lecture material. In particular, lectures focus on concepts and ideas, while assignments provide substantial experience and opportunities for skill development.

Courseware

The class has a Blackboard site that contains the syllabus, lectures, assignments, and other course-related materials. You can log in to the Blackboard page at: <https://learn.bu.edu/>

Graded Items:

- **Assignments:** There are a total of four assignments.
- **Final Project Presentation:** Students learn one topic from a list of topics, implement the algorithm, prepare a presentation, and write a final report/paper. In the final project presentation, students will present their work for 8 to 12 minutes.
- **Exam:** There will be an Exam in this course.

Overall Grading Percentages

Four Assignments	30
Final Project	40
Exam	30

Letter Grade

100-95.00	A	74.99-70.00	C+
94.99-90.00	A-	69.99-65.00	C
89.99-85.00	B+	< 65	F
84.99-80.00	B		
79.99-75.00	B-		

Class Policies

Assignment Completion & Late Work: We recognize that emergencies occur in professional and personal lives. If one occurs that prevents you from completing your homework by the deadline, please share the plan with the instructor. This must be done before the deadline (unless an emergency makes it impossible, of course) and should be accompanied by supporting particulars. Additional documentation may be requested. Late submissions without a valid reason will result in a grade deduction. **Late submissions without reasons will not be accepted.** There will be no make-up exam for the final exam. Students who are unable to take the final exam on the designated day will receive an incomplete grade. If you have any questions about your grading, please contact the grader and cc me **before the next assignment/quiz** (before the final exam for the last assignment/quiz). After that, we will not discuss the grade for that assignment/grade.

Academic Conduct Code: Cheating and plagiarism will not be tolerated in any Metropolitan College course. They will result in no credit for the assignment or examination and may lead to disciplinary actions. See link below

http://www.bu.edu/met/metropolitan_college_people/student/resources/conduct/code.html

Please do not share our class Assignments, Quizzes, and Exams on online websites like Coursehero, Chegg, etc. We are monitoring these sites and sending takedown requests to the providers. Our class material is protected by Boston University Copyright.

Resources/Support/How to Succeed in This Course:

Office hours, Blackboard discussion board, etc.

Disability and Access Services

By university policy, every effort will be made to accommodate students with speech, hearing, vision, or other disabilities. Any student needing accommodation for a documented disability should contact [Disability and Access Services](#) at 617-353-3658 or access@bu.edu for review and approval of accommodation requests.

Once students receive their accommodation letter, they must send it to the instructor and/or facilitator each semester. They must also send a copy to the Faculty & Student Support Administrator, who may need to update the course settings to ensure accommodations are in place. Accommodations cannot be implemented if the student does not send their letter.

Academic Conduct Policy

Please visit Metropolitan College's website for the full text of the department's [Academic Conduct Code](#).

A Definition of Plagiarism

"The academic counterpart of the bank embezzler and of the manufacturer who mislabels products is the plagiarist: the student or scholar who leads readers to believe that what they are reading is the original work of the writer when it is not. If it could be assumed that the distinction between plagiarism and honest use of sources is perfectly clear in everyone's mind, there would be no need for the explanation that follows; merely the warning with which this definition concludes would be enough. But it is apparent that sometimes people of goodwill draw the suspicion of guilt upon themselves (and, indeed, are guilty) simply because they are not aware of the illegitimacy of certain kinds of "borrowing" and of the procedures for correct identification of materials other than those gained through independent research and reflection."

"The spectrum is a wide one. At one end, there is a word-for-word copying of another's writing without enclosing the copied passage in quotation marks and identifying it in a footnote, both of which are necessary. (This includes, of course, the copying of all or any part of another student's paper.) It hardly seems possible that anyone of college age or more could do that without clear intent to deceive. At the other end there is the almost casual slipping in of a particularly apt term which one has come across in reading and which so aptly expresses one's opinion that one is tempted to make it personal property."

"Between these poles there are degrees and degrees, but they may be roughly placed in two groups. Close to outright and blatant deceit-but more the result, perhaps, of laziness than of bad intent-is the patching together of random jottings made in the course of reading, generally without careful identification of their source, and then woven into the text, so that the result is a mosaic of other people's ideas and words, the writer's sole contribution being the cement to hold the pieces together. Indicative of more effort and, for that reason, somewhat closer to honest, though still dishonest, is the paraphrase, and abbreviated (and often skillfully prepared) restatement of someone else's analysis or conclusion, without acknowledgment that another person's text has been the basis for the recapitulation."

The paragraphs above are from H. Martin and R. Ohmann, *The Logic and Rhetoric of Exposition, Revised Edition*. Copyright 1963, Holt, Rinehart and Winston.

Academic Conduct Code

I. Philosophy of Discipline

The objective of Boston University in enforcing academic rules is to foster a community atmosphere that promotes optimal learning conditions. Such an atmosphere can be maintained only so long as every student believes that his or her academic competence is being judged fairly and that he or she will not be put at a disadvantage because of someone else's dishonesty. Penalties should be carefully determined so as to be no more and no less than required to maintain the desired atmosphere. In defining violations of this code, the intent is to protect the integrity of the educational process.

II. Academic Misconduct

Academic misconduct is conduct by which a student misrepresents his or her academic accomplishments, or impedes other students' opportunities to be judged fairly for their academic work. Knowingly allowing others to represent your work as their own is as serious an offense as submitting another's work as your own.

III. Violations of this Code

Violations of this code comprise attempts to be dishonest or deceptive in the performance of academic work in or out of the classroom, alterations of academic records, alterations of official data on paper or electronic resumes, or unauthorized collaboration with another student or students. Violations include, but are not limited to:

- A. **Cheating on examination.** Any attempt by a student to alter his or her performance on an examination in violation of that examination's stated or commonly understood ground rules.
- B. **Plagiarism.** Representing the work of another as one's own. Plagiarism includes but is not limited to the following: copying the answers of another student on an examination, copying or restating the work or ideas of another person or persons in any oral or written work (printed or electronic) without citing the appropriate source, and collaborating with someone else in an academic endeavor without acknowledging his or her contribution. Plagiarism can consist of acts of commission-appropriating the words or ideas of another-or omission failing to acknowledge/document/credit the source or creator of words or ideas (see below for a detailed definition of plagiarism). It also includes colluding with someone else in an academic endeavor without acknowledging his or her contribution, using audio or video footage that comes from another source (including work done by another student) without permission and acknowledgement of that source.
- C. **Misrepresentation or falsification of data** presented for surveys, experiments, reports, etc., which includes but is not limited to: citing authors that do not exist; citing interviews that never took place, or field work that was not completed.
- D. **Theft of an examination.** Stealing or otherwise discovering and/or making known to others the contents of an examination that has not yet been administered.
- E. **Unauthorized communication during examinations.** Any unauthorized communication may be considered prima facie evidence of cheating.

- F. **Knowingly allowing another student to represent your work as his or her own.** This includes providing a copy of your paper or laboratory report to another student without the explicit permission of the instructor(s).
- G. **Forgery, alteration, or knowing misuse of graded examinations, quizzes, grade lists, or official records of documents,** including but not limited to transcripts from any institution, letters of recommendation, degree certificates, examinations, quizzes, or other work after submission.
- H. **Theft or destruction of examinations or papers** after submission.
- I. **Submitting the same work in more than one course** without the consent of instructors.
- J. **Altering or destroying another student's work or records,** altering records of any kind, removing materials from libraries or offices without consent, or in any way interfering with the work of others so as to impede their academic performance.
- K. **Violation of the rules governing teamwork.** Unless the instructor of a course otherwise specifically provides instructions to the contrary, the following rules apply to teamwork: 1. No team member shall intentionally restrict or inhibit another team member's access to team meetings, team work-in-progress, or other team activities without the express authorization of the instructor. 2. All team members shall be held responsible for the content of all teamwork submitted for evaluation as if each team member had individually submitted the entire work product of their team as their own work.
- L. **Failure to sit in a specifically assigned seat during examinations.**
- M. **Conduct in a professional field assignment that violates the policies and regulations of the host school or agency.**
- N. **Conduct in violation of public law occurring outside the University that directly affects the academic and professional status of the student, after civil authorities have imposed sanctions.**
- O. **Attempting improperly to influence the award of any credit, grade, or honor.**
- P. **Intentionally making false statements to the Academic Conduct Committee or intentionally presenting false information to the Committee.**
- Q. **Failure to comply with the sanctions imposed under the authority of this code.**

Tentative Schedule

The following schedule is tentative and subject to change.

Week	Topics	Lecture	Works due
1	Digital Image Introduction	Lecture 1	
2	Image Enhancement, Binary Image Analysis	Lecture 2	Assign 1
3	Image Filtering	Lecture 3	
4	Edge Detection	Lecture 4	Assign 2
5	Image Segmentation	Lecture 5	
6	Feature Extraction and Classification	Lecture 6	Assign 3
7	Spring Break		
8	Midterm Exam		
9	Final Project Introduction	Lecture 7	

10	Convolutional Neural Network (CNN)	Lecture 8	Assign 4
11	Evolution of Deep Learning and Applications	Lecture 9	
12	Generative AI, GPU, Cloud Computing	Lecture 10	Proposal
13	Technical Paper Writing	Lecture 11	Assign 5
14	Final Words	Lecture 12	
15	Final Presentation		Poster and code