DEPARTMENT OF THE ARMY
UNITED STATES MILITARY ACADEMY
DEPARTMENT OF MATHEMATICAL SCIENCES
WEST POINT, NY 10996

MADN-MTH 08 Jan 2026

MEMORANDUM FOR Students of MA289 Mathematics for AI

SUBJECT: Instructional Memorandum

1. **Purpose**. This memorandum specifies materials, describes the goals and objectives, and announces policies and procedures for MA289 during AY 26-2.

2. **Course Overview**. This course serves as the first semester in a planned multi-sequence course, which establishes the foundational skills and context needed for sustained work in data science and applied artificial intelligence. The ultimate goal of the full four semester sequence is to prepare Cadets to confidently analyze data, build and deploy models, and engage in longer-term technical and research efforts with a strong understanding of both theory and practice.

In this first semester, Cadets are introduced to core data science topics including data manipulation, visualization, basic statistical reasoning, and introductory predictive modeling, with an emphasis on interpreting results and communicating insights. Students will work extensively in Python for analysis and modeling, use Google Colab for cloud-based and distributed computation, and learn collaborative development practices through GitHub. Technical writing and documentation are developed in parallel using LaTeX and Overleaf.

By the end of the semester, Cadets are comfortable moving between data, code, computation, and written communication, providing a solid foundation for more advanced modeling, systems, and research-focused work in later semesters.

3. **Required Course Materials and Resources**. Please obtain a digital or printed copy of the 3rd edition of the Géron's Hands-On Machine Learning textbook prior to the first day of class.

a. James, Gareth, Daniela Witten, Trevor Hastie, and Robert Tibshirani. An Introduction to Statistical Learning. Vol. 112. New York: Springer, 2013. Available digitally at https://www.statlearning.com/.
b. Introduction to Machine Learning with Python Coursera course. Available at https://www.coursera.org/.
c. Major Patrick Kuiper's Instructor page: https://patrickkuiper.com
d. Google Colab: We distribute and collect all lesson materials through Canvas and will primarily use Colab. Please ensure you have a personal Google account prior to the first day of class if you don't have one.
e. Overleaf: We will complete technical writing assignments using this online latex compiler.

5. **Course Design.** The course is divided into four blocks with the following themes and outcomes. A table outlines the lesson structure in more detail:

Block I: Introduction to Statistical Learning

1. Understand the basic principles of statistical learning
2. Distinguish between supervised and unsupervised learning
3. Understand the bias-variance tradeoff and model evaluation concepts
4. Understand Resampling, Cross Validation, and Bootstrapping methods
5. Learn foundational techniques used in predictive modeling

Block II: Parametric Models

1. Understand how to fit and interpret linear regression models
2. Understand logistic regression and probability-based classification
3. Evaluate model performance using metrics like R^2, MSE, and classification accuracy
4. Apply regression techniques to real datasets using Python

Block III: Non-Parametric Models

1. Understand and implement Support Vector Machines (SVM) for classification.
2. Apply the K-Nearest Neighbors (KNN) algorithm in classification problems.
3. Understand and apply decision trees to statistical learning problems.

Block IV: Unsupervised Learning

1. Apply unsupervised learning techniques to extract insights from data.
2. Understand the Linear Algebra concepts behind Principal Component Analysis (PCA).
3. Implement K-means clustering algorithms using Python.

Projected Date / Time	Lesson Name	Reading
1245 14 JAN 2026	Lesson 01: Intro to Stat Learning 1	ISLP 1-39; MLP Mod 1
1245 20 JAN 2026	Lesson 02: Intro to Stat Learning 2	Google Colab Introduction
1245 27 JAN 2026	Lesson 03: Project 1 EDA	Overleaf Introduction
1245 03 FEB 2026	Lesson 04: Resampling, CV, Bootstrapping (Assignment 1 Due)	Demos for Class in Colab
1245 10 FEB 2026	Lesson 05: Supervised Learning 1 (Project 1 Due)	ISLP 69-108; MLP Mod 2
1245 17 FEB 2026	Lesson 06: Supervised Learning 2	ISLP 135-167; MLP Mod 3
1245 24 FEB 2026	Proj 2 Practical Supervised Model 1	
ss1245 03 MAR 2026	Proj 2 Practical Supervised Model 2	Github Introduction
1245 10 MAR 2026	Proj 2 Practical Supervised Model 3	Project 1 Due in Overleaf / Demos
1245 17 MAR 2026	Lesson 12: Non-Parametric Models 1	
1245 24 MAR 2026	Lesson 13: Non-Parametric Models 2	
1245 07 APR 2026	Lesson 10: Unsupervised Learning 1	ISLP 503-534; MLP Mod 4
1245 14 APR 2026	Lesson 11: Unsupervised Learning 2	
1245 21 APR 2026	Proj 3 Practical Unsupervised Model 1	
1245 28 APR 2026	Proj 3 Practical Unsupervised Model 2	
1245 05 MAY 2026	Lesson 14: Regularization Techniques	ISLP 229-252; MLP Mod 5

6. **Evaluation**. The following table shows the distribution of points in the course.

Graded Event	***Points***	***Total Points***
Lesson Assignments 2	*50*	*100*
Projects 3	*300*	*900*
Total		1000

a. Lesson Assignments. These assignments are short demonstrations of understanding from Lessons 6 and 10.
b. Projects. There will be three projects (individual). All projects must be submitted in Latex and will be evaluated on both the correctness of the analysis and the quality of the mathematical writing
c. Final course grades will follow the Department of Mathematical Sciences grade cut-offs as shown in Table 1 below. Students can view their performance on all graded events during the course in Canvas. Late assignments receive a 10% deduction per 24 hours late.

Table 1. Grade cut-offs

SUBJECTIVE INTERPRETATION	LETTER GRADE	NUMERICAL GRADE	QUALITY POINT
Beyond expectations of course	A+	97-100	4.33
Dominates the material	A	93-97	4.00
Mastery	A-	90-93	3.67
Excellent performance	B+	87-90	3.33
Good understanding	B	83-87	3.00
Proficient; Aptitude for the subject	B-	80-83	2.67
Can build upon this foundation	C+	77-80	2.33
Passing; Proficient now (short-range)	C	73-77	2.00
Short-range understanding	C-	70-73	1.67
Marginal performance with some elementary understanding	D	65-70	1.0
Failing; Definitely failed to demonstrate understanding	F	0-65	0

10. **Chain of Command**. The point of contact for this memorandum is MAJ Patrick Kuiper, patrick.kuiper@westpoint.edu

PATRICK K. KUIPER
MAJ, FA49
Assistant Dean for Data Analytics