CAPSTONE PROJECT

Bachelor in Computer Science and Artificial Intelligence
BCSAI SEP-2025 PC-CSAI.4.M.A

Area Functional Group - Program Direction
Number of sessions: 60
Academic year: 25-26
Degree course: FOURTH
Number of credits: 12.0
Semester: 2º
Category: COMPULSORY
Language: English

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Alexandre Anahory is an assitant professor at IE University. He obtained a Ph.D. in Mathematics from Universidad Autónoma de Madrid and graduated in Physics at University of Lisbon. He has conducted research at the Instituto de Ciencias Matemáticas in Madrid and at the Center for Automation and Robotics, also in Madrid.

His research focus on the application of modern cutting-edge mathematical theories to diverse areas such as physics, engineering, robotics, computer science, among others.

Office Hours

Office hours will be on request. Please contact at:

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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.

CHOOSING A TOPIC

1. Watch the videos available in the Catalyst video series.
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:

- **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.
- **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.
- **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).

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 need approval from the capstone project evaluation committee. The capstone Evaluation Committee, headed by the capstone project coordinator, must approve all choices for academic supervisors. The Academic Director will review any requests to change supervisors and will only be approved in special circumstances.

PROJECT CALENDAR

Throughout the year, the student will work with their supervisor(s) to develop the project. The project should consist of 375 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 2024 – 2025. 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 project topic.

Important Dates – In the Fall Semester

1. **September 23th: watch Catalyst video case series visualization and complete a form**, where you will be required to think about some of the questions appearing in emerging technologies.
2. **October 14th: short proposal**, students are required to submit the following information via a special Blackboard assignment (the link will be shared in due time):

- Topic (including a brief description and tentative project title).
- Project Type
- Name of supervisor.

3. **November 14th: full proposal.** 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. The proposal should include the following:

- Detailed description of the subject and type of project.
- Preliminary overview of project timeline.
- 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 11th**.

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 supervisor in the “process” component of the final grade.

Workshop theme	Tentative date
Catalyst video case series questionnaire	September 22
Short proposal deadline	October 13
Full proposal deadline	November 14
Capstone project Committee Review of Proposals	November 15 – 24
Proposal resubmission – if not approved	December 11
Workshop 1*: Demystifying the Thesis process	January
Workshop 2*: Unpacking the Literature Review	January
Deliverable 1 deadline: literature review draft	January 31
Workshop 3*: The Pieces of the Puzzles	February
Workshop 4*: Model development and Assessment	February
Deliverable 2 deadline: methodologies, schematization of the algorithms and preliminary analysis of the data.	February 27
Workshop 5*: Data visualization, statistics and model deployment	March
Deliverable 3 deadline: full draft for supervisor revision prior to final submission	March 30
Written report deadline (1st Call)	April 30
Approval of written report (1st Call)	May 10
Written report deadline (2nd Call)	May 30
Approval of written report (2nd Call)	June 10
Workshop 6*: Defending the thesis	Early May
Oral defense (1st call)	May 20-31
Oral defense (2nd call)	June 20-30

*The topics covered in these face-to-face workshops might change depending on the interest and necessities of the students as deemed by their supervisor and the academic coordinator and director.

**All submissions will be checked for plagiarism using tools including Turnitin, GPTZero, etc.

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.

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.

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

AI POLICY

Generative artificial intelligence (GenAI) tools may be used in this course for some specific tasks with appropriate acknowledgment. In any case, the final written thesis must be an original work and can not be AI generated. If a student is found to have used AI-generated content inappropriately, it will be considered academic misconduct, and the student might fail the respective assignment or the course.

If you are in doubt as to whether you are using GenAI tools appropriately in this course, we encourage you to discuss your situation with your supervisor and/or the capstone coordinator.

Below, is a suggested format to acknowledge the use of generative AI tools. Please note that acknowledging AI will not impact your grade.

<<I acknowledge the use of [AI systems link] to [specify how you used generative AI]. The prompts used include [list of prompts]. The output of these prompts was used to [explain how you used the outputs in your work].>>

PROGRAM

SUMMARY

Each supervisor will have at least 4 programmed meetings with his/her student(s). The content of these meetings will be specified by each supervisor and vary depending on the field of interest. Note that the topics covered in these meetings will be technical (e.g. programming, optimization algorithms, data cleaning and data acquisition, modeling, etc.). Other topics related to how to structure a thesis, conduct a literature review, etc. will be covered in specific workshops.

Meetings 1 – 4: Supervisor meetings; the content will be specified by each prof. in his/her own syllabus.

Remaining Sessions: Practice

SESSION 1 (LIVE ONLINE)

Videoconference; the content to be specified by each prof. in his/her own syllabus.

SESSION 2 (LIVE ONLINE)

Videoconference; the content to be specified by each prof. in his/her own syllabus.

SESSION 3 (LIVE ONLINE)

Videoconference; the content to be specified by each prof. in his/her own syllabus.

SESSION 4 (LIVE ONLINE)

Videoconference; the content to be specified by each prof. in his/her own syllabus.

SESSION 5 (LIVE ONLINE)

Videoconference; the content to 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)

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SESSION 59 (LIVE ONLINE)

SESSION 60 (LIVE ONLINE)

EVALUATION CRITERIA

The project will be subject to evaluation by a panel of four judges composed by the supervisor, second reader, and two outside panelists for the oral defense. 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 the two panelists.
- 40% of the grade will be given by an external second reader who will evaluate the quality of the written thesis.
- 20% of the final grade will be given by the supervisor. This grade will be split equally between the quality of the final product and the experience collaborating with the student during the process (continuous evaluation).

criteria	percentage	Learning Objectives	Comments
Written Report	60 %		Grade will be determined by the supervisor and the external second reader..
Oral Presentation	40 %		Grades will be determined by two panelists.

RE-SIT / RE-TAKE POLICY

To guarantee the adequate quality of all thesis, the evaluation is subject to the following procedure:

1. If the written report receives a grade below 5, the student has to make the necessary changes in order to approve the written report.
2. During the second call, the maximum grade is 8 out of 10.
3. In the second call, the student has to repeat the defense.

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.