SYLLABUS

CMPS 5323 – Graduate Topics in Computational Science: AI applications

Course Description

This course explores modern AI applications, focusing on how neural networks learn from large-scale data to recognize patterns and make predictions. Topics include natural language processing (e.g., chatbots) and autonomous systems, covering the full pipeline—from data and model architectures (CNNs, RNNs, Transformers) to training, evaluation, and responsible AI (bias, interpretability, privacy, and safety).

Instructor	Dr. Mahmoud Eldefrawy
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Lectures	TR 2:00 pm – 3:20 pm Bolin Hall 111
Office Hours	MW 3:30 pm – 5:00 pm, TR 1:45 pm – 2:45 pm & by Appt

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Prerequisites: CMPS 2433 and MATH 1634.

Course Website

D2L - All important class documentation, assignments, news items, and your gradebook will be posted here.

Optional Textbook and Materials

- Deep Learning by Aaron Courville, Ian Goodfellow, and Yoshua Bengio.
- Deep Learning with Python by François Chollet 3rd editions.
- Supplementary material and lecture slides on D2L.

General Topics

- Python (Pandas, Numpy, Scikit learn, PyTorch, TensorFlow)
- Image Classification
- Common ConvNet Architectures
- Interpreting what ConNet learn
- Image Segmentation
- Object Detection
- Time Series forecasting
- Text Classification
- Language Models and the Transformer
- Text Generation
- Image Generation
- Best Practices

Instructional Methods and Techniques:
The class will meet twice a week for 1 hour and 20 minutes per session, consisting of lecture and discussion periods. Some lectures may be supplemented with handouts, which will be available on D2L. Certain sessions will include coding labs. You are encouraged to use your laptop during these labs; if you choose to work on lab computers, please ensure that you back up your work regularly.

Exams and Assignments
There will be two exams cover material from the lectures and any supplementary material. Some textbooks and their resources are freely available, and it is part of the supplementary material. Projects are expected to be working, complete, has a good programming style. A report will also be expected for each project. ***All programs must be turned in to pass the course – see program grading policy in D2L.***

Course Evaluation

Assignments	= 45%
Two exams and quizzes	= 35%
Final project and report	= 20%

Grades may be determined according to this scale (approximate):

A	90% - 100%	C	70% - 79%
B	80% - 89%	D	55% - 69%

Course and Department Policies

Attendance Policy
Although student attendance is not calculated into the grade, attendance will be taken each day to track students. If a student is absent more than 3 classes and is not performing well in class, a report will be submitted to the Dean of Students and the student may be dropped from the class. Classes will not be streamed for absent students, whether it is excused or not.

Behavior in the classroom
Students are to assist in maintaining a classroom environment that is conducive to learning. This means that the presence of electronic devices other than your calculator are not to be seen, heard, or implied, ever. Questions are encouraged and discussion is acceptable, provided it is pertinent and does not distract from the lesson.

Make Up Work/Exams/Quizzes: Students need a valid university excuse (e.g., excuse from the doctor, death in the immediate family, etc.) to make up work or tests.

- For planned *excused* absences: Exam/Quiz may be taken early by prior arrangement.
- For unplanned *excused* absences: Student must make up a missed exam within 4 working days. All other missed exams will receive a zero.

Late Work

Late programs will be accepted up to 5 days late with a 10 point deduction per day. ***No late programs for last programming assignment. No late homework will be allowed in the Connect System.***

Computer Requirements: Taking this class requires you to have access to a computer (with Internet access) to access online course material. It is recommended in some lecture to bring your computer (with Internet access) to follow with some labs. The class utilizes Google Colab which is a free cloud-based Jupyter notebook environment provided by Google. It enables users to write and execute Python code in an interactive setting, without requiring any local setup. However, it will require a Gmail account. ***Personal computer technical difficulties will not be considered a reason for extra time to submit assignments, tests, or online discussion postings.*** Computers are available on campus in various areas of the buildings, as well as in the library. Contact your instructor immediately upon having computer trouble. If you have technical difficulties in the course, there is also a student helpdesk available to you. The university cannot work directly on student computers due to both liability and resource limitations, however they are able to help you get connected to our online services. For help, log into **D2L.**

Policy on Testing Process

The Department of Computer Science has adopted the following policy related to testing.

- All bags, purses, electronics (turned off), books, etc. will be placed in the front of the room during exams, or in an area designated by the instructor.
- Unless otherwise announced by the instructor, nothing is allowed on the desk but pen/pencil/eraser and test papers.
- A student who leaves the room during an exam must turn in the test and will not be allowed to return.

Policy on Programs

- Tests *will* have questions covering out-of-class assignments. Know the material!
- Students will be invited to orally answer questions regarding their assignments in my office and failure to answer those questions correctly will result in deductions from their grades. (Every student can expect to be invited 1-2 times during the semester to answer questions.)

Computer Science Tutoring

Tutoring is available in the ***Office of Tutoring and Academic Support Programs (TASP)*** in Moffett Library. A tutor may assist with programs and homework for computer science classes. The tutor will not do your work.

Academic Misconduct Policy & Procedures

Academic misconduct is cheating, collusion, and plagiarism: it is the act of using either published or unpublished source material of other students, persons, or generative AI (unless there are instructions that allow it), and must follow accepted techniques of crediting. The Department of Computer Science has adopted the following policy related to academic misconduct. The policy will be applied to all submission of work for credit as determined by the instructor of the course, e.g., assignments, quizzes and exams. (See below for link to MSU definitions.)

- *1st instance* of cheating in the program: The student will be assigned a non-replaceable grade of zero for the assignment, project or exam. If the final grade in the course, does not result in a one letter grade reduction, the student will receive a one letter grade reduction in course.
- *Further instances* of cheating in any course within the program: The student will receive a grade of F in the course & be removed from the course.
- All instances of cheating will be reported to the Department Chair, the MCOSME Dean, the Dean of Graduate Students, if a graduate student, and the Office of Rights and Responsibilities, who may decide at their own discretion to impose a stiffer sanction based on knowledge of other instances of cheating at MSU Texas.

Note: Letting a student look at your work is collusion and is academic misconduct!

See Also: MSU Student Handbook: Appendix E: Academic Misconduct Policy & Procedures
https://msutexas.edu/student-life/_assets/files/handbook.pdf.

Recording of Class Lectures

Permission must be requested in writing and obtained from the instructor before recording of class lectures. If permission is granted, the recording may only be used by the student making the recording. Recordings (or any class materials) may NOT be posted on any internet source without written permission of the instructor. Failure to adhere to the policy may result in removal from the course with a grade of F or other appropriate punishment.

University Policies and Procedures

Student with Disabilities

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible. Students should present appropriate verification from Disability Support Office during the instructor's office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification has been provided. For additional information, contact the Disability Support Office in Clark Student Center 168 - Phone: (940) 397-4140

Policy on Concealed Handguns on Campus

Senate Bill 11 passed by the 84th Texas Legislature allows licensed handgun holders to carry *concealed* handguns on campus, effective August 1, 2016. Please note, open carry of handguns, whether licensed or not, and the carrying of all other firearms, whether open or concealed, are prohibited on campus. Areas excluded from concealed carry are appropriately marked, in accordance with state law. For more information regarding campus carry, please refer to the University's webpage at MSU Campus Carry Policy *https://msutexas.edu/campus-carry/rules-policies*. If you have questions or concerns, please contact MSU Chief of Police Steven Callarman at Steven.callarman@msutexas.edu.

Midterm Progress Report

In order to help students keep track of their progress toward course objectives, the instructor for this class will provide a Midterm Progress Report for all students in the course through each student's MSU Portal account. Midterm grades will not be reported on the students' transcript; nor will they be calculated in the cumulative GPA. They simply give students an idea of where they stand at the midpoint of the semester. Students earning below a C at the midway point should a) schedule a meeting with the professor and b) Seek out tutoring.

Opt-out for Digital Course Materials

Required digital materials for this course are part of the Courseware Access and Affordability Program at MSU Texas. Students are charged for required course materials on their student account with the Business Office. Any students who wish to opt-out of the Program and purchase the required course materials on their own must do so prior to 1/26/24. Opt-out instructions are sent to students' official my.msutexas.edu email address after the first day of class. Please contact the MSU Bookstore if you have any questions about the opt-out process.

Important Dates

Visite MSU's Registrars website Important Dates https://msutexas.edu/registrar/