Universidad de Navarra

Data Analytics (MBRF)
Guía docente 2026-27

PRESENTATION

Brief description:

Banks currently use data science in the areas of customer service, fraud detection, forecasting, understanding consumer sentiment, customer profiling, target marketing and supervisory reporting, among others. In this context this subject is focused on providing students with a knowledge base in order to face different challenges when preparing and analyzing huge amounts of data. In order to do that, the students will be programming and analyzing current cases from the banking industry through SAS, R, Python and XBRL language.

- **Title**: Master in Banking and Financial Regulation
- **Módulo/Materia**: Data Analytics
- **ECTS**: 7.5
- **Semester**: First semester
- **Compulsory / optional**: Compulsary
- **Professors**:
  - Joan Arnau Romeu (Bestinver).
  - Carlos Valenzuela (True North Partners).
  - Javier Mora Gonzálbez (XBRL senior expert).
  - Maria Julieta Sammartino (UNAV).
  - Jesús García Dueñas (BBVA).
  - Alberto Torres Barrán (Komorebi).
  - Sergio Mira Albert (True North Partners) - Coordinator.
- **Language**: English
- **Room and schedule**: To be defined.

LEARNING OUTCOMES (Competencies)

- GENERALS
  - CG6 - To facilitate clear and effective oral and written presentation of financial topics.
  - CG7 - To provide knowledge of data extraction techniques and basic research in the field of financial intermediation.
  - CB7 - To enable students to apply the acquired knowledge and their problem-solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study.
  - CB10 - To empower students with learning skills that enable them to continue studying in a largely self-directed or autonomous manner.
- SPECIFICS
  - CE1 - To develop programming skills in common languages (Python, R, and XBRL) for solving issues related to financial intermediation. To introduce students to the use of Artificial Inteligence in the banking sector.
  - CE2 - To facilitate the location of specialized materials (reports, articles, data) related to various aspects of banking business in libraries, on the internet, in archives, in accessible databases, etc.

PROGRAM

Python – Professor: Joan Arnau

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Python is a computing language widely used in the banking sector. It is essential to manage large amounts of data as well as to extract data insights to improve decision making. You will acquire an intermediate level of *Python - Data Management* which is a skill highly appreciated in the financial industry.

As in the R course, raw data and exercises will in all cases be 100% related to banking applications.

1. Foundations (variables and data structures)

2. Data management with the package Pandas

3. Data Visualization with Pandas and Matplolib

4. Exercises of data management

Modelling (Python) – Professor: Joan Arnau

You will learn how Banks analyze data to derive business and efficiency strategies. This involves learning the challenges involved in creating a large data model, from managing the data to choose the best solution for a given business need, which includes Machine Learning and Artificial Intelligence applications. You will participate in *hands-on sessions* which combine statistics, programming and business knowledge. You will build analytical solutions which are key for financial institutions: ranging from Probability of Default risk management models to Customer Interactions retail strategies.

1. Modelling basic concepts

2. Unsupervised learning

3. Supervised Learning: classification and regression models

3.1. Steps of a large modelling project and best practices

3.2. Main Machine learning models: linear (logistic), random forest, boosted decision trees and multilayer perceptron

3.3. Model Calibration

3.4. Model Validation with ECB regulatory examples

3.5. Basics in Artificial Intelligence and applications in the Financial Sector

3.6. 'Tech hot topics' in the financial industry

4. Hands-On sessions (distributed through the course):

4.1. Building equity portfolios with a clustering algorithm

4.2. Probability of Default

4.3. Real State model

4.4. Delinquency management through optimal collections strategies

4.5. Design of mobile app for a retail Bank

R – Professor: Carlos Valenzuela

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Although the curriculum of this part is mainly about R programming language, raw data and exercises will in all cases be 100% related to banking applications, e.g., **house characteristics for sale price estimation and financial ratios of companies for default prediction used in order to develop scoring models**.

1. Introduction to R

1.1. What is R and how to install it

1.2. How to work with R in a user-friendly way: R Studio

1.3. Internet resources to work with R: Stack Overflow, etc.

2. Variables and data types in R

2.1. What is a variable, what it is useful for, and how to declare variables?

2.2. Numerical variables and vectors

2.3. Logical variables

2.4. Strings and string manipulation

2.5. Factors and categorical data

3. Control flow structures

3.1. If statement: do something if a condition is true

3.2. For statement: perform a task a finite number of times

3.3. While statement: repeat a task until a condition is no longer true

4. Functions

4.1. What is a function and what it is useful for?

4.2. How to declare a function

4.3. How to use functions

4.4. Variable scope in functions

5. R packages

5.1. What is a package and how to install new packages?

5.2. How to use packages

6. Data manipulation in R

6.1. Data import

6.2. Subsetting and manipulating Data Frames

6.3. Data aggregation

6.4. Merging and joining DataFrames

7. Data visualization in R

7.1. Introduction to plotting in R: available options

7.2. How to create a graphic in R using ggplot

7.3. Useful graphics for data visualization: boxplots, histograms, scatterplots, etc.

8. Descriptive analysis in R

8.1. Outlier detection and treatment

8.2. Treatment of missing cases

8.3. Empirical distribution of data: assessment of normality assumptions

8.4. Grouping of numerical and categorical variables

8.5. Variable predictive power: WOE and Information Value

XBRL – Professor: Javier Mora

1. What is XBRL? The standard for financial reporting

2. What is the Data Point Model (DPM)? The next ISO standard for reporting

3. Data Point Modelling (DPM) using XBRL in European Supervisors

4. DPM and XBRL in European Banking Supervision

Artificial Intelillence - Professor: various

1. AI Fundamentals, Machine Learning, and their relevance in banking

2. Generative AI and Language Models (LLMs)

3. AI Risk Management in Banking

4. From Generative AI to Agents: Preparing for Group Work

5. Agent Architecture and Ecosystem Tools

6. Guided Agent Construction (Hands-on)

Seminars:

Several presentations on use cases by professionals from the financial sector.

More information on the links below:

European Banking Authority (EBA)

https://eba.europa.eu/risk-analysis-and-data/reporting-frameworks

European Central Bank Authority (ECB) https://www.bankingsupervision.europa.eu/banking/approach/reporting/html/index.en.html

Single Resolution Board (SRB)

https://srb.europa.eu/en/content/reporting

ACTIVIDADES FORMATIVAS

1. Lectures: 70 hours

Theoretical and practical classes in themes indicated in the syllabus with the help of the blackboard, power point presentations and videos.

2. One-to-one tutorials: 20 hours

Each student may have personal interviews with the professor to help him/her with personal study and learning.

3.Practical assigment: 40 hours

Final projects

4.Personal work: 57.5

Students must understand themes covered early in the course to be able to comprehend information presented later in the course, and will have to be able to integrate material learnt throughout the course. Therefore, it is important that they do not fall behind and try to set aside regular times outside of class to work on the course material on a daily basis.

EVALUACIÓN

CONVOCATORIA ORDINARIA

Students are required to attend 80% of classes. Failing to do so without justified reason will imply a Zero grade in the participation/attendance evaluation item and may lead to suspension from the program.

The assessment will be:

- Final projects (e.g., Python, R, AI): 60%.
- Class participation: 10%.
- Daily work and exercises in class (e.g., Data Camp assignments): 30%.

HONESTY IS THE BEST POLICY

(Ethics Committee Provisions Against Plagiarism and Copying)

We value honesty. Without it, there can be no trust or any meaningful social relations. Therefore, the School expects honesty and fairness from all of its members: professors, non-academic staff, and students.

Dishonest behaviours will be sanctioned in accordance with the University Norms on Student Academic Discipline of August 2015, and include lying, cheating in exams, and plagiarism in written work. We take such violations seriously. Depending on their gravity, these offences will be

dealt with by the Professor in charge of the subject, by the Dean of Students, and in very severe cases, by the Vice President for Student Affairs.

Sanctions include:

- Formal warnings.
- Prohibition from entering University premises for a given period.
- Loss of admission rights to exams.
- Loss of scholarships.
- A failing grade for the piece of work or the whole course.

CONVOCATORIA EXTRAORDINARIA

- The students that fail in the fist round will need to produce a new final project. This project will count for 60% of the total grade. The other 40% correspond to the class participation and daily work during the ordinary call.

HORARIOS DE ATENCIÓN

- Through contact with the professor by email to schedule an appointment.

BIBLIOGRAFÍA Y RECURSOS

Among others, follow some resources students can use in order to get deeper understanding of what is going to be taught in class:

- Python Programming Documentation (web resources).
- R Documentation (web resources).

Databases:

Bankscope

Orbis

Alumni Library

Inglés

Commercial and Investment Banking & the International Credit and Capital Markets A guide to the global finance industry and its governance

Brian Scott-Quinn Palgrave macmillan

Disponible en papel y en electrónico. Find it in the library (Print version). Find it in the library (Electronic version)