

AI Finance



Course Overview

Course Objective

This course integrates finance with AI coding. Students are required to use one of the following AI-assisted coding tools:

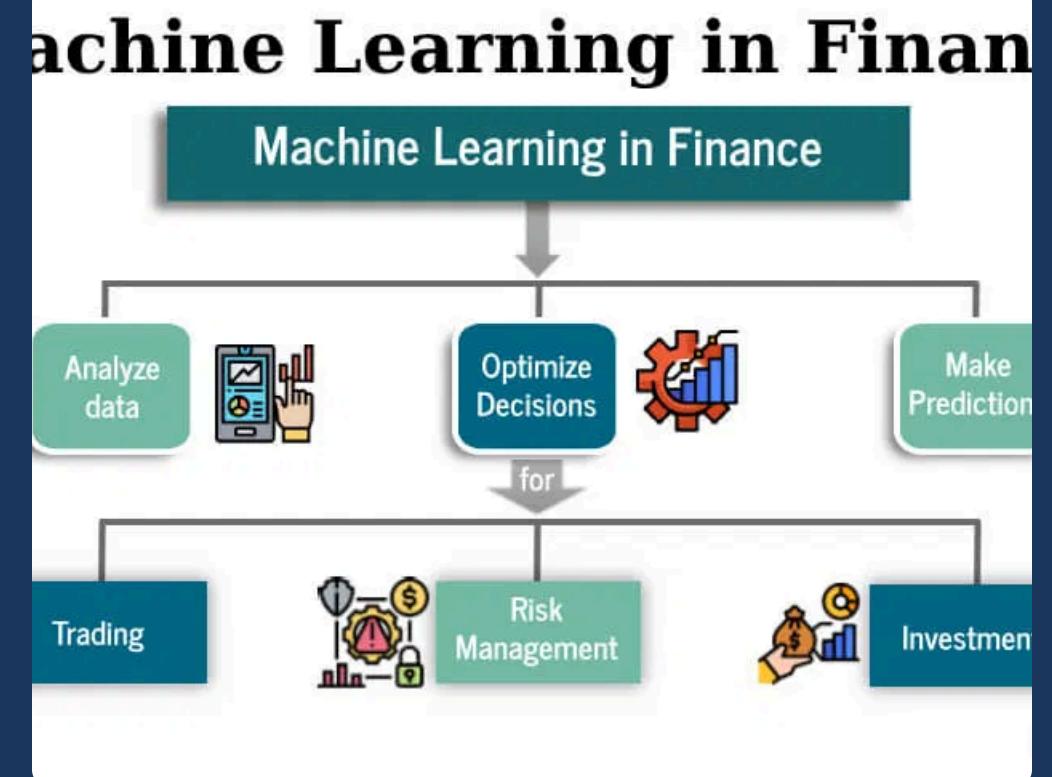
[aider](#), [cursor](#), [windsurf](#), [cline](#), [warp](#), [crush](#), or [claude-code](#)

Prerequisites

Students should be comfortable with basic Python tools:

[numpy](#), [pandas](#), [matplotlib](#)

NO AUDITING ALLOWED



Covered Topics - Finance

 CAPM, Three-Factor Models, C-CAPM

Asset pricing models and consumption-based approaches

 Mean-Variance Frontier and Asset Allocation

Portfolio optimization and efficient allocation strategies

 Market Microstructure

Bid-Ask Spread, Trading Volume, and Private Information



Covered Topics - Machine Learning

Selected Algorithms

Key machine learning methods for financial applications

Naive Bayes Linear Regression Lasso Regression SVM
Clustering Gaussian Mixture Random Forest

Large Language Models (LLMs)

Applications of LLMs in financial markets and analysis

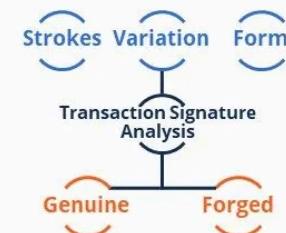
Network Analysis

Introduction to network analysis in financial contexts

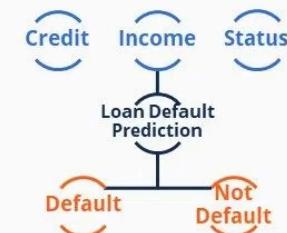
Learning Use Cases

Machine learning can be used across a wide variety of tasks in Finance.

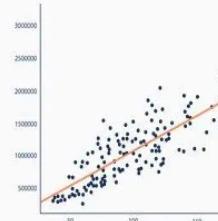
These tasks typically are **used to classify things**, or to **predict the amount of something (regression)**.



Classification Task



Classification Task



Asset Price Prediction (Regression)

Course Management

❖ Programming Language: **Python**

Course Structure

Weeks 1–6:

- 2.5 hours of lecture
- 0.5 hours of Q&A and hands-on coding practice

Weeks 7–10:

- 2.5 hours of lecture
- Student presentations on selected topics (meta-strategy, portfolio construction, LLMs in finance)

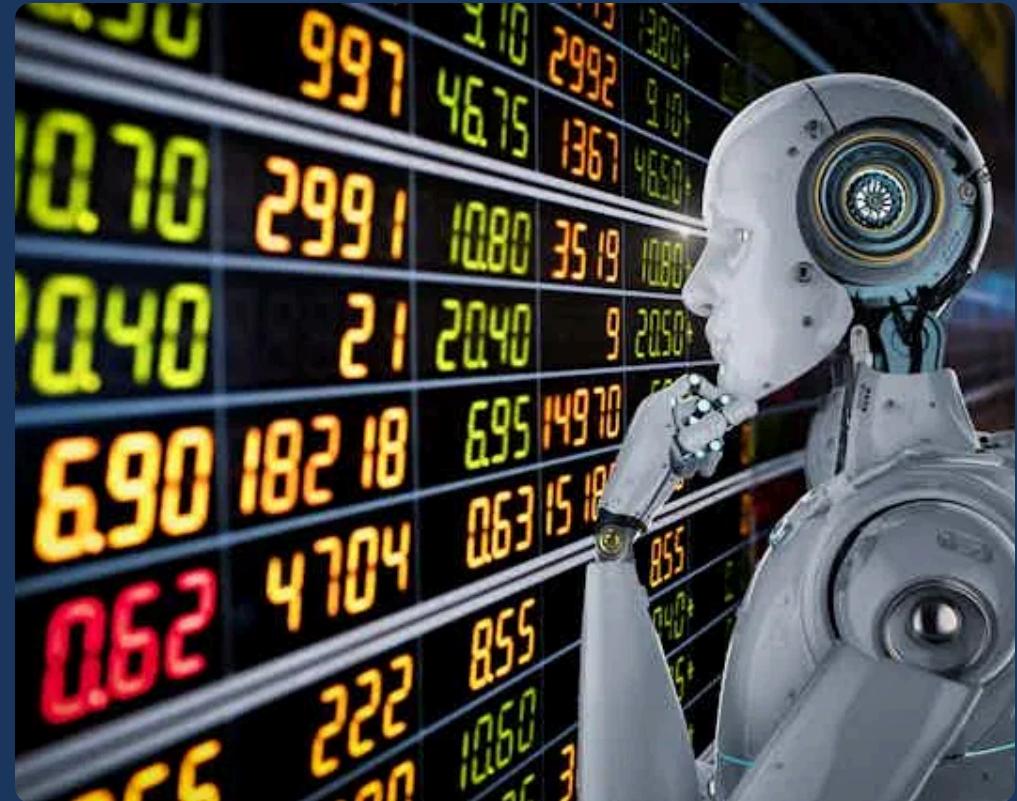
Weeks 11–12:

- 1.5 hours of lecture
- Student presentations on empirical financial research



Requirements

- 📄 Each student must write a **term paper** related to economics or finance using big data from open-source platforms.
- </> **Python** is strongly recommended. However, students may use other languages upon consultation.
- 🤖 Projects involving **LLMs**, such as domain-augmented knowledge retrieval, are highly encouraged.



Textbook and References

Main Textbook:

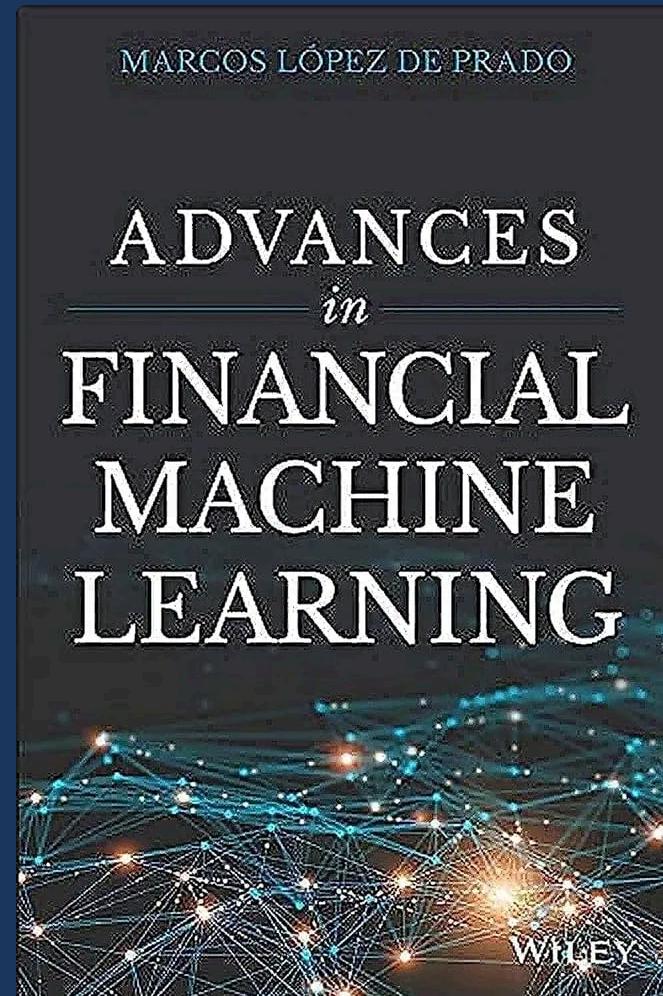
Marcos López de Prado, **Advances in Financial Machine Learning**, Wiley (2018)

Lecture Materials:

Lecture notes in .py, .md, and .pdf format will be distributed before class

Programming Resources:

Python libraries: numpy, pandas, matplotlib, and AI-assisted coding tools



Grading Breakdown

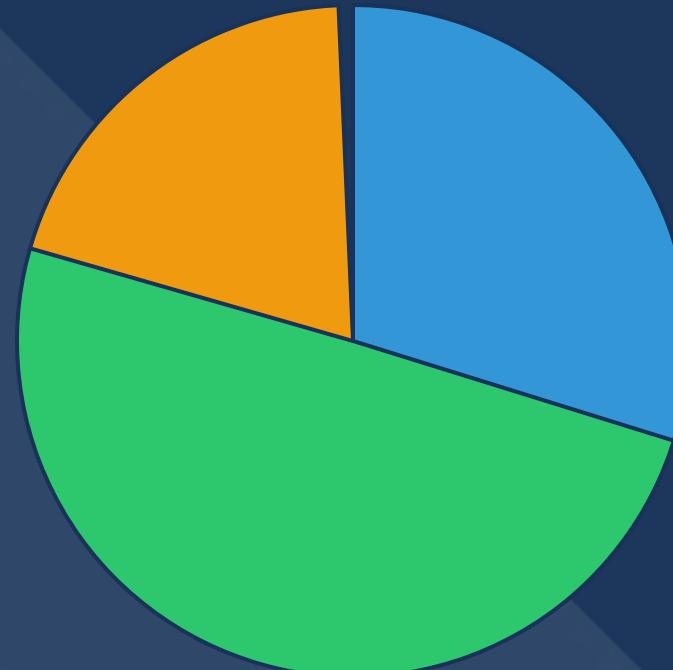
Homework / Midterm **30%**

Presentation **50%**

Term Paper **20%**

Each student must write a term paper related to economics or finance using big data from open-source platforms.

Projects involving LLMs, such as domain-augmented knowledge retrieval, are highly encouraged.



Homework / Midterm Presentation
Term Paper

Term Paper Timeline

September 26, 2025

Term paper outline due

Submit a detailed outline of your research topic, methodology, and expected outcomes

October 24, 2025

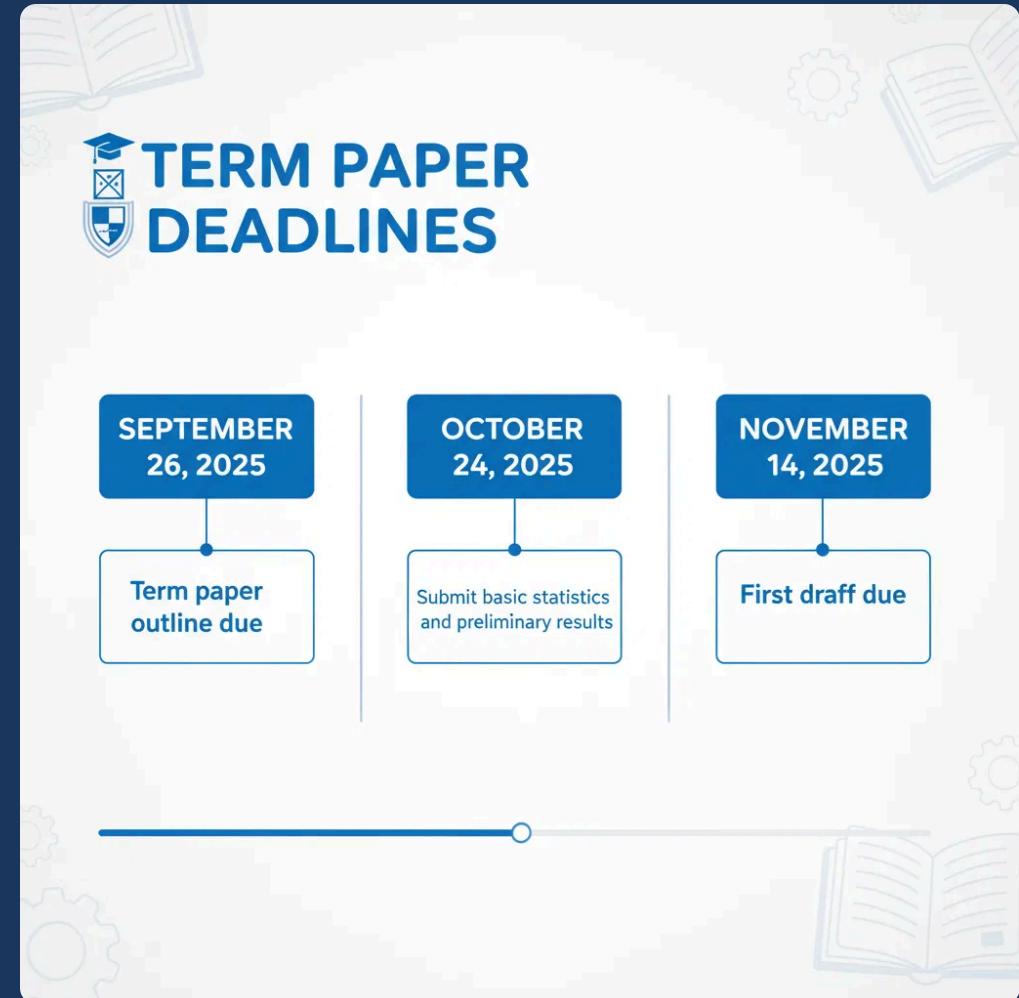
Submit basic statistics and preliminary results

Present initial data analysis and preliminary findings for feedback

November 14, 2025

First draft due

Submit complete first draft including all sections, analysis, and conclusions



Course Schedule

Week(s)	Topic
1-1.5	AI Finance Overview & Environment Setup
2	AFML Ch.2: The Information Bar
3	AFML Ch.3: Triple Barrier and Meta-Labeling
4	AFML Ch.4: Financial Data Challenges
5	AFML Ch.5: Long Memory and Feature Engineering
6	AFML Ch.6: Ensemble Methods and Applications
7	AFML Ch.10: Automatic Bet Sizing
8	AFML Ch.19: Private Information & Feature Engineering
9	NLP Feature Engineering and LLMs
10	Fine-tuning, Contextual Learning, and Applications
12-13	AI Agents and Their Applications in Financial Markets

AFML = *Advances in Financial Machine Learning* (Marcos López de Prado)

AI FINANCE: WEEKLY TOPICS

WEEK(S)	TOPIC
1-1.5	AI Finance Overview & Environment Setup
2	AFML Ch.3: Triple Barrier and Meta-Labeling
3	AFML Ch.4: Financial Data Challenges
4	AFML Ch.5: Long Memory and Feature Engineering
6	AFML Ch.10: Ensemble Methods and Applications
7	AFML Ch.10: Automatic Bet Sizing
9	NLP Feature Engineering and LLMs
10	Fine-tuning, Contextual Learning, and Applications
12-13	AI Agents and Their Applications in Financial Markets
11	Independent Study / Project Work

FALL 2024 SEMESTER