**Syllabus**

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| **Course Number** | COMP 4220 – 201 |
| **Course Title** | Machine Learning |
| **Credits** | 3 |
| **Semester/Class** | Spring 2023 / Thursday 3:30 – 6:20 / Falmouth 209 - NC |
| **Faculty** **Name** | Chris Geggis |
| **Office Hours** | Before Class/After Class |
| **Contact Info for Office Hours** | Christoper\_Geggis@uml.edu |
| **Phone/Email** | Christoper\_Geggis@uml.edu |

**Course Description**

This introductory course gives an overview of machine learning techniques used in data mining and pattern recognition applications. Topics include: foundations of machine learning, including statistical and structural methods; feature discovery and selection; parametric and non-parametric classification; supervised and unsupervised learning; use of contextual evidence; clustering, recognition with strings; small sample-size problems and applications to large datasets.

**Course Learning Outcomes**

Upon completion of this course, the students will demonstrate the ability to:

1.  Program a Quantum Computer (assuming they are online)

2.  Demonstrate the ability to create a machine that learns to look for patterns in a dataset

3. Learn how machines learn, and demonstrate the ability to answer questions about ML

**Textbook/Readings/Videos**

Required - Artificial Intelligence – A Modern Approach *Fourth Edition*, by Stuart J. Russell and Peter Norvig

<http://neuralnetworksanddeeplearning.com/> (Text and Program)

<https://www.youtube.com/watch?v=aircAruvnKk&list=PLZHQObOWTQDNU6R1_67000Dx_ZCJB-3pi>

How to install Qiskit (YouTube)

O’Reilly Online (UML Library)

**General Information**

A. Teaching Methods:

Lectures, Reading, Assignments

B. Attendance and Participation:

Students are expected to attend class regularly, as regular attendance is one of the most important contributors to student success. However, students may occasionally need to miss class due to illness, emergency, or caring for a sick family member. In such cases, you are responsible for notifying me of your absences and working with me to arrange to make up any missed work.

Likewise, if I should become ill or need to miss class, I will communicate with you via email as soon as possible with clear instructions.

C. Assessment and Evaluation Methods:

Attendance, Assignments, Quizzes, Mid-Term, Final Exam

E. Student Mental Health and Well-being

We are a campus that cares about the mental health and well-being of all individuals in our campus community. If you or someone you know are experiencing mental health challenges at UMass Lowell, please contact [Counseling Services](https://www.uml.edu/student-services/counseling/), who are offering remote counseling via telehealth for all enrolled, eligible UMass Lowell students who are currently residing in Massachusetts or New Hampshire.  In addition, a crisis counsellor is available 24 hours a day, seven days a week at 855-890-2879.

F. Disability Services

If you have a documented disability that will require classroom accommodations, please notify me as soon as possible, so that we might make appropriate arrangements. Please speak to me during office hours or send me an email, as I want to protect your privacy. Visit the [Student Disability Services webpage](https://www.uml.edu/student-services/Disability/) for further information and to register with that office if you require accommodations.

Additionally, Student Disability Services supports software for ALL students. Read&Write Gold is literacy software that allows you to read on-screen text aloud, research and check written work, and create study guides. You can download the software from the IT Software webpage on the UML website: [IT Software page](https://www.uml.edu/IT/Services/Software/Read-Write-Gold.aspx)

G. Diversity, Inclusion, and Classroom Community Standards:

UMass Lowell—and your professor—value human diversity in all its forms, whether expressed through race and ethnicity, culture, political and social views, religious and spiritual beliefs, language and geographic characteristics, gender, gender identities and sexual orientations, learning and physical abilities, age, and social or economic classes. Diversity and individual differences are respected, appreciated, and recognized as a source of strength in this class. Please interact respectfully with one another.

H. Academic Integrity Policy:

Students are responsible for the honest completion and representation of their work and are held to the highest standards of integrity. Please review the [University policy regarding academic integrity](https://www.uml.edu/catalog/undergraduate/policies/academic-policies/academic-integrity.aspx). If you choose to remain in this course, you must agree that you will neither give nor receive any unauthorized help on your homework, papers, exams, or other work.

I. Cell Phones and Other Devices:

Laptops are OK, cell phones, not as much

J. Credit Hour Policy

Federal definition of a credit hour requires that for every course credit awarded, a course must offer 15 hours of instructor-led course activities and 30 hours of out-of-class student work.  This means that a standard 3 credit hour course requires 45 hours of instructor-led course activities and 90 hours of out-of-class student work.

K. University Privacy Statement

UMass Lowell recognizes the importance of mutual trust between students and faculty. Neither faculty nor students may record video or audio of a course or private conversation without all parties' consent. Massachusetts is a two-party consent state, which means it is illegal to record someone without their permission. Recordings of classroom lectures are the intellectual property of the instructor. Instructors have the right to prohibit audio and video recording of their lectures, unless the requesting student is registered with Disabilities Services and recording of class sessions is an approved accommodation. In addition, sharing of or selling recordings of classroom activity, discussions or lectures with any other person or medium without permission of the instructor is prohibited.

I am making video recordings of my lectures, and I require written consent to share these video recordings with anyone. I have no plans to make my recordings public, but I reserve the right to change my mind regarding this statement.

**Course Requirements**

1. Attendance – 10%
2. Quizzes – 10%
3. Mid-Term – 10%
4. Assignments – 30%
5. Final Project – 15%
6. Final Exam – 25 %

Late assignments will be penalized.

**Course Outline & Class Schedule:**

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| **Date** | **Topic** | **Resources/Assignment** |
| Session 1  1/19/23 | Go over Syllabus  Introductions  Overview of Future Material  Intro to Deep Learning | Read Chapter 1 of - Artificial Intelligence – A Modern Approach *Fourth Edition*, by Stuart J. Russell and Peter Norvig  Create an Ubuntu System using Virtual Box  <https://ubuntu.com/tutorials/how-to-run-ubuntu-desktop-on-a-virtual-machine-using-virtualbox#1-overview>  Output of “uname -a” from terminal program  This will be your signature for future assignments  Name an innovation besides “a smart phone” (but an aspect of the smart phone is acceptable) that had a positive impact on your life. |
| Session 2  1/26/23 | Bayes Theorem (Chapter 12.5), Intelligent Agents, Adversarial Search and Games |  |
| Session 3  2/2/23 | Chapter 10 – Knowledge Representation |  |
| Session 4  2/9/23 | Clustering, Learning from Examples (Chapter 19), Part 1, Decision Trees, Error Rate & Reduction, Model Selection | Final Project dataset selection required by this date |
| Session 5  2/16/23 | Chapter 19, Learning from Examples, Part 2, SVMs (Support Vector Machines), Ensemble Learning, etc. |  |
| Session 6  2/23/23 | Mid-term |  |
| Session 7  3/2/23 | IBM Quantum Computing, HPC (High Performance Computing) |  |
| 3/9/23 | No Class (Spring Break) |  |
| Session 8  3/16/23 | Chapter 20, Learning Probabilistic Models |  |
| Session 9  3/16/23 | Chapter 21, Deep Learning |  |
| Session 10  3/23/23 | Chapter 22, Reinforcement Learning |  |
| Session 11  3/30/23 | Chapter 23, Natural Language Processing |  |
| Session 12  4/6/23 | Chapter 24, Deep Learning for NLP |  |
| Session 13  4/13/23 | Chapter 25, Computer Vision |  |
| Session 14  4/20/23 | Chapter 27, Philosophy, Ethics, and safety of AI/ML | Final Project due, midnight 4/19/23 |
| Session 15  4/27/23 | Chapter 28, The Future of AI |  |
| Between 04/??/23 and 05/??/23 | Final Exam |  |