Prof. dr. Mirjana Kljajić Borštnar
University of Maribor, Faculty of Organizational Sciences

Course title: Introduction to machine learning with hands on training

Data mining and machine learning in its core, have become important tools in numerous industries, including finance, healthcare, marketing, and technology etc. They empower us to unlock the potential, hidden within the huge amount of data generated every day, enabling us to make data-driven decisions, develop accurate predictive models, and gain a deeper understanding of complex systems.

In this course, we will embark on a journey that explores the field of extracting valuable insights and patterns from vast amounts of data, and leveraging those discoveries to make intelligent predictions and decisions. Through the course, we will go into the fundamental concepts, methodologies, and algorithms that underpin data mining and machine learning. We will explore the lifecycle of knowledge discovery, starting from data collection and preprocessing, progressing through exploratory data analysis, and finally the construction and evaluation of predictive models.

We will cover a wide range of topics, including supervised and unsupervised learning, (classification, regression and clustering). You will learn about popular algorithms such as decision trees, support vector machines, k-means clustering, and neural networks, among others. Moreover, we will discuss the ethical considerations surrounding data mining and machine learning, including privacy, bias, fairness.

To ensure a hands-on learning experience, this course will provide opportunities to apply the concepts and techniques through practical exercises and projects. You will work with real-world datasets, implement algorithms, and analyze the results to gain a deeper understanding of the principles and challenges of data mining and machine learning. For this purpose, an open source software for data mining will be used: Orange datamining (https://orangedatamining.com/). Thus, previous knowledge on programing is not needed.

By the end of this course, you will be equipped with a solid foundation in data mining and machine learning, enabling you to start working on your own data mining projects.

Proposed content:

- Introduction to AI, Knowledge discovery from data
- Introduction to machine learning
- Data collection & preprocessing
- Data analysis: sampling, visual analysis, descriptive statistics
- Supervized learning: decision trees, kNN, SVM, neural networks & deep learning, logistic regression, Naïve Bayes, decision rules, ansamble methods (Ada Boost, xgboost, Random Forest)
- Evaluation of the models
- Unsupervized learning (hierarchical clustering, k-Means)
- ML models' explanations

Methods of teaching: lectures, use cases, individual hands-on training, project work in teams.

About the speaker

Prof. Mirjana Kljajić Borštnar, PhD
University of Maribor, Faculty of Organizational Sciences
Laboratory for Decision Processes and Knowledge-Based Systems
Kidričeva 55a, 4000 Kranj, Slovenia
mirjana.kljajic@um.si

Mirjana Kljajić Borštnar is a full professor of information systems at the University of Maribor. She received her PhD in management information systems from the University of Maribor. She is a member of the Laboratory of Decision Processes and Knowledge-Based Systems. Her research includes decision support systems, multi-criteria decision making, data mining, and organizational learning. She is the author and co-author of several scientific articles published in recognized international journals and conferences, including Expert Systems with Applications, Industrial Management and Data Systems, Electronics, PLOS One, Group Decision and Negotiation, and System Dynamics Review.

She is vice president of the Slovenian society INFORMATIKA and a member of the System Dynamics Society, the European Research Center for Information Systems and others. She is co-chair of the Bled eConference and the International Symposium on Operations Research in Slovenia, a member of the program committee of Dnevi slovenske informatike, Symorg, ICT, editor-in-chief of the journal Uporabna informatika, and a reviewer for numerous scientific journals. She received several awards for her research work: "Best Paper Award" at the international conference "Computer Supported Education" in 2010; "Outstanding scholarly award" from the International Institute for Advanced Studies in Systems Research and Cybernetics in 2012, "Best Paper Award" at the 42nd International Scientific Conference on the Development of Organizational Sciences.

She has worked on numerous national and EU projects mainly related to decision support and digital transformation of small and medium enterprises. She is co-author of the Automated Digital Maturity Assessment Model used to assess the digital maturity of Slovenian SMEs, and co-author of a multi-attribute assessment tool to evaluate the high-performance computing potential of SMEs in the cloud. She is also an academic representative for AI & Big Data at the Strategic Research & Innovation Partnership "Smart Cities and Communities" and a board member of AI4Slovenia. She is the director of PhD programs at University of Maribor, Faculty of Organizational Sciences, and author of the textbook Information Systems Research.