



University of New Hampshire
Peter T. Paul College of Business and Economics

ECON 898/720: MACHINE LEARNING FOR
ECONOMICS
TERM 3, SPRING, 2025

Course Information:

Course ID:	ECON 898/720	Credit Hours:	3.00 for 898 /4.00 for 720
Department:	Economics		
Attributes:	Graduate level course		
Start/End Dates:	1/21/24 to 3/14/24		
Class Times/Location:	MW 5:10 pm - 7:00 pm @ Paul235		
Recommended Readings: (Optional)	1. Hands-on Machine Learning with Scikit-Learn, Keras & TensorFlow <i>by</i> Aurelien Geron 2. Causal Inference and Discovery in Python <i>by</i> Aleksander Molak, Ajit Jaokar		

Instructor Information:

Instructor:	Bingjin (Ben) Xue Assistant Professor of Economics
Office Location/Phone:	Paul College 321 ☎ (603) 862- 3364
Office Hours:	TBD
Email Address Preferred Method of Contact:	bingjin.xue@unh.edu Discussion forum on MyCourses are preferred contact for course-related questions and I will respond within one business day.
Teaching Assistants:	TBD ✉

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Course Overview

Dive into the fusion of economics and AI with our transformative course, "Machine Learning for Economics". This course serves as a bridge between traditional economic theories and the burgeoning world of machine learning, providing participants with an enriched understanding of how these two domains intersect. You'll not only gain a robust foundation in machine learning but also understand its invaluable application in econometric analysis and forecasting. Designed with precision and a focus on real-world relevance, this course empowers you to harness the capabilities of Python, the premier programming language in the analytics sphere, and develop potent predictive models that can revolutionize economic and business decision-making.

Prerequisites

This course utilizes math skills including calculus and optimization.

Learning Objectives

By course end it is expected that you will be able to:

- Get familiar with Python and Jupyter Notebook
- Use Python to discover and visualize the data and gain insights.
- Handle different types of data and build pipelines.
- Build machine learning models to make predictions and causal inferences.
- Fine-tune machine learning models.

Textbook & Software:

Recommended Optional Textbooks

1. Hands-on Machine Learning with Scikit-Learn, Keras & TensorFlow by Aurelien Geron
2. Causal Inference and Discovery in Python by Aleksander Molak, Ajit Jaokar

Software

No required software, we will use Google Colab

Learning Management Systems:

[MyCourses](#) is the learning management tool we use for this course. The site will be used to post announcements, maintain a gradebook and provide a discussion forum.

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Grades & Grading Scale

The course grade consists of the following components:

3 Homework Assignments	20% * 3 = 60%
1 Final Project	30%
Participation	10%
Total	100%

** Participation is assessed by random in-class quizzes

The following scale, which is the standard UNH grading scale, determines letter grades. Grades do NOT get rounded up.

Percentage	Grade	Percentage	Grade
94–100	A	77–79.99	C+
90–93.99	A-	74–76.99	C
87–89.99	B+	70–73.99	C-
84–86.99	B	69.99 or lower	D or F
80–83.99	B-		

Assignment Details

- **Assignments:** Every other week there will be one coding assignment on MyCourses, which is due one week after. Assignments may be submitted up to 7 days late, but for each day past the deadline that you take, you will incur a 10% penalty.¹
- **Final Project:** There is one comprehensive final project, in which you will use all the techniques you've learned in the class to analyze a dataset of your own choice and draw insights. Evaluation criteria will be posted.
- **Participation:** You will frequently be asked to respond to progress assessments during lecture days. These assessments account for 10% of your total grade and cannot be made up. The participation final grade is averaged over all assessments given in the semester.
- **Missed Class:** If you must miss class for any reason, it is your responsibility to ensure you keep up with material and turn in assignments on time. I strongly recommend that you review the relevant material on the MyCourses site have another student provide you with a scan or copy of their notes from the session you missed. Please contact your instructor or a TA with any questions about the material or assignments you missed.

¹ For example, if you would have earned an 88% but you submitted 2 days late, the grade would be a 68%.

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Course Workload and Credit Hours

This syllabus reflects the federal definition of a credit hour, which entails a minimum 3 hours of engaged time per week per credit over a 15-week semester (student workload for shorter length terms must be increased proportionally per week to maintain required approximately 45 hours of work per credit per term). Examples of engaged time include class time, assignments, examinations, laboratories, participation in course-related experiences (attending a talk or performance, speakers and events, fieldwork, etc.), conferences, and office hours. Student work reflects intended learning outcomes and is verified through evidence of student achievement.

Course Schedule

Week	Topic	Assignment
	First Day of Term 3	
1	Python, Jupyter Notebook, Colab	
	Descriptive Analysis: Tables and Graphs - matplotlib	
	Descriptive Analysis: Statistics - Numpy, pandas	
2	Descriptive Analysis: Distribution - scipy, seaborn	Assignment 1
	Python – if, for, functions, modules	
	Simple Regression Model - statsmodels	
3	Model Specification: Bias-Variance	
	Hypothesis Test	
4	Machine Learning: a project - scikit-learn	Assignment 2
	Supervised Learning: Linear Models	
	Training Models: Computational Complexity, Gradient Descent, Learning Curves	
5	Supervised Learning: Decision Trees	
	Ensembles: Gradient boosting, random forest, bagging, voting, stacking	
	Supervised Learning: Other popular models: SVM, NB, LDA	
6	Unsupervised Learning: K-Means, NN	Assignment 3
	Unsupervised Learning: Gaussian Mixture	
7	Model Selection and evaluation: Cross-validation, Metrics and scoring	
	Tuning the hyper-parameters of an estimator	
8	Neural Networks and Deep Learning	Final Project

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	-PyTorch	
	Computer Vision Using CNN	
	Causal Machine Learning – an introduction	
	Last Day of Term 3	

Student to Instructor Communication Expectations

How to Reach Me

Discussion Forum:

A Discussions tab can be found on MyCourses. Questions related to assignments or learning should first be asked here, if possible, so that the answers are visible to all other students. I will be active in the MyCourses class area daily, Monday through Friday. If you post a question for me in the discussion forum, please anticipate a response within 24 hours or sooner.

Email:

Bingjin.Xue@unh.edu

The use of email is reserved for questions of a private nature. If you would like to send me an email, please anticipate a response within 48 hours.

In-person Office hours:

TBD

Technical Requirements and Technical Support

See website listings for current recommendations and requirements related to this course - <https://online.unh.edu/technical-requirements>. Technical assistance related to Canvas is available at <https://itsupport.unh.edu/mycourses/>.

Mental Health and Wellness

Your academic success and overall mental health are very important. If, during the semester, you find you are experiencing emotional or mental health issues, please contact the University's (PACS) (3rd floor, Smith Hall; 603-862-2090/TTY: 7-1-1; <https://www.unh.edu/pacs/>) which provides counseling appointments and other mental health services. If urgent, students may call PACS M-F, 8 a.m.-5 p.m., and schedule an Urgent Same-Day Appointment.

University Disability Accommodations

According to the Americans with Disabilities Act (as amended, 2008), each student with a disability has the right to request services from UNH to accommodate his/her/their disability. If you are a student with a documented disability or believe you may have a disability that requires an accommodation, please contact Student Accessibility Services (SAS) at 201 Smith Hall. Accommodation letters are created by SAS with the student. Please follow up with your instructor as soon as possible to ensure timely implementation

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of the identified accommodations in the letter. Faculty have an obligation to respond once they receive official notice of accommodations but are under no obligation to provide retroactive accommodations. For more information refer to <https://www.unh.edu/studentaccessibility> or contact SAS at 603.862.2607, 711 (Relay NH) or sas.office@unh.edu.

Academic Honesty and Plagiarism

Students are required to abide by the UNH Academic Honesty policy located in the [Student Rights, Rules, and Responsibilities Handbook](#).

As your instructor, I proactively monitor academic integrity through regular use of tools like [Turnitin](#) and a diversified assessment approach. All works submitted to SafeAssign become a part of a UNH proprietary database. This is actively used to identify future intellectual property theft. Plagiarism of any type may be grounds for receiving an “F” in an assignment or an “F” in the overall course. Plagiarism is defined as “the unattributed use of the ideas, evidence, or words of another person, or the conveying the false impression that the arguments and writing in a paper are your own.” (UNH Academic Honesty Policy, 09.3) Examples of plagiarism include:

- Copying part or all of a previously published or written document, without quotation marks. This cut-and-paste practice is considered plagiarism, even if the writing is cited properly.
- Copying the sentence and/or paragraph structure of a source while substituting other words. “Patchwriting” is very common among students who struggle to understand information. Whether or not it is cited, this kind of paraphrasing is considered plagiarism, and it indicates that students have not fully understood the information.
- Submitting work that was completed for other courses, other times, by other students or the student him/herself.
- Submitting writing acquired from a “paper mill” resource.

UNH provides a comprehensive Plagiarism Tutorial for students who may be unclear about what specifically constitutes "plagiarism".

Incidents of academic dishonesty are reported to the school dean and may be grounds for further action. You can contact me at any time on this issue. Additional resources are located below:

<http://libraryguides.unh.edu/unhmcitingsources>
<http://www.library.unh.edu/reference/citation.shtml>
[UNH Academic Honesty Policy, 09.3](#)

Note: This syllabus is subject to change. Students will be promptly notified of any changes.