

Machine Learning for Finance

Prepared by Dr. Diaa Salama

FNT633
Orientation Week

Lecture 0





مجموعة جامعة
الجميع الذكية
للتعليم القابضة

MIDOCEAN
UNIVERSITY

Machine Learning for Finance

Lecture 0

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Orientation Week

Prepared by
Dr. Diao Salama

www.midocean.ae

- **Associate Professor, Data Science Department**, Faculty of Computers Science , Misr International University, **On Leave from Faculty of Computers & Artificial Intelligence, Banha University, Banha, Egypt.**
- **Member**, National Committee of Communications and Information Technology, Academy of Scientific Research & Technology, CAIRO, Egypt.
- **Member**, International Telecommunication Union (ITU), United Nations (UN)
- **Member**, International Federation for Information Processing - IFIP
- **Winner of** the Arab Republic of **Egypt Encouragement Award** for Advanced Science and Technology in the Field of Engineering Sciences **2021**
- **Winner of** the **Benha University Encouragement Award** for Advanced Science and Technology in the Field of Engineering Sciences **2019**
- **Winner** of the DELL EMC AWARD for the academic year 2015/2016, 2016/2017, and 2017/2018



Dr.Diao Salama Ph.D

One of the top 2% Scientists worldwide 2023 by Stanford university ranking.

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Week

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Master of Financial Technology

- After completion of the program, the graduate becomes eligible to
- The Master of Financial Technology focuses on developing FinTech services.
 - The program emphasizes the systematic understanding of new digital business models in financial services,
 - how innovation through technology is changing business practices,
 - quantitative finance skills, and the application of emerging technologies to financial services.

Week

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Degree Requirements

- To earn a master's degree in Financial Technology (FinTech), the student must complete a minimum of 30 credit hours of credit upon graduation and successfully complete the required scientific seminars of the programs.
- Period of study
 - 3 terms

Week

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Careers

- After completion of the program, the graduate becomes eligible to work in several jobs, including:
 - Data Specialist
 - Quantitative Analyst
 - Application Developer
 - Machine Learning Engineer/Analyst
 - Blockchain Developer

Week

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Course Basics data

Instructor:	Associate Professor : Diao Salama
Subject Name:	Machine Learning in Finance
Subject Code:	FNT633
Program name:	Master of Financial Technology
University Name:	Midocean
Faculty	Faculty of Humanities
Department	Financial Technology
Academic Year	2024
Teaching Language	Course are in English, with explanations provided in Arabic.
Date of establishment of the curriculum plan/Date of review of the curriculum plan.	2024

Week

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Course Objectives

- After finishing this course, students are expected to learn the following objectives :
 - Understand the fundamental concepts of machine learning.
 - Explore the application of machine learning techniques in the financial industry.
 - Develop practical skills to implement machine learning solutions in finance.
 - Analyze the impact and future trends of machine learning in finance.

Week

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Course Description

- This course provides a comprehensive introduction to machine learning and its applications in the financial sector.
 - Students will learn about various machine learning techniques, from fundamental concepts to advanced algorithms, and how these can be applied to solve real-world economic problems.
 - The course covers data processing, feature engineering, supervised and unsupervised learning, and natural language processing, focusing on their relevance to financial forecasting, credit scoring, risk management, algorithmic trading, and regulatory compliance.
 - Through lectures and case studies, participants will gain practical experience implementing machine learning models using economic data.

Week

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Course Information

- English/Arabic
- 80-90-minute videos
- Practice Questions by the end of each domain
- Extra study resources (if needed)

YOU MUST KNOW THE BASICS FIRST

Week

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Course Information

Work and Grading:

10 Weeks and Weekly Exam (each Week 8 marks , Final Exam 20 marks)

homework assignments:

Part 1: interactive, solve together

Part 2: written, solve together, write up alone, electronic submission through Moodle

Fixed scale

Contests!

Week

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Course Information

Communication:

- During Discussion panels
- SIS tickets

Course technology:

- New infrastructure
- Help us make it awesome!

Week

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Prerequisites

Prerequisites:

- **No** specific prerequisites
- **No** work experience in cybersecurity.
- **Only**
 - ✓ Basic information technology (IT) knowledge & Network basics) & Math courses.
 - ✓ Basic English understanding

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This could be achieved through the following:

- Class Lectures
- Tutorials
 - Weekly Exam.
 - In-Class activities and attendance.
 - Final examination.
- Problem Solving

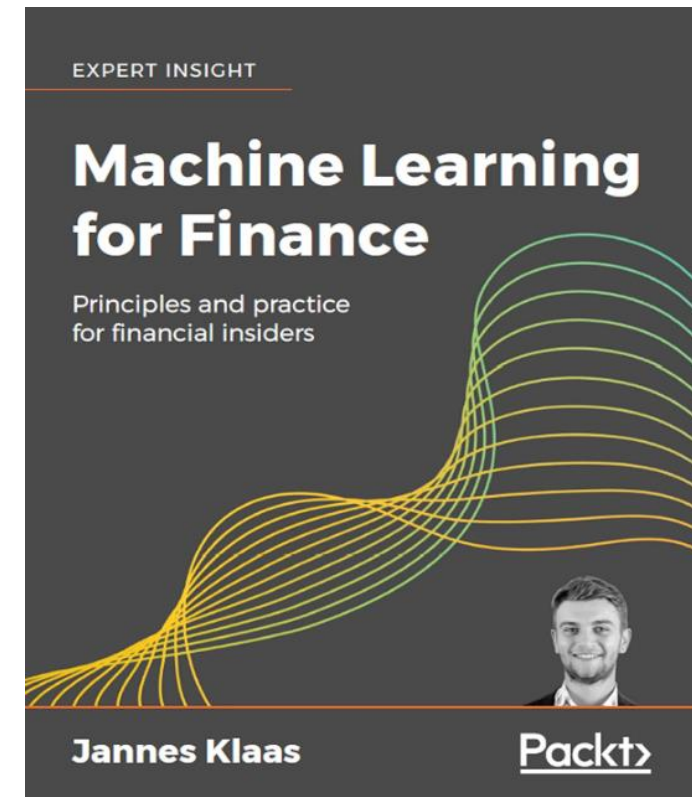


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Text Book

- Not required, but for students who want to read more we recommend
 - Machine Learning for Finance: Principles and practice for financial insiders
 - Warning: Not a course textbook, so our presentation does not necessarily follow the presentation in the book.



Course content and Weekly plan

Lecture	Topic	Notes
	Orientation Lecture	Lecture
1	Introduction to Machine Learning and Finance (Data Science Life Cycle) (Data Understanding -Financial Data Types and Sources)	Lecture & Exam
2	Data Preparation I (Cleaning and Preprocessing)	Lecture & Exam
3	Data Processing and Feature Engineering II (Data Integration, Data Normalization)	Lecture & Exam
4	Statistical Foundations for Data Science (Descriptive and Inferential Statistics and Data Visualization Techniques)	Lecture & Exam
5	Supervised Learning Fundamentals (Introduction to supervised learning, classification, and regression in finance using KNN, Decision Tree)	Lecture & Exam
6	Decision Trees and Random Forests (Fundamentals of tree-based methods.)	Lecture & Exam
7	Association Rule Learning (Market basket analysis and the Apriori algorithm.) Naïve Bayes (Implementation and Use Cases)	Lecture & Exam

8	Time Series Analysis I- Models and Forecasting	Lecture & Exam
9	Unsupervised Learning in Finance (Clustering algorithms and their applications.)	Lecture & Exam
10	Natural Language Processing for Financial News - NLP techniques for sentiment analysis. - Impact of news on market movements. Dimensionality Reduction Techniques - PCA and t-SNE	Lecture & Exam
11	Revision	
12	Final Exams	
13	Final Exams	
	Final Exams	

Module 1: Introduction to Machine Learning

- Overview of machine learning and its history.
- Types of machine learning: supervised, unsupervised, and reinforcement learning.
- Key algorithms and techniques.

Module 2: Data Handling and Preprocessing

- Financial data sources and formats.
- Data cleaning and preprocessing techniques.
- Feature engineering and selection.

Module 3: Data Analysis

- Data Visualization
- BoxPlot , Five number summery

Module 4: Predictive Modeling in Finance

- **Supervised Learning**
 - Regression models for financial prediction.
 - Classification models for credit scoring and risk assessment.
- **Unsupervised Learning**
 - K means Clustering
- **Forecasting Methods**
 - Time series analysis and forecasting.
 - Moving Average , Weight Moving Average , ARIMA , Forecasting Including Trend
- **Association Rule**
 - Apriori Algorithm
- **Natural Language Processing for Financial News**
 - NLP techniques for sentiment analysis.
 - Impact of news on market movements.
 - Dimensionality Reduction Techniques - PCA and t-SNE

Module 5: Practical Implementation and Case Studies

- Hands-on projects
- Case studies from industry leaders.
- Ethical considerations and regulatory environment.

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Exam Overview

- 10 Weekly Exams MCQs / each Exam 8 Questions
- Exam Availability: English
- Final Exam MCQs / 20 Questions

Recommended Textbooks and Main References

1. "Machine Learning for Finance: Principles and Practice for Financial Insiders" by Jannes Klaas
2. Machine Learning for Asset Managers" by Marcos López de Prado
 - ISBN: 978-1108792891
3. "Advances in Financial Machine Learning" by Marcos López de Prado
 - ISBN: 978-1119482086
4. "Hands-On Machine Learning for Algorithmic Trading: Design and Implement Algorithmic Trading Systems Using Python and Advanced Data Analysis" by Stefan Jansen
 - ISBN: 978-1839217715
5. "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython" by Wes McKinney
 - ISBN: 978-1491957660
6. "Introduction to Machine Learning with Python: A Guide for Data Scientists" by Andreas C. Müller and Sarah Guido
 - ISBN: 978-1449369415
7. "Artificial Intelligence in Finance" by Yves Hilpisch
 - ISBN: 978-1492055433

Textbooks:



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Thank You

