MACHINE LEARNING

Course Information

Course:	CIS-571-01ATE: MACHINE LEARNING
Semester:	Fall 2025
Location:	Library 126
Schedule:	Monday, Wednesday: 5:30 PM - 8:15 PM
Credits:	3

Instructor Information

Instructor: Dr. Chad Redmond

Office: Library 416

Email: credmond@mercyhurst.edu

Phone: (814) 969-2269

Office Hours

Days/Times: Monday, Wednesday, Friday: 11:00 AM - 12:10 PM

Location: Library 416 (My Office)

**Evening
Hours:**   Monday, Wednesday: 8:15 PM - 9:30 PM

**Evening
Location:**   Cyber Security Labs

Course Description

An exploration of fundamental machine learning algorithms and their practical applications through

hands-on web development. Students will explore key machine learning concepts including k-means clustering, k-nearest neighbors, decision trees, random forests, ensemble learning methods, support vector machines, principal component analysis, and recommender systems. The course emphasizes practical implementation using GitHub, GitHub Codespaces, and GitHub Copilot for collaborative development and AI-assisted programming. A central component of the course involves building interactive web applications that demonstrate and visualize machine learning concepts, allowing students to gain both theoretical understanding and practical experience in deploying machine learning solutions. Students will complete a comprehensive final project that integrates multiple machine learning techniques and demonstrates mastery of course concepts.

Recommended References

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems

https://www.amazon.com/Hands-Machine-Learning-Scikit-Learn-TensorFlow/dp/1492032646/ref=sr_1_4

2. Data Science from Scratch: First Principles with Python

https://www.amazon.com/Data-Science-Scratch-Principles-Python/dp/1492041130/ref=sr_1_1

Learning Objectives

Machine Learning Fundamentals:

- Understand and implement k-means clustering algorithms for unsupervised data grouping and pattern recognition
- Apply k-nearest neighbors (KNN) classification and regression techniques to solve prediction problems
- Build and optimize decision trees for classification and regression tasks with interpretable results
- Implement random forests and ensemble learning methods to improve model accuracy and reduce overfitting
- Apply support vector machines (SVM) for classification and regression problems with optimal decision boundaries
- Implement principal component analysis (PCA) for dimensionality reduction and feature extraction
- Design and develop collaborative filtering and content-based recommender systems

Development Tools & Collaboration:

- Demonstrate proficiency in using GitHub, GitHub Codespaces, and GitHub Copilot for machine learning project development
- Utilize AI-assisted programming techniques to accelerate model development and debugging
- Apply version control best practices for collaborative machine learning projects

Web Application Development:

- Build interactive web applications that demonstrate machine learning concepts and algorithms
- Create data visualizations and user interfaces that effectively communicate ML model results
- Deploy machine learning models through web-based platforms for real-world accessibility

Practical Implementation:

- Evaluate model performance using cross-validation, confusion matrices, and other assessment techniques
- Handle real-world data challenges including preprocessing, feature selection, and missing data
- Apply ethical considerations and bias detection in machine learning model development and deployment

Grading

Grade Components:

- Quiz 1: 75 points
- Quiz 2: 75 points
- Quiz 3: 75 points
- Quiz 4: 75 points
- Final Exam: 100 points
- Attendance: 100 points
- Participation: 100 points

Total Points: 600

Grade Scale:

Grade	Points Required
A	550-600
B+	500-549
B	400-499
C+	350-399
C	300-349
D+	250-299
D	200-249
F	Below 200

Tentative Schedule

Date	Day	Topics
August 20	Wednesday	K-means Clustering Algorithm
August 25	Monday	K-nearest Neighbor Algorithm
August 27	Wednesday	Quiz 1
September 1	Monday	Labor Day (No Class)
September 3	Wednesday	Decision Trees
September 8	Monday	CART Algorithm

Date	Day	Topics
September 10	Wednesday	Quiz 2
September 15	Monday	Ensemble Methods
September 17	Wednesday	Bagging
September 22	Monday	Quiz 3
September 24	Wednesday	Boosting
September 29	Monday	Principal Component Analysis
October 1	Wednesday	Support Vector Machines
October 6	Monday	Quiz 4
October 8	Wednesday	Final Exam

Academic Honesty Policy

Students are expected to adhere to Mercyhurst University's Academic Honesty Policy. Please review the complete policy at:

https://www.course-catalog.com/mercyhurst/C/2023-2024/content/academic-affairs/academic-honesty/41

ADA Accommodations & Accessibility

Mercyhurst University values inclusion and is committed to the goal of providing equal opportunities for all. It is our policy and practice to create accessible learning environments consistent with federal and state law.

Students who are currently eligible should verify as instructed and contact me to discuss how their accommodations will be implemented in this class.

Students who have not been determined eligible, but have a temporary limitation (e.g., broken leg) or permanent medical, physical, sensory, learning, cognitive, or mental health disability issue that requires accommodations, should contact the ADA Coordinator to make a request. Requests for accommodations can be made at any time throughout the calendar year and at any point in a student's enrollment.

Please contact Susan Reddinger, ADA Coordinator and Compliance Officer, at ada@mercyhurst.edu, 814-824-2362, or in Old Main 300. Additional information can be found on the student hub https://lakersmercyhurst.sharepoint.com/sites/StudentsHub under the Services tab.

Students with questions about Academic Support, please refer to the Hub https://lakersmercyhurst.sharepoint.com/sites/StudentsHub and select the Academic Resources tab, then Academic Support for more information.

Title IX

Mercyhurst is committed to providing an environment free from sex discrimination, including sexual harassment and sexual violence. Please refer to the HUB: https://lakersmercyhurst.sharepoint.com/sites/StudentsHub and select the Resources tab, then Title IX – Sexual Respect from the dropdown for more information.

If you would like to file a sexual misconduct complaint, please contact Ann Miller, Title IX Coordinator and Compliance Officer, titleix@mercyhurst.edu , 814-824-2363, Egan Hall 311. Please be aware that in compliance with Title IX, educators must report incidents of sexual assault/harassment, stalking, domestic/dating violence, sex discrimination, and hostile environment harassment. If you disclose any of these situations in class, in papers, or to a faculty or staff member personally, they are required to report it to the Title IX Coordinator (or any of the Deputy Title IX Coordinators).