CHAMPLAIN COLLEGE

DAT-410 Machine Learning

- **Instructor:** Vikas Thammanna Gowda
- **Division:** Information Technology & Sciences
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- **Office Location:** West Hall 100
- **Office Hours:** M/T 1:30 PM to 3:30 PM
- **Classroom Location:** Joyce, Room 210
- **Classroom Day/Time:** M/TH 11:30 AM – 12:45 PM
- **Prerequisite:** CSI-270 or CSI-281

How to use this syllabus

This syllabus provides you with information specific to this course. This document should be viewed as a course overview; it is not a contract and is subject to change as the semester evolves.

*****Changes will be announced via CANVAS and during lectures*****

Academic Integrity

In addition to skills and knowledge, Champlain College aims to teach students appropriate Ethical and Professional Standards of Conduct. The Academic Honesty Policy exists to inform students and Faculty of their obligations in upholding the highest standards of professional and ethical integrity. All student work is subject to the Academic Honesty Policy. Professional and Academic practice provides guidance about how to properly cite, reference, and attribute the intellectual property of others. Any attempt to deceive a faculty member or to help another student to do so will be considered a violation of this standard.

The student's work must match the instructor's intended purpose for an assignment. While the instructor will establish the intent of an assignment, each student must clarify outstanding questions of that intent for a given assignment. The full text of the Academic Honesty Policy is in the *Student Handbook*.

I have zero tolerance for academic dishonesty. This means that a first offense results in an F for the course and the student shall be reported.

Course Description

This course provides an introduction to the foundational concepts and techniques in machine learning, equipping students with the skills to analyze and build predictive models. Students will explore various types of machine learning, including supervised, and unsupervised approaches. Students will also become familiar with artificial neural networks and their use in prediction modeling. Software packages and tools related to machine learning algorithms will also be covered.

Measurable Student Learning Outcomes

After passing this course, students will be able to:

1. Explain the fundamental concepts and types of machine learning, including supervised, and unsupervised approaches.
2. Perform data pre-processing to prepare raw datasets for machine learning models.
3. Build and evaluate regression models and decision trees for predictive analysis.
4. Apply ensemble methods and optimization techniques to improve model performance.
5. Implement dimensionality reduction techniques to handle high-dimensional datasets effectively.
6. Develop and train neural networks to solve real-world problems.
7. Evaluate model accuracy using cross-validation and other validation techniques.
8. Critically analyze and interpret machine learning results to provide actionable insights.

Topics Covered

- Introduction to machine learning and its types
- Data pre-processing
- Dimensionality reduction
- Simple and multiple-linear regression.
- Decision Trees, Ensemble learning, Random Forest
- Gradient descent and cross-validation.
- Semi-supervised learning*
- Neural networks.

Textbooks

Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems 3rd edition, by Aurélien Géron. O'Reilly publishers.

Other Equipment

Students are required to have complete access to a functioning laptop or PC with internet capabilities. It is strongly recommended that the computer is capable of having an ANACONDA environment installed on it.

Class Protocol

The primary method of instruction is through class lectures. This is a skill-building course, and the programming assignments are the backbone of the course. Thus, students are expected to attend classes regularly, actively read the textbooks, and most importantly, complete all programming assignments.

Attendance: Regular class attendance is essential for your success in this course. Many classes will include discussions and/or activities that are critical to your learning experience. If you miss a class, it is your responsibility to:

1. **Meet with the Instructor**: Schedule a meeting with the instructor to discuss what you missed and how to make up for it.
2. **Consult Your Peers**: Reach out to your classmates to gather any notes, solutions, or insights from the missed session.

Grading Policy

Your letter grade will be based on the following components:

Programming Assignments:	30%
Quizzes:	20%
Final Exam:	20%
Project:	30%

Grading Scale

>= 93.00	A	73.00 - 76.99	C
90.00 - 92.99	A-	70.00 - 72.99	C-
87.00 - 89.99	B+	67.00 - 69.99	D+
83.00 - 86.99	B	63.00 - 66.99	D
80.00 - 82.99	B-	60.00 - 62.99	D-
77.00 - 79.99	C+	<= 59.99	F

Note: *The grades will be curved only if the average attendance of the entire class is 90% or higher throughout the semester.*

Programming assignments: You will have 3 assignments. They are due 1-2 weeks from the day they are assigned depending on the content.

Quizzes: You will have 5-6 quizzes. They will be a closed-book quiz.

Note: *Quizzes will be held at the beginning of the class, and no additional time will be given to latecomers.*

Final exam: Held during the finals week. It will be a closed-book exam.

Project: Multi-class image classification. To find out more information about the semester projects, please log into Canvas and access this course. All of the requirements, particulars and all deliverables are contained in this section of the course in Canvas. You are totally and completely responsible for meeting all project requirements. Failure to meet these requirements will lead you to earn an "F" for the project. This will negatively impact your grade in this course. Feel free to discuss any aspects of the project with your instructor.

Tentative schedule

Week	Topics
1	Introduction
2*	Introduction, Data pre-processing
3	Data pre-processing (Unsupervised ML)
4	Data pre-processing (Unsupervised ML), Supervised ML
5	Supervised ML

6	Supervised ML, Performance evaluation
7	Performance evaluation, Model Validation
8	Model Validation
9	Buffer
10	**Spring break**
11	Semi-supervised ML *
12	Deep learning: Perceptron, MLPs, Backpropagation
13	Activation functions, Loss functions
14	Convolutional Neural Networks (CNN)
15	Project presentations

Contact Policy

Feel free to email me any questions or concerns following these guidelines:

- **Always use the course name in the subject line of the email.**
- Remember to sign your name.
- Always email me from your Champlain College email address. Email sent from personal email servers like Gmail, Yahoo, etc., tend to end up in my spam folder, and I never see them.

Response Time

No more than 2 days. After 2 days, assume something happened and reach out again.

Missed Assignments and Exam

Normally, assignments/exams cannot be made up. If an emergency arises, it can be handled on a case-by-case basis.

IMPORTANT: Notify your instructor as early as reasonably possible. It is always much easier to come to an agreement if the instructor has prior knowledge or is made aware as early as reasonably possible.

Students with Disabilities

If you believe that you have a disability requiring accommodation in this class, please contact the Coordinator of Services for Students with Disabilities as soon as possible. You will be able to schedule a meeting with either Skip Harris or Maggie

Riley and have your documentation reviewed. During that meeting Skip or Maggie will provide you with letters for your faculty, which will detail your needed accommodation. It is the student's responsibility to seek and secure accommodation prior to the start of an exam or project.