New Mexico State University
Department of Computer Science

Spring 2026

CSCI 5420 – Applied Machine Learning I

Course Information
Applied Machine Learning I (3 Credits)
The course lasts for **16 weeks**, from **January 21st, 2026** to **May 15th, 2026**.

Instructor: Monica Nogueira (monicaln@nmsu.edu)
Office hours: Monday-Wednesday 3 PM – 4:30 PM (MST). Appointments must be scheduled in advance by email.
Location: Zoom: 615 686 7260 (https://nmsu.zoom.us/j/6156867260)

TA: Aditya Jadhav (aditya27@nmsu.edu)
Office hours: Tuesday and Thursday 12–2 PM (MST) or by appointment
Location: Zoom: 355 158 7150 (https://nmsu.zoom.us/j/3551587150) or at Science Hall 159

Canvas Website: learn.nmsu.edu
Please use Canvas and email as your primary means of communication for this class. Email me with questions at any time, and I will try to get back to you within 24 hours.

Course Description
An introductory course on practical machine learning. An overview of concepts for both supervised and unsupervised learning. Topics include classification, regression, clustering, and dimension reduction. Classical methods and algorithms such as linear regression, neural networks, support vector machines, and ensemble approaches. Recent techniques such as deep learning. Focused on applying machine learning techniques in application domains.

Course Goals and Objectives

By the end of the semester, students should be able to:

1. Implement and utilize different data processing techniques
2. Differentiate and assess several dimension reduction techniques
3. Utilize several classifiers (SVM, Decision Tree, k-Nearest Neighbor, and Logistic Regression) and differentiate their advantages and disadvantages
4. Explain and demonstrate regression analysis
5. Describe and illustrate clustering approaches
6. Apply ensemble learning approaches
7. Implement several neural network classifiers, including deep learning models

Course Practicum Requirement

- Be able to write, debug, and run Python programs
- Be able to use Python packages and libraries for scientific computing (e.g., NumPy, SciPy, Pandas), for machine learning and visualization (e.g., Scikit-learn, Matplotlib, Seaborn)
- Be able to use a library (e.g., PyTorch or TensorFlow) for deep learning

Prerequisites

At least a C- in C S 272 or CSCI 2310, MATH 280; or consent of instructor.

Textbooks and Materials

- *Machine Learning with PyTorch and Scikit-Learn: Develop machine learning and deep learning models with Python*, by Sebastian Raschka, Yuxi (Hayden) Liu, and Vahid Mirjalili. Packt Publishing Ltd., February 25, 2022, ISBN: 978-1-80181-931-2
- *Python Machine Learning (Machine Learning and Deep learning with Python, scikit-learn, and TensorFlow)* (2nd Edition), by Sebastian Raschka and Vahid Mirjalili. Packt Publishing Ltd., ISBN: 978-1-78712-593-3
- *Artificial Intelligence – A Modern Approach*, by Stuart Russell and Peter Norvig, Fourth Edition, Prentice Hall, ISBN 0-13-790395-2 (3rd Ed. freely available).
- *scikit-learn* Tutorial: https://scikit-learn.org/stable/tutorial/index.html
- *TensorFlow* Tutorial: https://www.tensorflow.org/tutorials
- *PyTorch* Tutorial: https://pytorch.org/tutorials/beginner/pytorch_with_examples.html
- Free book: *Introduction to machine learning with Python: a guide for data scientists*, by Andreas C. Muller & Sarah Guido. Free to read online from Internet Archive.
- Free book: *The Hundred-Page Machine Learning Book*, by Andriy Burkov. Free released book chapters: http://themlbook.com/wiki/doku.php

Software

- You are required to use Python 3 (version 3.10 or higher) on all your homework and projects: https://www.python.org
- You may want to use GitHub to manage your project files. The core of Git is available below (you may have it, or it may be bundled with a graphical user interface): Git 2.9.2

or higher. Online: https://git-scm.com. If you want to have a GUI available; the following are suggested:
    - SourceTree 2.1.3 or higher. https://www.sourcetreeapp.com. Available for OS X and Windows.
    - SmartGit 7.1.4 or higher. http://www.syntevo.com/smartgit/. Available for all platforms.
- scikit-learn: https://scikit-learn.org
- PyTorch: https://www.pytorch.org
- TensorFlow: https://www.tensorflow.org

Course Schedule

See the Schedule of Assignments and Course Activities on the Canvas home page.

Weeks	Assignments
01/21 – 01/24	Lecture01: Introduction to Machine Learning
01/25 – 01/31	Single-layer NNs: Lect02: Perceptron and Lect03: Adaline **Introductions (January 31, 2026) on Canvas>Discussions**
February 6	**CENSUS - Last Day to Cancel Registration WITHOUT "W" (100% Refund)**
02/01 – 02/07	Multiclass Classification: Lect04: SGD and Lect05: Scikit-learn
02/08 – 02/14	Classification Algorithms1: Lect06: LogRegression and Lect07: SVM
02/15 – 02/21	Classification Algorithms2: Lect08: DecisionTrees and Lect09: KNN
02/22 – 02/28	Model Evaluation: Lect10: ModelEval and Lect11: Diagnose_ParamTuning
03/01 – 03/07	Dimensionality Reduction: Lects 12, 13, 14
03/08 – 03/14	EDA and Linear Regression: Lects 15, 16, 17
March 16 – 20	**SPRING BREAK**
03/15 – 03/21	**Midterm Exam (March 21, 2026) on Canvas**
March 26	**Last Day to Withdraw from a Single Course WITH a "W" (No Refund)**
03/22 – 03/28	Regression2: Lect18: RegressionEval, Lect09: NonlinearRegression
03/29 – 04/04	Cluster Analysis1: Lect20 and Lect21
04/05 – 04/11	Cluster Analysis2: Lect22 and Lect23
04/12 – 04/18	Ensemble Learning: Lect24: Bagging and Lect25: AdaBoost
04/19 – 04/25	PyTorch: Lects 26, 27, 28
04/26 – 05/02	Convolutional Neural Networks: Lects 29, 30
05/03 – 05/09	Recurrent Neural Networks: Lects 31, 32
May 08	**Last Day to Withdraw from University (No Refunds)**
05/10 – 05/15	**Final Exam (May 11, 2026) on Canvas**

Course Delivery Method

The course is entirely online, beginning on January 21, 2026, and running until May 15, 2026, spanning a total of 16 weeks. There are weekly assignments and possibly a couple of quizzes. We will not use ZyBooks for this course; instead, the instructor will provide weekly lecture materials. All programming assignments and quizzes will be based on these materials.

This course does not include synchronous online or in-person lectures, except for students in section CSCI 5420-U40. Those students must attend in-person lectures on *March 7, 2026*, at the NMSU Las Cruces campus.

Communication

- The instructor will use Canvas Announcements to send time-sensitive information to the entire class. You need to make sure you receive announcements daily. ***You are required to set your notifications for Announcements to be "Notify Immediately".***
- To change announcement settings in Canvas, click Account, then click Notifications. In the Course Activities group, look for Announcement and click the icon in the column for Email or Push Notification (or both) and choose "Notify Immediately".

Use of AI

No Use of Generative AI Permitted This course assumes that all work submitted by students will be generated by the students themselves, working individually or in groups. Students should not have another person/entity do the writing of any substantive portion of an assignment for them, which includes hiring a person or a company to write assignments and using AI tools.

Required Technical Skills

Taking an online course requires technical skills as well as other soft skills. However, at a minimum you will need to meet certain technology responsibilities to complete work for this course. If you have questions about technical requirements for the course, please contact us immediately.

To begin in this course, you must:

- Read this syllabus carefully and contact me immediately if you have any questions. You are responsible for the content and assignments in this syllabus.
- Be able to obtain access to an internet connection, preferably broadband, and a working computer for the duration of this course.
- Be able to send and receive emails and email attachments with your NMSU email.
- Be able to change your Canvas Notification settings.
- Be able to maintain backups of all work you create for this course.
- Be able to write, debug, and run Python programs.
- Be able to use Python packages and libraries for scientific computing (e.g., NumPy,
- SciPy, Pandas), for data mining and visualization (e.g., Scikit-learn, Matplotlib, Seaborn)

Programming Assignments

Programming assignments in this course will use the Python programming language. Each assignment will be available on Canvas one week before its due date. It's your responsibility to check Canvas frequently and keep up with assignments. Programming assignments may be submitted up to 48 hours after the deadline. A penalty of 15% of the earned score is applied for each 24-hour period the assignment is late. The final score is computed using the formula **(earned points)×(1−0.15×late days)**, where late days is at most 2. No submissions are accepted

beyond the 48-hour late window, except in documented medical emergencies and with instructor approval. **Do not** zip, tar, or compress files for a lab assignment unless specifically asked to do so in its instructions. Canvas will allow you to submit a lab assignment more than once, as long as the due date hasn't passed. When an assignment requires multiple files, you must submit ALL files with EVERY submission. Only your latest submission will be graded.

Exams and Quizzes

No quizzes are planned for this semester. Exams will be available in Canvas on the day of the test. However, there is a limited to time to finish the test once you begin it.

If you have a serious illness, accident, or other extenuating circumstances that cause you to miss a programming assignment or exam, speak with the instructor right away about your situation.

Score Distribution

The total grade for the course is a combination of grades on projects, assignments, and exams. The weighting will be: assignments (35%) + project (35%) + exams (30%)

- Homework assignments must be done individually.
- The course includes a group project. Groups must be composed of 2–3 students.
- There will be one midterm and one final exam.

Grading scale

98.00 % and higher	A+
90.00 % to 97.99 %	A
86.00 % to 89.99 %	B+
80.00 % to 85.99 %	B
70.00 % to 79.99 %	C
60.00 % to 69.99 %	D
0.00 % to 59.99 %	F

NMSU - Important Dates for Spring 2026

First Day of Classes	January 21, Wednesday
Last day to add a course without instructor permission	January 22, Thursday
Last day to add a course (instructor signature required)	January 30, Friday
CENSUS - Last day to drop a course without a "W" (100% Refund)	February 6, Friday
Last day to drop a course with a "W" (No Refund)	March 26, Thursday
Last day to withdraw from the university (all classes)	May 8, Friday

Makeup Work

Make-up work beyond the 48-hour late submission window will be permitted only under the following circumstances:

1) Hospitalization or serious illness
2) Confinement in a jail or prison

3) Other documented situation that physically prevents the student from using a computer

- The student or his/her representative must notify the instructor within 48 hours of the due date and time of the missed assignment.
- The student or his/her representative must provide documentation of the circumstance that includes the reason for the student's inability to do schoolwork and the specific dates that the student was affected. Documentation must be provided to the instructor within 7 days of the due date and time.

You are encouraged to complete assignments early to avoid missing a deadline.

Incomplete Grades

Instructors may assign "I" grades only if the student meets these two criteria:

1. The student has a grade of C or higher as of the last day to withdraw with a "W".
2. The student is unable to complete the course due to circumstances beyond the student's control that develop after the last day to withdraw from the course.

Class Withdrawals

It is your responsibility to know important dates such as the final day to withdraw from classes. You must officially withdraw from any class that you intend to drop. You may view the Academic Calendar at https://records.nmsu.edu/academic-calendar/2026.html

Netiquette

Online course expectations for netiquette are:

- Don't flame (personally attack) someone. It is possible to disagree with an idea without flaming the person espousing the idea.
- Use emoticons and acronyms to convey your emotional intent to avoid misunderstandings.
- Remember that the concept of "politeness" is defined for us by the families and cultures of which we are a part. What is considered polite communication in one family or culture may be impolite in another. Sometimes you may inadvertently seem impolite or feel that someone else was being impolite. Talk it out instead of assuming the person meant to be rude.
- Listen actively.
- Think critically. Critical thinking, grounded in intellectual integrity, is expected. In other words, seek clarity of meaning and understanding.
- Question ideas, not people.
- Attempt to see things from other perspectives.
- Use supporting relevant information.

Academic Misconduct

Academic and non-academic misconduct: The Student Code of Conduct defines academic misconduct, non-academic misconduct and the consequences or penalties for each. The Student Code of Conduct is available in the NMSU Student Handbook.

Academic misconduct is explained here with academic misconduct examples provided here.

Technology Requirements

Computer Hardware & Software

You should have access to:

- Windows or Macintosh desktop computer or laptop with Internet access, sound, and speakers
- Canvas Learning Management System: NMSU Canvas login , Canvas student FAQ
- Microsoft Office 365
- Adobe Reader (for reading PDF files)
- Adobe Connect – built into Canvas. No download needed.
- Headset with microphone.
- Python (programming language). Download and help can be found at https://www.python.org/

Web Browsers

Use only the latest version of Google Chrome or Mozilla Firefox for Canvas. Other web browsers including Safari, Internet Explorer, and Microsoft Edge have known issues that can interfere with performing basic tasks within Canvas.
The links to download the recommended browsers as well as instructions on how to ensure you have the latest version are listed below:

- Download Google Chrome
- How to update Google Chrome
- Download Mozilla Firefox
- How to update Mozilla Firefox

Canvas does not fully support mobile devices; while there is a free Canvas mobile app available through iTunes store, a lot of functionality is unavailable when using a mobile phone. When you take this course, it is assumed you have access to a computer or laptop for full access to functionality in this course.

Support Services

Student Support Services

Find information and support on advising, registration, and financial aid on NMSU Current Student webpage. You will also find links to the academic calendar, Student Affairs, the student handbook, and Student technologies on this page.

Technical Support

The ICT Customer Service Center is equipped to deal with all of your information technology (IT) and telecommunications needs at NMSU. Please feel free to contact them at (575) 646-1840 or via email at helpdesk@nmsu.edu. You can also go to the Student Technology Help web page for additional information on Canvas.

Students with Disabilities

If you have or believe you have a disability, you may wish to self-identify. You can do so by providing documentation to the coordinator of Student Accessibility Services (SAS), located at Corbett Center, Room 244, phone: (575) 646-6840. Appropriate accommodations may then be provided for you.
The instructor will receive specific written guidelines for appropriate accommodations for individual students from the SAS office. Students will be given accommodations for disabilities as requested by the director of SAS.

Discrimination and Disability Accommodation

Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act Amendments Act (ADAAA) covers issues relating to disability and accommodations. If a student has questions or needs an accommodation in the classroom (all medical information is treated confidentially), contact:

Main Campus
Student Accessibility Services (SAS)
Corbett Center Student Union Room 208
Phone: (575) 646-6840
E-mail: das@nmsu.edu
Website: http://das.nmsu.edu/

New Mexico State University, in compliance with applicable laws and in furtherance of its commitment to fostering an environment that welcomes and embraces diversity, does not discriminate on the basis of age, ancestry, color, disability, gender identity, genetic information, national origin, race, religion, retaliation, serious medical condition, sex (including pregnancy), sexual orientation, spousal affiliation, or protected veteran status in its programs and activities, including employment, admissions, and educational programs and activities. Inquiries may be directed to:

William D. Nutt, Executive Director, Title IX and ADA Coordinator
Office of Institutional Equity
P.O. Box 30001, E. 1130 University Avenue, Las Cruces, NM 88003
575.646.3635; 575-646-7802 (TTY)
E-mail: equity@nmsu.edu

Title IX prohibits sex harassment, sexual assault, intimate partner violence, stalking and retaliation. For more information on discrimination or Title IX, or to file a complaint contact:

Office of Institutional Equity (OIE)
O'Loughlin House, 1130 University Avenue
Phone: (575) 646-3635
E-mail: equity@nmsu.edu
Website: https://equity.nmsu.edu/

Other NMSU Resources:

NMSU Police Department:	(575) 646-3311	www.nmsupolice.com
NMSU Police Victim Services:	(575) 646-3424	

NMSU Counseling Center:	(575) 646-2731
NMSU Dean of Students:	(575) 646-1722
For Any On-campus Emergencies:	911

Academic Resources

NMSU provides students with academic resources such as tutoring, final exam schedules, library and research, and transcript information on the NMSU Current Student webpage.

Campus Activities

Campus Activities offers activities outside the classroom involvement. The program/services are non-academic and are provided directly to the student. A complete list of offered activities can be found on the Student Life website.

Accessibility of eLearning Tools

This course uses several software programs and technologies. Please read the following for more information about their accessibility.

Note: A Voluntary Product Accessibility Template (VPAT) is a standardized form developed by the Information Technology Industry Council to show how a software product meets key regulations of Section 508 of the Rehabilitation Act.

- Canvas Accessibility Standards and help.
- Canvas-compatible Screen Readers: VoiceOver (Mac), JAWS (PC)
- Adobe Products Accessibility for Adobe Connect 9, Adobe Acrobat, and more.
- Apple Products VPATs and Accessibility features for Safari Web Browser, Mac OS X, etc.
- Microsoft Products: Section 508 and Microsoft Accessibility for Office, Skype, and more.
- Google VPATs and Accessibility Products and Features for Google Earth, Chrome Web Browser, Google Docs, and more.
- Firefox Web Browser: Section 508 (version 3.5 and up)
- zybooks Accessibility
- Python Accessibility Conformance
- Anaconda Distribution There is no VPAT or Section 508 for this software.

Privacy Policies

We take protecting and honoring your privacy very seriously at NMSU. Please note that several software and technology materials are used in the course. Their privacy policies are noted below.

- Canvas Privacy Policy
- Adobe Privacy Policy
- FireFox Privacy Policy
- Google Product Privacy Guide (e.g., Chrome, Google Drive, YouTube)
- Microsoft Privacy Policy
- Apple Privacy Policy for software and devices

Syllabus Modifications Statement

The information in this syllabus is provided on a good faith basis. You will be notified through Canvas Announcements if and when any change to the syllabus occurs.