

## **CAPSTONE PROJECT**

### **Bachelor in Data and Business Analytics BDBA SEP-2023 CP-DBA.4.M.A**

Area Others

Number of sessions: 60

Academic year: 23-24

Degree course: FOURTH

Number of credits: 12.0

Semester: 2º

Category: COMPULSORY

Language: English

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Rafael Ballester-Ripoll ([rafael.ballester@ie.edu](mailto:rafael.ballester@ie.edu)) joined IE University in 2019 as an Assistant Professor in Data Science. Prior to that, he was a Postdoctoral Associate at the University of Zurich (UZH) and at the Swiss Federal Institute of Technology in Zurich (ETH). He holds a PhD in Computer Science from UZH (2017) as well as BSc and MSc degrees in Mathematics and Computer Science from the Technical University of Catalonia-UPC (2012).

#### **Office Hours**

Office hours will be on request. Please contact at:

[rafael.ballester@ie.edu](mailto:rafael.ballester@ie.edu)

## **SUBJECT DESCRIPTION**

The purpose of this capstone project (Final Thesis project) is to bridge the completion of the student's undergraduate education and the commencement of his/her professional career. The project is a way to integrate and synthesize the theoretical and practical skills acquired throughout their studies. The project should be research-oriented and aimed at addressing a data analytics, computer science or AI problem in the form of a classic research project (qualitative or quantitative), a software prototype, venture project, or policy brief. Students are encouraged to choose projects in collaboration with the [Impact Xcelerator](#) research labs at IE.

The capstone project should contribute to the existing body of knowledge in a specific field of computer science or data science. It should be meaningful, accessible, and valuable to the community and to the student portfolio.

## LEARNING OBJECTIVES

**Research Abilities:** the ability to effectively develop a research question and carry out qualitative or quantitative research project from: identifying appropriate sources and navigating search engines and databases to successfully produce useful models based on computer or data science, and clearly and persuasively communicating results and conclusions.

**Theoretical Proficiency:** the ability to identify and critically engage the core theoretical approaches to the question(s) relevant to the student's project.

**Analytical Skills:** the ability to use large amounts of data in data analytics or AI models; analyze and properly cite academic texts to draw conclusions about a particular topic.

**Transversal Skills:** time management and organizational skills necessary to conduct and carry out a large-scale research project within a designated timeline; clearly and effectively communicate ideas and conclusions in both a written and oral format; fostering a collaborative working relationship with his/her thesis supervisor, respecting the internal deadlines and meetings throughout the process, and adequately incorporating advisor feedback.

## TEACHING METHODOLOGY

IE University teaching method is defined by its collaborative, active, and applied nature. Students actively participate in the whole process to build their knowledge and sharpen their skills. Professor's main role is to lead and guide students to achieve the learning objectives of the course. This is done by engaging in a diverse range of teaching techniques and different types of learning activities such as the following:

Learning Activity	Weighting	Estimated time a student should dedicate to prepare for and participate in
Lectures	5.0 %	15.0 hours
Individual studying	95.0 %	285.0 hours
TOTAL	100.0 %	300.0 hours

## CHOOSING A TOPIC

1. **Watch** the videos available in the [Catalyst Video Case Series](#). For each one, you will have to fill out a form (to be distributed) answering the questions posed in the video.
2. Decide on a **topic** to work for your Capstone. It can either be one suggested in the videos, one suggested by our list of supervisors, or a topic proposed by you.
3. Decide on a **project type**. The options are:
  - a. **Prototype**. The student will build a data model or software application proof-of-concept, will study its performance and compare it with existing solutions in the market. This project should nonetheless include theoretical, methodological, and empirical contributions to the topic. The student is still required to deliver a report at the end.
  - b. **Venture**. The student will launch his/her own venture project. This project should include a detailed report about its business plan explaining how this project will create, deliver and attract value and a proof-of-concept demonstrating the applicability of the new technology in a

particular task.

c. **Research.** A quantitative or qualitative investigation of a particular problem (social, business, analytical, etc.) in which the student will be required to propose or develop an appropriate methodology to address the research question, to identify or develop a model or algorithm and, given the case, run it on collected data, and to write-up in an APA formatted research report (following the standard convention of including a literature review, methods, results, and discussion/conclusion).

d. **Policy.** Develop a technology policy brief to guide policymakers in future regulations. The student should study in depth the issue in question and provide a clear and detailed overview of the main legal issues that may arise from it. Based on this discussion, the student should make a clear proposal of regulations that should be implemented to fix those issues.

Your topic should pass the *so what* or *who cares* test. Do not start from the “conclusion”.

## CHOOSING A SUPERVISOR

You are responsible to find a suitable supervisor for your project and get in touch with him/her. The list of the Capstone Project Supervisors will be available in the Blackboard course. Outside professionals are also allowed, but only as co-supervisors for a project. The capstone Evaluation Committee, headed by the capstone project coordinator, must approve all choices for academic advisers. The Academic Director will review any requests to change supervisors and will only be approved in special circumstances.

### Functions of the supervisor

The thesis supervisor’s primary role is to monitor the student’s progress and offer ongoing support and guidance throughout the project. As part of the project proposal, the student and their supervisor must agree on a work plan for the semester including the frequency and timing of check-ins. Students are expected to meet with their supervisors at least four times over the course of the project. These meetings can be in-person or virtual.

The supervisor is also responsible for ensuring that the student’s work complies with the established criteria.

In addition to the relationship that students have with their supervisors, students can consult other experts/ faculty members to ask ad-hoc questions, but experts or other faculty members should not be expected to read drafts. This supplementary advising should be done in consultation with the student’s supervisor.

## PROJECT CALENDAR

Throughout the year, the student will work with their supervisor(s) to develop the project. The project should consist of 300 hours’ worth of work.

There will be workshops provided to support students throughout the final thesis project process. A list of the workshops and their dates is provided under Capstone Project Timeline 2023 – 2024. **All workshops that take place in the Fall semester will be held in a virtual classroom. The rest will be face to face.** Attending at least half of the workshops is mandatory – otherwise, the student will receive a failing grade on both calls for that academic year.

In addition to the workshops, thesis supervisors will also hold group/individual meetings with their thesis advisees’ to focus on specific contents, theories, or methodologies related to their course topic.

### Important Dates – In the Fall Semester

1. **September - October 2023:** watch the [Catalyst video case series](#) and complete a form where you will be required to think about some of the questions appearing in emerging technologies. Read the list of **proposed topics** by our professors. Once you have a topic in

mind, **get in touch with a potential supervisor.**

2. **October 13th 2023:** short proposal, students are required to submit the following information via a special Blackboard assignment (the link will be shared in due time):
  - a. Topic (including a brief description and tentative project title).
  - b. Project Type
  - c. Name of supervisor.

Use the NABC format (Need, Approach, Benefit, Competition) for the proposal.

3. **November 17th, 2023: full proposal**

- a. After the topic has been approved, the student should work in collaboration with their thesis supervisor(s) to further refine their project and must submit a 500-word formal project proposal via Blackboard.

- b. The proposal should include the following:

- i. Detailed description of the subject and type of project
- ii. Preliminary overview of project timeline
- iii. Summary of initial literature review. Must include at least 5 academic sources. The

capstone project Evaluation Committee will review all the submissions.

If a proposal is deemed insufficient, the student will be given one opportunity to resubmit their proposal by **December 1st 2023**.

Should the student fail to submit a proposal by the deadline or receive approval during the period of resubmission, the student will automatically receive a failing grade for the first call and will be required to present the project during the second call in June.

**In addition, the student is required to submit three deliverables to the supervisor during the spring semester** (see table below). The timeliness and quality of these assignments will be considered by the professor in the "process" component of the final grade.

UNIVERSITY

<b>Task</b>	<b>Tentative Date</b>
Workshop 1*: Demystifying the Thesis process	September 20, 2023
Catalyst video case series questionnaire	September 29, 2023
Short proposal deadline	October 13, 2023
Workshop 2*: Unpacking the Literature Review	October 18, 2023
Workshop 3*: The Pieces of the Puzzles	November 15, 2023
Full proposal deadline	November 17, 2023
Capstone project Committee Review of Proposals	November 17 – 24, 2023
Proposal resubmission – if not approved	December 1, 2023
Deliverable 1 deadline: literature review draft	February 28, 2024
Workshop 4*: Model development and Assessment	Spring 2024
Workshop 5*: Designing data solutions and implementing a prototype	Spring 2024
Workshop 6*: Data visualization, statistics and model deployment	Spring 2024
Deliverable 2 deadline: methodologies, schematization of the algorithms and preliminary analysis of the data.	March 26, 2024
Workshop 7*: Defending the thesis	Spring 2024
Deliverable 3 deadline: full draft for supervisor revision prior to final submission	April 16, 2024
Written report deadline (1st Call)	May 3, 2024
Approval of written report (1st Call)	May 9, 2024
Written report deadline (2nd Call)	May 16, 2024
Approval of written report (2nd Call)	May 21, 2024
Oral defense	May 27-31, 2024

## **STRUCTURE OF THE WRITTEN REPORT AND DEFENSE**

The written report should include the following (unless an alternative structure is approved by the supervisor):

- Title Page
- Acknowledgements
- Table of Contents
- Abstract
- Introduction
- Main body with sections depending on the project type, for example: methodology, data collection, literature review, experimental design, business plan, etc. This list is merely orientative.
- Discussion and Conclusion: a synthesis that demonstrates the student's comprehensive understanding of the subject area and how it relates to the broader field of study. This section should also be used to compare this technology results with existing ones in the market.

- Bibliography
- Appendix (if relevant).
- Software, if applicable.

#### **Format of the Written Paper**

- The project should be submitted in a standard 12-point font, double-spaced using standard margins. Both Ariel and Times New Roman will be accepted.
- The written work must be between 25 (minimum) and 50 pages (maximum). These page limits do not include software, appendices and bibliography.
- Students are required to use APA formatting.

#### **The Oral Presentation**

- The student will have up to 15 minutes to present his or her work. The panel will then ask questions for a maximum of 20 minutes.
- The presentation should include the research question(s), methodologies, key findings, conclusions, and implications.

## **PROGRAM**

### **SESSION 1 (LIVE ONLINE)**

Supervisor meetings; the content will be specified by each prof. in his/her own syllabus.

### **SESSION 2 (LIVE ONLINE)**

Supervisor meetings; the content will be specified by each prof. in his/her own syllabus.

### **SESSION 3 (LIVE ONLINE)**

Supervisor meetings; the content will be specified by each prof. in his/her own syllabus.

### **SESSION 4 (LIVE ONLINE)**

Supervisor meetings; the content will be specified by each prof. in his/her own syllabus.

### **SESSION 5 (LIVE ONLINE)**

Supervisor meetings; the content will be specified by each prof. in his/her own syllabus.

### **SESSION 6 (LIVE ONLINE)**

### **SESSION 7 (LIVE ONLINE)**

### **SESSION 8 (LIVE ONLINE)**

### **SESSION 9 (LIVE ONLINE)**

**SESSION 10 (LIVE ONLINE)**

**SESSION 11 (LIVE ONLINE)**

**SESSION 12 (LIVE ONLINE)**

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**SESSION 59 (LIVE ONLINE)**

**SESSION 60 (LIVE ONLINE)**

## **EVALUATION CRITERIA**

The project will be subject to evaluation by a panel composed by the supervisor plus external panelists. The panel will give the final grade according to the following guidelines:

- 40% of the grade will be based on the quality of the student's oral presentation. This percentage is equally divided between two panelists which will attend the defense.
- 30% will be given by the supervisor. This grade will be split equally between the quality of the final thesis and the experience collaborating with the student during the process (continuous

evaluation).

- 30% will be given by an external reader (someone other than the supervisor) who will independently assess the quality of the final thesis.

The Grading rubrics are available in Additional Documentation on Blackboard. To guarantee the adequate quality of all thesis, the evaluation is subject to the following procedure:

1. The **written report** must be approved for oral defense i.e., it must be evaluated with a grade higher than 5. If the written report receives a grade below 5, the supervisor will request the student to make the necessary changes in order to approve the written report.
2. **Second call:** if the written report is not approved, the student will be granted at least one week to make the requested changes, after which the written report will be reevaluated (on a maximum grade of 8 out of 10). If the written report is not approved after the second call, the student will receive a fail.
3. If the written report is approved, the student may proceed to **oral defense**.
4. If after the oral defense the overall grade is lower than 5, the student will receive a fail without the possibility of repeating the defense.

criteria	percentage	Learning Objectives	Comments
Oral defense	40 %		Grade will be determined by two panelists.
Written report and process	30 %		Grade will be determined by the supervisor.
Written report	30 %		Grade will be determined by an external reader.

## RE-SIT / RE-TAKE POLICY

### DEVELOPMENT PROCESS – PREREQUISITES

In this step, you need to pick the optimal data storage option, data analysis or machine learning strategy, and development and deployment processes for your use case. In developing your project, ask yourself the following questions:

1. What is the type of data you will collect and how will it be stored?
2. Where will the model be hosted and how will it be deployed? Can the deliverable be structured as a pipeline or system, and if so, what do the inputs and outputs if the system looks like?
3. What are the critical characteristics of the models I am looking for and what algorithms fit that description?
4. How will you debug and evaluate your models? What are the metrics you will consider and any visualizations?

## BEHAVIOR RULES

Please, check the University's Code of Conduct [here](#). The Program Director may provide further indications.

## ATTENDANCE POLICY

Please, check the University's Attendance Policy [here](#). The Program Director may provide further indications.

### **ETHICAL POLICY**

Please, check the University's Ethics Code [here](#). The Program Director may provide further indications.

