

# **Econometrics: Data Analytics for Development**

## **Master in International Development MID SEP-2024 S-1**

Area Sustainable Development

Number of sessions: 20

Term: Term 2

Category: regular

Language: English

Professor: **JEAN-BAPTISTE BOVE**

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Jean-Baptiste is an experienced information management specialist with a background in both the private and nonprofit sectors. His passion lies in leveraging technology and data for humanitarian and development purposes. His areas of expertise include conducting humanitarian needs assessments, managing cash transfer programs, implementing logistics information systems, advocating for open data practices and applying machine learning in emergency contexts.

Currently, Jean-Baptiste is an Assessment Expert within the Italian Red Cross and is concurrently pursuing a doctoral degree at the CIMA Research Foundation. His research focuses on enhancing crisis prevention and response by integrating AI into early warning to early action strategies.

Over the course of his career, Jean-Baptiste has held key roles at international organizations, including Logistics and Information Management Manager at WeWorld-GVC, Product Owner at Data Friendly Space, and Assessment Officer at IMPACT REACH.

He holds a Master of Science (MSc) in Humanitarian Logistics, another MSc in International Development, and a Bachelor of Arts (BA) in Biomedical Engineering, reflecting his solid academic background and a deep understanding of the humanitarian and development sectors.

### **Office Hours**

Office hours will be on request. Please contact at:

Professor: **JOSE LUIS DELGADO DAVARA**

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Jose Luis is a professional in the field of Information Technologies with over 9 years of experience working for the private sector and multilateral organizations. He has a strong background in data analytics, international development, innovation, and product management. During his time in the multilateral development banks, Jose Luis played a key role in designing and implementing data-driven solutions that helped drive positive change in developing countries. Currently, Jose Luis is the founder and CEO of Mottum.io, a technology and strategy consulting firm that leverage in data analytics and innovation to help businesses and organizations navigate the ever-changing technology landscape.

### Office Hours

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## SUBJECT DESCRIPTION

This course provides an in-depth exploration of data analytics as a powerful tool for driving development and humanitarian initiatives. Students will learn the essential techniques for collecting, cleaning, analyzing, and visualizing data to generate actionable insights in the context of international development. Through a combination of theoretical foundations and hands-on practice, the course will cover key methodologies in data analytics, including data processing, exploratory data analysis, and visualization using various tools.

In addition, students will be introduced to machine learning and artificial intelligence, with a particular focus on their applications in development-related projects. By examining real-world case studies from the development and humanitarian sectors, participants will gain a comprehensive understanding of how data-driven approaches can address complex global challenges.

The course emphasizes a practical approach, allowing students to work with real datasets from international organizations and development agencies. By the end of the course, participants will be equipped with the skills to use data analytics as a strategic asset in designing and implementing effective development policies and programs.

## LEARNING OBJECTIVES

By the end of this course, participants will be able to

- **Comprehend Data Analytics Fundamentals:** Develop a solid foundation in data analytics concepts, methodologies, and tools, including data collection, cleaning, visualization, and analysis, with a specific focus on their applicability within the international development sector.
- **Apply Data Analytics Techniques:** Acquire hands-on experience in utilizing data analytics techniques to extract actionable insights from real-world development data sets. Students should be able to apply various analytical methods to solve practical development challenges.
- **Interpret and Communicate Data Findings:** Develop the ability to interpret complex data findings and effectively communicate them to diverse stakeholders, such as policymakers, practitioners, and community members, to inform evidence-based decision-making in the international development sector.

- **Ethical Data Use and Privacy:** Gain an understanding of ethical considerations and privacy concerns related to data analytics in the development sector. Learn how to navigate ethical dilemmas and adhere to international standards while working with sensitive data.
- **Project-Based Problem Solving:** Engage in hands-on, project-based learning experiences that require students to apply data analytics techniques to real-world development problems. Foster critical thinking and problem-solving skills by working on development-focused data analysis projects throughout the course.

## TEACHING METHODOLOGY

The course employs a dynamic and interactive teaching methodology that combines lectures with hands-on practical sessions to ensure a thorough understanding of data analytics in real-world development contexts. Lectures will provide the theoretical background and introduce key concepts, while the practical sessions will allow students to apply these techniques using real datasets. Group work is an integral part of the course, with teams collaborating on a real-world data analytics project sourced from a United Nations multi-agency initiative. This project-based learning approach encourages critical thinking, problem-solving, and teamwork. Assessments will include a combination of exams and the evaluation of group projects, ensuring that students can demonstrate both their technical skills and their ability to work collaboratively on complex development challenges.

<b>Learning Activity</b>	<b>Weighting</b>
Lectures	30.0 %
Discussions	5.0 %
Exercises in class, Asynchronous sessions, Field Work	25.0 %
Group work	25.0 %
Individual studying	15.0 %
<b>TOTAL</b>	<b>100.0 %</b>

## AI POLICY

In this course, we encourage the thoughtful use of GenAI tools to enhance and support the learning experience. GenAI can be a valuable resource for tasks such as data analysis, visualization, and research. However, while GenAI can aid in these areas, it should not be seen as a substitute for critical thinking, problem-solving, or hands-on learning. Students are expected to engage deeply with the course material, applying their own reasoning and analytical skills to develop a solid understanding of the concepts presented. GenAI tools should complement your work, helping to streamline workflows or generate insights, but the focus must remain on mastering the techniques and methodologies integral to data analytics for development.

Recommendations for Using GenAI:

- **Verify Accuracy:** Always double-check GenAI-generated outputs against reliable sources, especially for data analysis, calculations, or factual content.
- **Critical Review:** Analyze and assess the logic behind GenAI outputs to ensure they align with the course principles and your understanding of the subject matter.
- **Refinement:** Use GenAI outputs as drafts or inspiration, refining and expanding upon them with your own critical thinking and insights.
- **Contextualization:** Ensure that GenAI-generated content is adapted and contextualized to the specific development challenges and scenarios you are addressing in your work.

- Avoid Over-Reliance: Use GenAI to assist with tasks like research or automation, but avoid over-reliance—make sure to develop your analytical and problem-solving skills independently.

## **PROGRAM**

### **SESSION 1 (LIVE IN-PERSON)**

#### **Introduction to data analytics for development**

Present the syllabus and main concepts covered in this class. Introduce the pillars of data analytics and some practical use cases in the development sector. Talk about quantitative vs qualitative, raw vs structured, continuous vs discrete, nominal vs categorical etc.).

#### **Learning objectives:**

1. Understand the objectives of the class, syllabus and evaluation scheme
2. Understand the main concepts and definition of data analytics
3. Discover and present practical use cases in the development sector
4. Understand the expectations of the students

The learning material will be uploaded to the platform prior to the class.

### **SESSION 2 (LIVE IN-PERSON)**

#### **Introduction to Data analytics for development II - Generative AI**

Presents practical use cases of data analytics for development to give the students an overview of the current status of data analytics in development, trends and future possible future evolution of techniques and processes.

#### **Learning objectives:**

1. Review several use cases of how data analytics, AI and machine learning are used in the development sector
2. Understand the main requirements, risks and implications of using these technologies in the development sector

The learning material will be uploaded to the platform prior to the class.

### **SESSION 3 (LIVE IN-PERSON)**

#### **Data collection Theory**

Present the different data collection techniques and tools used in the development sector. Define the types of data collected (primary, secondary, quantitative, qualitative, etc.). Define the techniques (surveys, FGDs, KI interviews etc.). Define the tools (kobo, ODK, GIS etc.). Define the sources (Open data, World Bank, HDX etc.).

#### **Learning objectives**

1. Understand what type of data is collected in the development sector
2. Understand why data is collected in the dev sector and how it is used
3. Understand how data is collected in the dev sector and what are the main challenges

The learning material will be uploaded to the platform prior to the class.

### **SESSION 4 (LIVE IN-PERSON)**

## **Data Collection Workshop 1**

Introduce the use of Kobo toolbox and survey design using the form builder and the xls forms.

### **Learning objective**

1. Learn the basics of data collection and survey design.
2. Learn how to use the form builder of kobo.
3. Learn how to create forms with the xls forms

The learning material will be uploaded to the platform prior to the class.

## **SESSION 5 (LIVE IN-PERSON)**

### **Data collection Workshop 2**

Collect data with kobo collect and export data. Get a first overview of the output of data and the importance of using features that limit errors in data collection and therefore minimize the data cleaning steps needed to turn raw data into clean data. Explore sources of open data and understand the importance of collecting both primary and secondary data within a project.

### **Learning objective**

1. Learn how to collect data on the field with Kobo Toolbox

The learning material will be uploaded to the platform prior to the class.

## **SESSIONS 6 - 7 (LIVE IN-PERSON)**

### **Data cleaning Theory**

Present the different data cleaning techniques used in the development sector and provide insights on how minimize and automate the steps needed to turn raw data into structured data.

### **Learning objective**

1. Understand the difference between raw and structured data.
2. Understand the steps needed to clean the data.
3. Understand the main sources of errors in the data and how to minimize them.

### **Data cleaning Workshop 1**

Practical workshop on cleaning techniques using advanced tools like Power BI Query editor.

### **Learning objective**

1. Hands-on learning activities to clean datasets using advanced tools commonly seen in large corporations.
2. Practice solving the main challenge when working with real data.

The learning material will be uploaded to the platform prior to the class.

## **SESSION 8 (LIVE IN-PERSON)**

### **Intro to Power BI and Data cleaning**

Getting familiar with Power BI and its Data Cleaning tool to prepare and ingest complex datasets in a data analytics environment.

### **Learning objective**

1. Get familiar with Power BI Data Prep.
2. Practice Data cleaning tasks with Data Prep and understand.
3. Understand the value of Data Prep in corporate environments.

The learning material will be uploaded to the platform prior to the class.

## **SESSION 9 (LIVE IN-PERSON)**

### **Midterm exam**

Covering previous sessions material (20-30 min), followed by:

### **Introduction to Data Visualization**

Introduce the main principles of good data analysis and visualization. Present the tools used in the development sector to visualize and extract insights from data.

### **Learning Objective**

1. Learn about the importance of data visualization for effective communication
2. Understand the design principles and different types of dashboards
3. Develop critical thinking when developing dashboards

The learning material will be uploaded to the platform prior to the class.

## **SESSIONS 10 - 11 (LIVE IN-PERSON)**

For these sessions the class will be split in two groups and the sessions will be duplicated.

### **Data viz Workshop 1**

Hands-on data visualization bootcamp using Power BI. During this practical session student will have their first interaction with Power BI, the data analytics tool from Microsoft that will allow them to extract, transform and analyse data. The purpose of this session will be to familiarize the student with the interface and main sections of the tool so they can practice by themselves. The class will cover connection to data sources, Power BI Query editor, how to publish a dashboard and other main transformation processes.

### **Learning objective**

1. Getting familiar with the Power BI environment
2. Practice the main data transformation features in Power BI Query Editor
3. Practice the main data visualization features in Power BI

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### **Data viz Workshop 2**

Hands-on advanced data visualization bootcamp using power BI. The objective of this practical session is to provide students with the most advanced skills in Microsoft PowerBI. At the end of this lesson participants should be able to use Microsoft Power BI to monitor and analyze data across any organization.

### **Learning objective**

1. Hands-on training to training to develop dashboard with Power BI
2. Advanced Power BI Features to deploy and automatize professional dashboards with Power BI

The learning material will be uploaded to the platform prior to the class.

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## **SESSION 12 (LIVE IN-PERSON)**

### **Data viz Workshop 3**

Hands-on advanced data visualization focused on Geographic Information systems. Merging data sets in Power BI and developing maps. Connecting Power BI to Kobo via API

**Learning objective**

1. Getting familiar with GIS concepts and the different type of geographic data
2. Practice data transformation with geographic files and learning how to produce maps.
3. Learning how to connect Power BI to external data sources via API

The learning material will be uploaded to the platform prior to the class.

## **SESSION 13 (LIVE IN-PERSON)**

**The Analysis workflow**

Define the analysis flow and present all the different types of analysis: descriptive, explanatory, interpretative, anticipatory, and prescriptive analysis. Study the basics of reporting rules in order to make sure analytical statements are expressed accurately. Explore and study analytical biases and how to mitigate them.

**Learning objective**

1. Study the analysis flow and learn how to differentiate between all the different types of analysis.
2. Learn how to produce accurate and efficient analytical outputs that are adapted to the need of the organization.
3. Understand the nature of analytical biases and how to mitigate them.

The learning material will be uploaded to the platform prior to the class.

## **SESSION 14 (LIVE IN-PERSON)**

**Intro to AI, ML and LLMs**

Provide an overview of the theoretical principles underlying machine learning and artificial intelligence and to elaborate on concrete example and applications.

**Learning objective**

1. Understand the main concepts and definitions of AI
2. Understand the other industries and components AI relies upon (hardware, algorithms and web applications)
3. Learn about LLMs, its uses, risks and threats for social and government landscapes.

The learning material will be uploaded to the platform prior to the class.

## **SESSION 15 (LIVE IN-PERSON)**

**Machine learning Workshop 1**

Hands-on workshop focused on building a machine learning model to automate the analysis of large amounts of data

**Learning objective**

1. Understand how machine learning can be used to automate the processing and analysis of data.
2. Implement a machine learning model using ChatGPT.
3. Using the model to provide a concrete analytical output.



## SESSIONS 16 - 17 (LIVE IN-PERSON)

### Bootcamp 1 (Hackathon style) *Double session with session 18*

Bootcamp is a session where we present a problem to the students and they do all by themselves from A to Z. We are there to support them but we do not show how to do because they have already seen it. The bootcamp is also an opportunity to refine and practice what has been seen in class and in the workgroup assignment, but with a different use case, and maybe also in groups that are different from those of the assignment?

#### Learning objective

1. Apply everything seen in class in group in a new use case with limited guidance. The learning material will be uploaded to the platform prior to the class.

## SESSION 18 (LIVE IN-PERSON)

### Final exam

Session dedicated for the individual final graded exam

The learning material will be uploaded to the platform prior to the class.

## SESSIONS 19 - 20 (LIVE IN-PERSON)

### Work Group Presentations

## EVALUATION CRITERIA

criteria	percentage	Learning Objectives	Comments
Final Exam	30 %		Single choice, multiple choice and open questions. Covers whole class.
Intermediate tests	20 %		Single choice, multiple choice and open questions. Covers sessions up to the date of the test.
Group Work	40 %		Group work based on a real case data project from the development sector, deliverable and final presentation
Class Participation	10 %		Grade based on interactions in and outside class, home assignments and readings

## FAILING GRADE AND REASSESSMENT

When students receive a Fail in a course, they have the opportunity to present themselves for reassessment in order to earn the necessary credits toward graduation.

The reassessment of students should be scheduled between 5 and 10 working days after the review session takes place.



Grades for the reassessment are limited to a Low Pass and Fail.

Both, the initial Fail as well as the grade of the reassessment remain on the transcript. For the purpose of calculating the GPA however, only the grade of the reassessment is to be considered. Students receiving a failing grade in the reassessment of a course will not be able to continue in the program.

## **BIBLIOGRAPHY**

### **Recommended**

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<https://www.unocha.org/publications/report/world/humanitarian-innovation-state-art>

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## **ETHICAL POLICY**

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