

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Business Administration in Foreign Languages
1.3. Departments	Department of Economic Informatics and Cybernetics
1.4. Field of study	Business Administration
1.5. Cycle of studies	Master Studies
1.6. Education type	Full-time
1.7. Study programme	Digital business and innovation
1.8. Language of study	English
1.9. Academic year	2023-2024

2. Information on the discipline

2.1. Name	Machine learning								
2.2. Code	23.0295IF1.2-0003								
2.3. Year of study	1	2.4. Semester	2	2.5. Type of assessment	Exam	2.6. Status of the discipline	O	2.7. Number of ECTS credits	6
2.8. Leaders	C(C)	conf.univ.dr. ÎNTORSUREANU Iulian Costinel				iulian.intorsureanu@ie.ase.ro			
	C(C)	Cadru asoc Conf.dr. NAGHI ANDREA-ANITA				andrea.naghi@csie.ase.ro			
	S(S)	Cadru asoc.(Lector) SERBAN CONSTANTIN LIVIU				liviu.serban@fabiz.ase.ro			

3. Estimated Total Time

3.1. Number of weeks	14.00		
3.2. Number of hours per week	4.00	of which	
		C(C)	2.00
		S(S)	2.00
3.3. Total hours from curriculum	56.00	of which	
		C(C)	28.00
		S(S)	28.00
3.4. Total hours of study per semester (ECTS*25)	150.00		
3.5. Total hours of individual study	94.00		
<i>Distribution of time for individual study</i>			
Study by the textbook, lecture notes, bibliography and student's own notes	40.00		
Additional documentation in the library, on specialized online platforms and in the field	12.00		
Preparation of seminars, labs, assignments, portfolios and essays	40.00		
Tutorials	0.00		
Examinations	2.00		
Other activities	0.00		

4. Prerequisites

4.1. of curriculum	-
4.2. of competences	-

5. Conditions

for the C(C)	The lectures will take place in rooms with teaching multimedia equipment and internet connection.
for the S(S)	The seminars / lab classes will take place in computer labs with teaching multimedia equipment and internet connection.

6. Acquired specific competences

PREFESSIONAL	C4	
PREFESSIONAL	C6	

7. Objectives of the discipline

7.1. General objective	Acquiring knowledge and abilities for designing and using Machine learning solutions for enterprises.
7.2. Specific objectives	<ul style="list-style-type: none">- main approaches used in machine learning solutions- categories of ML algorithms and their properties / applicability to business problems- modeling practical problems in preparation for applying ML algorithms- using adequate software tools and techniques to configure, test and use ML-based solutions

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Machine learning (ML): definitions and concepts. Types of ML. Phases and activities.	Presentation, practical examples, case studies	
2	Supervised learning - regression. Introduction, examples.	Presentation, practical examples, case studies	
3	Supervised learning - classification. Introduction, examples.	Presentation, practical examples, case studies	
4	Data analysis and data preparation.	Presentation, practical examples, case studies	
5	ML algorithms for regression. The gradient descent method. Polynomial regression.	Presentation, practical examples, case studies	
6	ML algorithms for classification. Logistic regression. Decision trees. K-Nearest Neighbors (KNN).	Presentation, practical examples, case studies	
7	Using performance measures for predictive models. Model validation and tuning	Presentation, practical examples, case studies	
8	Unsupervised learning algorithms. Modeling, configuration.	Presentation, practical examples, case studies	
9	Unsupervised learning algorithms. Implementing solutions for business problems	Presentation, practical examples, case studies	
10	Neural networks and deep learning: introduction and use cases.	Presentation, practical examples, case studies	
11	Building predictive models with neural networks: architecture, training and tuning.	Presentation, practical examples, case studies	
12	Introduction to Causal Inference and Causal Machine Learning	Presentation, practical examples, case studies	
13	Methodology -- Double Machine Learning (DML) for Causal Analysis	Presentation, practical examples, case studies	
14	Applications – Double Machine Learning in Economics and Business	Presentation, practical examples, case studies	

Bibliography

- Kelleher, J.D. et al., Fundamentals of Machine Learning for Predictive Data Analytics, MIT Press, 2020, Statele Unite ale Americii
- Finlay, S., Artificial Intelligence and Machine Learning for Business, Relativistic, 2018, Marea Britanie
- Baiardi, A., Naghi, A., The value added of machine learning to causal, The Econometrics Journal
- Imbens, G.W, Rubin, D.B., Causal Inference for Statistics, Social, and Biomedical Sciences, Cambridge University Press, 2015, <https://ideas.repec.org/b/cup/cbooks/9780521885881.html>, Marea Britanie
- Chernozhukov, V., Chetverikov, D., Demirer, M., Duflo, E., Hansen, C., and, Double/debiased/neyman machine learning of treatment, American Economic Review, 2017

8.2. S(S)		Teaching/Work methods	Recommendations for students
1	Introduction, requirements for evaluation. Software tools for machine learning: Google Colab and Python.	Presentations, discussions	
2	Python libraries for machine learning primer.	Examples, practical exercises	
3	Data exploration / analysis, checking and solving data quality issues.	Examples, practical exercises	
4	Data processing steps with Scikit-Learn. Examples.	Examples, practical exercises	
5	Applying supervised learning with regression models. Application / business case study.	Examples, practical exercises	
6	Applying supervised learning with classification models. Application / business case study.	Examples, practical exercises	
7	Using performance measures for predictive models. Model validation and tuning. Case studies.	Examples, practical exercises	
8	Applying unsupervised learning. Application / business case study.	Examples, practical exercises	
9	Building a neural network	Examples, practical exercises	
10	Neural network testing and tuning	Examples, practical exercises	
11	Introduction to Causal Inference and Causal Machine Learning	Examples, practical exercises	
12	Methodology -- Double Machine Learning (DML) for Causal Analysis	Examples, practical exercises	
13	Applications -- Double Machine Learning in Economics and Business (I)	Examples, practical exercises	
14	Applications -- Double Machine Learning in Economics and Business (II)	Examples, practical exercises	

Bibliography

- Kelleher, J.D. et al., Fundamentals of Machine Learning for Predictive Data Analytics, MIT Press, 2020, Statele Unite ale Americii
- Imbens, G.W, Rubin, D.B., Causal Inference for Statistics, Social, and Biomedical Sciences, Cambridge University Press, 2015, <https://ideas.repec.org/b/cup/cbooks/9780521885881.html>, Marea Britanie
- Baiardi, A., Naghi, A., The value added of machine learning to causal, The Econometrics Journal
- Chernozhukov, V., Chetverikov, D., Demirer, M., Duflo, E., Hansen, C., and, Double/debiased/neyman machine learning of treatment, American Economic Review, 2017
- Platforma online DataCamp - cursuri/capitole selectate, 2024, Datacamp.com, Marea Britanie

9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

The course content was correlated with local and international business requirements during various professional meetings and debates where the Lecturers took part.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. S(S)	Preparation and active participation in lab classes	The participation frequency and degree of interaction during lab classes is evaluated	30.00
10.2. S(S)	Solving exercises and homeworks	The submitted results are evaluated.	20.00
10.3. Final assessment	Written exam	The answers are evaluated according to an established evaluation scheme	50.00

10.4. Modality of grading	Whole notes 1-10
10.5. Minimum standard of performance	Knowledge and understanding of the presented concepts and terms; Practical abilities for using the presented software applications, which allow the complete performing of an average difficulty data processing flow. Obtaining the grade 5 in the final evaluation (acc. to Study regulation, art.42)

Date of listing,
04/26/2024

Signature of the discipline leaders,

Date of approval in the
department

Signature of the Department Director,