Universitat Pompeu Fabra Barcelona

Academic Year: 2025/26

26179 - Applied Machine Learning and Optimisation

Teaching Guide Information

Academic Course: 2025/26

Academic Center: 304 - Faculty of Law and Economics
332 - Faculty of Economic and Business Sciences

Study: 3041 - Double bachelor's degree programme in Law and Business Management and Administration / Economics
3324 - Bachelor's degree in Business Management and Administration

Subject: 26179 - Applied Machine Learning and Optimisation

Credits: 5.0

Course: 418 - Bachelor's degree in Economics: 4
412 - Bachelor's degree in Business Sciences: 4
418 - Bachelor's degree in Economics: 3
412 - Bachelor's degree in Business Sciences: 3
417 - Bachelor's degree in Business Management and Administration: 3
417 - Bachelor's degree in Business Management and Administration: 4
523 - Double bachelor's degree programme in Law and Business Management and Administration / Economics: 6

Teaching languages:

Theory:	Group 1: English
Seminar:	Group 101: English
	Group 102: English

Teachers: Jingjing Yu

Teaching Period: Third term

Presentation

This course is aiming to provide an applied introduction to machine learning and optimization techniques, specifically tailored for students with a background in social sciences.

Upon completion, students will be familiar with a wide array of advanced techniques, including supervised and unsupervised learning methods, model validation, feature engineering, regression models, ensemble methods, support vector machines, neural networks, and various optimization techniques like sensitivity analysis, and intelligent algorithms.

While these techniques are often taught in engineering and technical disciplines, this course focuses on developing sufficient conceptual and practical understanding for students to engage confidently with technical experts. It serves both as a practical toolkit and a foundational stepping stone for further learning.

Associated skills | General learning outcomes

Upon successful completion of this course, students will be able to:
• Understand how machine learning and optimization techniques can be used to address practical business and organizational challenges.

• Assess real-world problems and determine the most appropriate techniques such as regression, clustering, or optimization methods.

• Translate business problems into well-defined machine learning or optimization models.

• Understand methodological steps for implementing algorithms like decision trees, support vector machines, neural networks, and heuristic approaches.

• Gain a better understanding of optimization modeling, sensitivity analysis, solver usage, and decomposition techniques.

• Navigate a project management environment involving technical professionals, formulating business cases, assigning tasks, and managing teams.

• Write Python code to implement basic machine learning models and optimization solutions, using practical libraries and tools relevant to real-world applications.

Learning outcomes | Specific learning outcomes

Students are expected to obtain the following competences upon completing the course:

- Understand how can simulation, optimization and machine learning be applied in business and organizations to solve practical problems.
- Learn how to assess real world problems to identify the best techniques to use in each case.
- Learn how to translate problems from business domain to simulation, optimization and machine learning solutions.
- Understand the methodological steps to apply simulation, optimization and machine learning solutions.
- Become familiar with the management environment that surrounds the course techniques: how to write business cases, perform project management, assign the right tasks to different technical and non-technical professionals, deliver solutions in production.
- Learn how to use Python code to implement simulation, optimization and machine learning.

Contents

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L17 Simulation-based Optimization 2

L18 Intelligent Algorithms 1

L19 Intelligent Algorithms 2

L20 Q&A

Sustainable Development Goals

9 - Industry, Innovation and Infrastructure
11 - Sustainable Cities and Communities

Evaluation and grading system

Seminar

Seminars will be conducted in teams. Each team should consist of 3 to 4 members. Seminar tasks may include:

- Academic paper analysis presentation
- Written academic report on case study

Grading

- Seminar Performance: 50%
- Final Exam: 50%

Students who fail the course, have followed the continuous assessment and took the final exam will get the chance to sit a retake exam. The grade they obtain in the retake exam will replace the grade they obtained in their first final exam. Their grades for the case assignments will remain the same and the final grade will be computed with the same formula.