IA651: Machine Learning

Spring 2025

Instructor Contact Information

Instructor: **Michael Gilbert**

- Bertrand Snell Hall 209 (Second Floor Corner Office)
- mgilbert@clarkson.edu

Slack: https://dataanalytics-9i15755.slack.com/archives/C08715PGUJ1

Office Hours: Wednesday-Friday 2-4 and By Appointment (Just Ping me in Slack)

GAs:

- **Nagarjuna Vaduguru**
  - nvadugu@clarkson.edu
- Office Hours: Monday and Wednesday 11AM to 1PM (Bertrand Snell Hall 238)

Zoom link (office hours): https://clarkson.zoom.us/j/4027595142

Section Meeting and Zoom Links:

Section 1 (11-12:15): 239 Bertrand H. Snell Hall
https://clarkson.zoom.us/j/99262871350

Section 2 (2:30-3:45): 239 Bertrand H. Snell Hall
https://clarkson.zoom.us/j/93694984505

Text/Materials:

We will use a mix of materials for the course, including textbooks, journal articles, and other online open-source resources, but mainly this textbook. All other required materials will be available on the Moodle page.

- *Hand-On Machine Learning with Scikit-Learn, Keras and TensorFlow* Aurelien Geron, 3rd Edition

Course Description:

IA651 covers conceptual and practical skills needed to approach machine learning problems. The course helps students identify categories of problems in machine learning and applied statistics. Emphasis is put on feature engineering, regularization and understanding what type of problems are best solved with machine learning. Students will use the Python programming language to inspect data and solve problems.

Course Topics:

1. Introduction
2. Machine Learning Overview and Landscape/Basic Mathematical Notation and Definitions/Fundamental Concepts
3. Python, Pandas and Numpy
4. Data Prep and Preprocessing/Feature Engineering
5. Linear Regression and SGD/Regularization Techniques
6. Logistic Regression and Performance Measures
7. Time Series
8. SVM
9. Unsupervised Learning/PCA
10. Decision Trees/Ensemble Learning and Random Forests
11. Neural Networks
12. CNNs

Also see below course schedule with readings, homework due dates and quiz dates.

2025_01_IA651 Course Schedule

The topic list above approximately breaks to roughly one topic per week. The content and ordering of the topics are very flexible and I encourage any student who has a desire to learn about any NLP related topic to step forward and let us know what that might be so we can include it in the course, provided it doesn't interrupt the overall flow of the course.

Learning Objectives:

In this course students will:

1. Learn to work with data using Python, Pandas and Numpy
2. Learn to feature engineer and prepare data for various machine learning algorithms.
3. Understand and be able to implement various machine learning algorithms to a variety of use cases.
4. Understand high level machine learning concepts and be able to apply those concepts to real world situations.

Technology

Computer System & Software Requirements

- Software Accessibility Policies in General
- Software Privacy Policies in General
- Python
- Excel, Word
- Slack (for messaging, class discussion threads)

Minimum Technology Skills

- Use a learning management system
- Create and submit files in commonly used formats
- Basic familiarity with coding (some course support provided)
- Create and use spreadsheets in excel
- Download and install software

Grading

Grade will be based on overall course performance, with an approximate breakdown as follows:

- **Homework Assignments (15%) –** the exercises like activities are meant to explore application of techniques and algorithms and software. Students should expect 8-10 homework assignments during the semester.
- **Midterm Exam (15%)**
- **Final Exam (15%)**
- **Project (15%) –** There will be one final, directed group project completed at the end of the semester
- **Quizzes (25%**) – Students will complete 8-9 quizzes on Moodle throughout the semester at the end of most modules. These quizzes will be completed in class and announced at least 1 class in advance. All of these will be proctored with Lockdown browser for in person students and Respondus (your video will be recorded) for online students.
- **Attendance and Participation (15%)** Students will be expected to participate in discussions, including during class sessions. A majority of the grade will be assigned based on attendance, which will be taken for each class online and in-person. Online students are expected to have their cameras on (and muted) to receive marks for attendance.

My overall grading goal is to assign an evaluation that best reflects your understanding of the material. As such, these percentages provide guidance as to relative importance, not a means for mechanical calculation of the grade. The instructor reserves the right to adjust up or down by one letter grade based on holistic evaluation of your effort and development.

Grade Ranges

Course Average	Grade	Quality Points
97+	A+	4.0
93-96	A	4.0
90-92	A-	3.667
87-89	B+	3.334
84-86	B	3.0
80-83	B-	2.667
76-79	C+	2.334
70-75	C	2.0
<70	F	0

Instructor Participation

During this course, as your instructor, you can expect me to

- Respond to emails and Slack messages within 24 hours.
- Grade activities and assessments within 7 days
- Be available for 1-1 consultations during via Zoom during listed hours

Course Policies

Late Work: Due dates for assignments are provided on Moodle. Unless otherwise stated, assignments are due on those days. Late work is not accepted unless prior arrangements have been made. Late work is subject to a grade penalty.

Attendance: Please email me if you are not feeling well or will miss class for any other reasons. If you are attending the class virtually, I do expect you to participate as much as possible. In virtual format, students are expected to have cameras and microphones on (muted is okay when not speaking).

Instructional Continuity Plan: In the event of a school closure, we may meet via Zoom.

Respondus/Lockdown Browser

Respondus and Lockdown Browser, an online proctoring software, will be used for quizzes and exams in this course.

Generative AI/ChatGPT Policy

Artificial intelligence (AI) language models, such as ChatGPT, cannot be used for course assignments except as explicitly authorized by the instructor. If you are in doubt, I encourage you to discuss your situation with me. The following actions are prohibited in this course:

- Incorporating any part of an AI generated response in an assignment;
- Submitting your own work for this class to an online learning support platform for iteration or improvement.

Institutional Policies

Institutional Policies & Regulations

Academic Integrity

Academic Integrity, based on the values of honesty, trust, fairness, respect, and responsibility, is a fundamental principle of scholarship in higher education. Clarkson's Academic Integrity Policy prohibits: plagiarism (using another person's writing or copying any work without proper citation), falsification, unauthorized collaboration during a test or on an assignment, or substitution for another student to take an exam, course or test, and other forms of academic dishonesty.

If you are to benefit from this class and be properly evaluated for your contributions, it is important for you to be familiar with and follow Clarkson University's Academic Integrity policy. Please review this policy online (Undergraduate section IV – Academic Integrity, Graduate section IV – Academic Integrity). ***Work that violates this policy will not be tolerated***. Students who are found responsible for a violation of the Academic Integrity Policy will have both a university process sanction and an academic outcome, that could include a failing grade on the assignment or exam, or a failing grade for the course.

Please refer to **Clarkson Library's Guide to Plagiarism** and the **guide to Citing Sources** for assistance on avoiding plagiarism and properly citing sources.

Students with Disabilities Requesting Accommodation(s)

The University strives to make all facilities and programs accessible to students with permanent, ongoing, and temporary disabilities by providing appropriate and reasonable academic accommodations, as necessary. Disabilities that may benefit from reasonable accommodations include, but are not limited to, broken wrist, ADHD, surgery recovery, Learning Disability, concussion, visual impairment, etc. For more information and/or to request accommodations, contact the Office of Accessibility Services at oas@clarkson.edu or 315-268-7643.

Students with Disabilities Policy
Office of Accessibility Services Website

Other Policies of Note:

Student Regulation Requirements for Excused and Extended Absence:

Undergraduate: III-F. Attendance
Graduate – II-F. Attendance

Grading System

Discrimination & Harassment

Religious Accommodations