

ARTIFICIAL INTELLIGENCE PRINCIPLES AND APPLICATIONS

Course code	<i>GRAI019</i>
Compulsory in the programmes	<i>International Marketing and Management / Innovations and Technology Management / Financial Economics</i>
Level of studies	<i>Graduate</i>
Number of credits	<i>6 ECTS (32 contact hours + 2 consultation hours, 124 individual work hours) + additional review and preparation for the course hours (16 contact hours + 1 consultation hour)</i>
Course coordinator (title and name)	<i>Assist. Prof. Dr. Simonas Čepėnas</i>
Prerequisites	<i>Undergraduate diploma</i>
Language of instruction	<i>English</i>

THE AIM OF THE COURSE:

In this introductory AI course, students will simultaneously learn programming fundamentals (using R) and AI principles. They will delve into essential concepts of Artificial Intelligence, exploring topics such as machine learning, neural networks, and data analysis techniques to build a foundational understanding of AI principles. Since students have a diverse level of experience with data science, there is an additional component to this course – an introduction to data analytics, where students will review (and learn) about the principles of data analytics.

MAPPING OF COURSE LEVEL LEARNING OUTCOMES (OBJECTIVES) WITH DEGREE LEVEL LEARNING OBJECTIVES (See Annex), ASSESMENT AND TEACHING METHODS

Course level learning outcomes (objectives)	Degree level learning objectives (Number of LO)	Assessment methods	Teaching methods
CLO1. Knowledge and its application. Demonstrate and apply critical understanding of the artificial intelligence (AI) principles.	LO1.3. Students will be able to demonstrate critical thinking in problem solving.	Final exam.	Lectures, Interactive class and group discussions, workshops, individual and group assignments.
CLO2. Research skills. Gain skills how to synthesize and apply theoretical knowledge of AI using R and R studio.	LO1.2. Students will become independent learners and develop their own comprehension of scientific theories, models, and concepts. LO3.2. Students will develop and deliver	In-class group activities, final exam, Kaggle competition.	Theory sessions and workshops. R assignments.

	a coherent written research paper.		
CLO3. Special abilities. Be able to analyze the organizational capability to innovate and provide recommendations from an AI perspective.	LO1.1. Students will be able to define the business problem and develop innovative solutions.	In-class group activities, Kaggle competition.	Case analysis, groups discussions, R assignments.
CLO4. Social abilities. Adhere to the principles of professional ethics and citizenship participating in discussions on relevant academic issues. Be able to lead the team and be accountable for its performance.	LO2.1. Students will be able to evaluate past and current practices in their discipline from an ethical perspective. LO3.1. Students will develop and deliver a coherent oral presentation.	In-class group activities, final exam, Kaggle competition.	Group activities, discussions and workshops.
CLO5. Personal abilities. Develop personal and professional abilities, critical thinking, and creativity.	LO2.1. Students will be able to evaluate past and current practices in their discipline from an ethical perspective.	Demonstration of professional behavior, creativity and critical thinking during the class and group discussions.	Critical evaluation of the theories and group members' opinion, management of complicated social situations during the discussion of cases.

ACADEMIC HONESTY AND INTEGRITY

Plagiarism is considered a breach of academic integrity. In case of plagiarism, a student/group will result in an automatic failure in this course. Late assignments are marked zero.

COURSE OUTLINE

This course will consist of lectures, case studies and workshops during which we will use our theoretical knowledge to apply theory to business cases and R to study actual data from business. Lectures will consist of interactive discussions, case analysis, class discussions, group project work, article analysis discussions, group presentations, and individual final class exam.

Part 1

Day	Topic	Class hours		Readings
		T	P	
Friday 1				



12:30-14:00	Introduction to Mathematical Thinking How do data scientists analyse and process information?	2		Provost & Fawcett [Ch. 1].
14:15-15:45	Workshop 1 Tic-tac-toe: How do algorithms work?	1	1	Provost & Fawcett [Ch. 1].
16:45-18:15	Module 1 What is the distinction between mathematics, statistics, data analytics and data science?		2	Provost & Fawcett [Ch. 1].
18:30-20:00	Module 2 The principles and key concepts in data analytics and descriptive statistics.		2	Provost & Fawcett [Ch. 1].
Saturday 1				
9:00-10:30	Module 3 The principles and key concepts of inferential statistics.	1	1	Provost & Fawcett [Ch. 1- Ch.3].
10:45-12:15	Module 4 Introduction to R programming.	2		Grolemund & Wickham. Ch. 2]
13:15-14:45	Module 5 Workflow and main functions in R	2		Grolemund & Wickham. Ch. 1-6, 26]
15:00-16:30	Workshop 2 In-class R assignment.		2	The material and excercises for workshop will be provided by the instructor.

Part 2

Day	Topic	Class hours		Readings
		T	P	
Friday 1				
12:30-14:00	Business Problems and Data Science Solutions Data Mining, Prediction versus Inference, Team Structures.	2		Provost & Fawcett [Ch. 2, 3].
14:15-15:45	Module 6 Supervised Learning Methods: Regression, Model Evaluation and mistakes.	1	1	Provost & Fawcett [Ch. 2, 3, 4, 5].
16:45-18:15	Module 7 Supervised Learning Methods: Classification, Model Evaluation and mistakes.	2		Provost & Fawcett [Ch. 2, 6, 7];
18:30-20:00	Workshop 3 Potential Data Science Solutions for a Business Problem.		2	Case study will be provided by the instructor.
Saturday 1				
9:00-10:30	Module 8 Quick Review and Further Study of AI principles and applications	1	1	Provost & Fawcett [Ch. 2-7].
10:45-12:15	Module 9 Using R for AI: Supervised Learning and Regression	1	1	Provost & Fawcett [Ch. 2, 3, 4, 5]; Golemund & Wickham. Ch. 18-19]
13:15-14:45	Module 10 Using R for AI: Supervised Learning and Classification	1	1	Provost & Fawcett [Ch. 6]; Golemund & Wickham. Ch. 18-19]
15:00-16:30	Workshop 4 In-class R group activity.		2	Provost & Fawcett [Ch. 3-6]; Golemund & Wickham. Ch. 18-19]



Part 3

Day	Topic	Class hours		Readings
		T	P	
Friday 2				
12:30-14:00	Recap and further study of AI principles and Machine Learning Unsupervised Learning .	2		Provost & Fawcett [Ch. 1-7]; Golemund & Wickham. [Ch. 25]
14:15-15:45	Module 5 Neural networks and Reinforcement Learning	2		TBA
16:45-18:15	Workshop 3 Large Language Models	2		TBA
18:30-20:00	Workshop 4 Potential Data Science Solutions for a Business Problem .		2	The material and exercises for workshop will be provided by the instructor.
Saturday 2				
9:00-10:30	Module 6 Recap of main R Functions and additional study of more advanced R features, such as unsupervised learning, reinforcement learning and generative AI.	2		Golemund & Wickham. Ch. 2, 18-19]
10:45-12:15	Module 7 Neural Networks, Generative AI and Large Language models in R	2		(1) https://research.ibm.com/blog/what-is-generative-AI and (2) https://towardsdatascience.com/getting-started-with-generative-art-in-r-3bc50067d34b
13:15-14:45	Churn Prediction for a Business AI in business. Introduction to the case and preparation for modeling and predicting customer churn rates.		2	Case study and all associated necessary data will be provided by the instructor.
15:00-16:30	Kaggle Competition Group activity. The due date for the final machine learning model/student predictions will be announced after a discussion with the students.		2	
	Total class hours:	26	22	
	CONSULTATIONS		3	
	FINAL EXAM		4	

FINAL GRADE COMPOSITION

Part 1



Type of assignment	%
<i>Individual Components</i>	
Final Examination (Oct 25) Students will use R to solve various problems. Student will knit an html document and upload that on elearning.	50
Total:	50

Part 2

Type of assignment	%
<i>Group Components</i>	
In-class assignments	10
Kaggle competition	40
Total:	50



DESCRIPTION AND GRADING CRITERIA OF EACH ASSIGNMENT

(Provide short descriptions and grading criteria of each assignment)

Final Examination. The examination is an individual assignment and makes up 50% of the final grade. The exam is based on all of the material covered in the class. During the exam students will use R to solve various problems. As part of the assignment students will knit an html document with all of the solutions and upload it on elearning to be graded by the instructor.

In-class assignments/group activities. Students will have to complete at least two group activities, which will facilitate their learning of R programming language and application of AI principles. These activities constitute 10% of the final grade.

Kaggle competition. Students will have to create a machine learning model/algorithm to predict scores from consumer reviews. Best performing groups will receive the highest grades. This group activity makes up the remaining 40% of the grade.

Re-take of the exam. Students who receive a failing final grade have a right to a re-take exam, which will comprise 50% of the final grade. In-class assignments and Kaggle competition cannot be completed at a later time.

REQUIRED READINGS

Provost, F., Fawcett, T. (2013). *Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking*. United Kingdom: O'Reilly Media.

Grolemund, G., & Wickham, H. (2017). *R for Data Science*. O'Reilly Media (This textbook is also available online at <https://r4ds.hadley.nz>).

ADDITIONAL READINGS

TBA

SOFTWARE REQUIREMENTS

During the course we will use R and R studio. Since this course relies heavily on programming and data analysis, bring your own laptops to each session.

ADDITIONAL REMARKS

The syllabus is subject to small changes.



DEGREE LEVEL LEARNING OBJECTIVES

Learning objectives for the Master of Business Management

Programme:

Innovations and Technology Management

Learning Goals	Learning Objectives
Students will be innovative decision makers	LO1.1. Students will be able to define the business problem and develop innovative solutions .
	LO1.2. Students will become independent learners and develop their own comprehension of scientific theories, models, and concepts.
	LO1.3. Students will be able to demonstrate critical thinking in problem solving.
Students will be socially responsible leaders	LO2.1. Students will be able to evaluate past and current practices in their discipline from an ethical perspective .
Students will be effective communicators	LO3.1. Students will develop and deliver a coherent oral presentation .
	LO3.2. Students will develop and deliver a coherent written research paper .