

Course Syllabus
International Banking and Capital Markets II
II semester - Fall 2022

Instructor: Valentina Lagasio (valentina.lagasio@uniroma1.it)

Office: Room 21, Management department, 3rd floor

Office Hours (hours of teaching assistance): please fix an appointment via email

Class Hours (day, time, room): to be defined

Course website: [Link](#)

Textbooks

Tatsat, H., Puri, S., & Lookabaugh, B. (2020). *Machine Learning and Data Science Blueprints for Finance*. O'Reilly Media.

Additional Materials (shared via Google classroom)

- Slides used during the classes
- Financial time series
- Papers focusing on specific topics covered during the course
- Websites of interest

Prerequisites

There are no binding prerequisites. However, students should preferably know the main aspects of bank management (i.e. risk management) and master basic statics for analyzing financial data.

Final and grade policy

Final Exam:

ATTENDING STUDENTS

- Group Project (with class presentation)
- Individual written examination

NON-ATTENDING STUDENTS

- Individual written examination

Weights:

ATTENDING STUDENTS

- Course participation (attendance and assignments): 5/30
- Group Project evaluation: 15/30
- Individual written examination: 18/30

NON-ATTENDING STUDENTS

- Individual written examination: 33/30

Registration Area

In Google Classroom a Registration Area is active. Students will be asked to fill a form reporting some details which will be kept in due consideration to constitute the groups for each project and adjust the focus of the lessons, to avoid going into too much obvious explanation or, conversely, taking for granted topics with which the class is less familiar. Students are asked to register within the first two weeks of the course.

<https://form.jotform.com/222923505393355>

Course Objectives

The Artificial Intelligence in Banking and Finance course lays the foundation for the development of new financial business models and trading strategies with artificial intelligence techniques. It is meant for students interested in artificial intelligence applications in banking finance.

This course has a dual purpose: to give a theoretical foundation for fundamental procedures as well as empirical examples using cutting-edge frameworks.

This course will examine the significant effects that the adoption of new technologies could have on conventional business operations. The course provides students with the knowledge necessary to analyse and assess the adoption of Artificial Intelligence and Machine Learning technologies in the banking and financial sectors.

Expected learning objectives and skills

At the end of the course on Artificial Intelligence in Banking and Finance, students will have a thorough understanding of the origins of Artificial Intelligence, with a focus on the most implemented Machine Learning technologies, as well as the technological factors that support the business and their various practical applications in banking and finance.

The course aims to train students with the skills appropriate to solve practical problems they may encounter in the real world, such as: understanding where the problems lay on a general landscape of available Artificial Intelligence methods; understanding which Artificial Intelligence approach(es) would be most suitable for resolving the problem; and being able to successfully implement a solution and evaluate its performance.

Group project (for attending students only)

Students will be divided into small groups. They are requested to apply knowledge and understanding: the student will be able to analyze bank management via machine learning applications on different case studies. The student will be able to apply the concepts learned during the classes and will enhance the ability to make a public presentation.

Preliminary Weekly Course Calendar

Week	Topics
1.	<u>INTRODUCTION TO THE COURSE</u> <ul style="list-style-type: none">- Risk management in banking- Financial risks <u>THE ROLE OF ARTIFICIAL INTELLIGENCE IN BANKING AND FINANCE</u> <ul style="list-style-type: none">- Machine Learning, Deep Learning, and Data Science- Applications and examples in Banking and Finance (case studies presentation)

2.	<p><u>INTRODUCTION TO PYTHON AND (FINANCIAL) DATA GATHERING</u></p> <ul style="list-style-type: none"> - Describing the main Python packages for finance - Describing the main sources of financial data - Analyzing the different database structures - Exploratory data analysis and Descriptive statistics
3.	<p><u>SUPERVISED LEARNING: OVERVIEW</u></p> <ul style="list-style-type: none"> - Regression (specific skills for ML applications) - Support Vector Machine - K-Nearest Neighbors - Linear Discriminant Analysis - Classification and Regression Trees <p><u>MODEL PERFORMANCE</u></p> <ul style="list-style-type: none"> - Overfitting and Underfitting - Cross Validation - Evaluation Metrics
4.	<p><u>SUPERVISED LEARNING: REGRESSION</u></p> <ul style="list-style-type: none"> - Linear Regression (specific skills for ML applications) - Logistic Regression (specific skills for ML applications) - Polynomial Regression (specific skills for ML applications) - Applications and examples in Banking and Finance (i.e. determinants of bank default; asset price prediction; ...): coding exercises and academic papers discussion
5.	<p><u>SUPERVISED LEARNING: CLASSIFICATION</u></p> <ul style="list-style-type: none"> - Classification Predictive Modeling - Binary Classification - Multi-Label Classification - Imbalanced Classification - Applications and examples in Banking and Finance (i.e. loan defaults; fraud detection; ...): coding exercises and academic papers discussion
6.	<p><u>ARTIFICIAL NEURAL NETWORKS</u></p> <ul style="list-style-type: none"> - Architecture - Training - Hyperparameters - Applications and examples in Banking and Finance (i.e. determinants of bank default; ...): coding exercises and academic papers discussion
7.	<p><u>UNSUPERVISED LEARNING: OVERVIEW</u></p> <ul style="list-style-type: none"> - Dimensionality reduction - Clustering <p><u>MODEL PERFORMANCE</u></p> <ul style="list-style-type: none"> - Evaluation Metrics

8.	<u>UNSUPERVISED LEARNING: DIMENSIONALITY REDUCTION</u> <ul style="list-style-type: none"> - Feature selection - Feature extraction - Applications and examples in Banking and Finance (i.e. risk management; ...): coding exercises and academic papers discussion
9.	<u>UNSUPERVISED LEARNING: CLUSTERING</u> <ul style="list-style-type: none"> - K-means - Hierarchical clustering - Applications and examples in Banking and Finance (i.e. bank business models identification; ...): coding exercises and academic papers discussion
10.	<u>NATURAL LANGUAGE PROCESSING</u> <ul style="list-style-type: none"> - Topic modeling - Sentiment analysis - Applications and examples in Banking and Finance (i.e. trading strategies; crypto sentiment evaluation; ...): coding exercises and academic papers discussion
11.	<u>ETHICS AND TRANSPARENCY IN ARTIFICIAL INTELLIGENCE</u> <ul style="list-style-type: none"> - (How to deal with) applications and examples
12.	<u>PROJECT PRESENTATIONS AND CONCLUSION OF THE COURSE</u> <ul style="list-style-type: none"> - Group presentations - Wrapping up of the course
EXTRA	<u>REAL WORLD EXPERIENCES</u> <ul style="list-style-type: none"> - Lessons from regulators (European Central Bank; Bank of Italy; ...) - Practitioners (Bankers; Financial or industrial companies; ...)