



Academia de Studii Economice
Departamentul de Informatică și Cibernetică Economică
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Contest Topics for University Professor

Position 30, year 2023-2024, semester 2

Disciplines: Data Analysis; Data Mining; Simulation of Economic Processes

Data Analysis

1. Introduction to Data Analysis; examples of concrete solutions offered by specific data analysis techniques; concepts from algebra, calculus and probabilities;
2. Principal component analysis (PCA): Introduction; mathematical model; Properties;
3. Correspondence analysis (CA)- problem definition; mathematical model;
4. Factorial analysis- problem definition; examples of solutions offered by factorial analysis; mathematical model;
5. Unsupervised techniques. Introduction;
6. Cluster analysis - hierarchical methods; Evaluation of solutions;
7. Cluster analysis - Partitioning algorithms;
8. Introduction to supervised learning.
9. Elements of Bayesian analysis. Bayesian classifier;

Bibliography:

1. Ruxanda G, *Analiza datelor*, Editura ASE, Bucuresti, 2001, România
2. Muraru, A., *Metode și tehnici de analiza multidimensională a datelor*, Editura ASE, Bucuresti, 2018, România

Data Mining

1. Introduction to Data Mining: Basic Concepts.
2. Dimensionality Reduction Techniques. Principal Component Analysis, Correspondence Analysis, LDA (Latent Dirichlet Allocation).
3. Information Extraction from Textual Data. Structured data representation in document analysis. Supervised learning for textual data.

4. Classification techniques: Specific concepts, evaluation tools.
5. Construction of Classification Trees.
6. Construction of Random Forest Classifiers.
7. Advanced methods used in the classification context - "Tree Boosting".

Bibliography:

1. Stancu, S., *Data Mining*, ASE, 2021, România;
2. Stancu, S., *Data Science. Teorie și aplicații*, ASE, 2020, România;
3. Hastie, Trevor, et al. *The elements of statistical learning: data mining, inference, and prediction*. Vol. 2. New York: springer, 2009.
4. James, G., Witten, D., Hastie, T., & Tibshirani, R. (2013). *An introduction to statistical learning* (Vol. 112, p. 18). New York: springer.

Simulation of Economic Processes:

1. General considerations on the use of simulation techniques in economics;
2. Random number generation methods.
3. General structure of economic simulation models;
4. Principles and characteristics of the Monte Carlo method;
5. Simulation and queuing theory;
6. PERT method.
7. Resampling techniques. Bootstrap.

Bibliography:

1. I Dobre; Fl. Mustata, *Simularea proceselor economice*, INFOREC, București, 1996, România;
2. Fl. Mustata; M. Paun, I. Dobre, *Simularea numerica a proceselor economice*, ASE, Bucuresti, 2000, România;
3. Efron, B., & Tibshirani, R. J. (1994). *An introduction to the bootstrap*. Chapman and Hall/CRC.