Laboratory for Cognitive Modeling

Head: Professor Dr. Igor Kononenko
Fax: (+386 1) 426 4647
Phone: (+386 1) 47 68 + ext.
WWW: http://lkm.fri.uni-lj.si

Staff	E-mail	Ext
Professor **Dr. Igor Kononenko**	igor.kononenko@fri.uni-lj.si	390
Associate Professor **Dr. Marko Robnik Šikonja**	marko.robnik@fri.uni-lj.si	188
Assistant Professor **Dr. Matjaž Kukar**	matjaz.kukar@fri.uni-lj.si	914
Assistant Professor **Dr. Zoran Bosnić**	zoran.bosnic@fri.uni-lj.si	459
Assistant **Petar Vračar, M.Sc.**	petar.vracar@fri.uni-lj.si	459
Junior Researcher **Erik Štrumbelj, B.Sc.**	erik.strumbelj@fri.uni-lj.si	459
Junior Researcher **Darko Pevec, B.Sc.**	darko.pevec@fri.uni-lj.si	459

RESEARCH ACTIVITIES

Laboratory for Cognitive Modeling (LKM) was officially founded in 2001. LKM carries out research in cognitive modeling, machine learning, neural networks, picture and data mining. Research results concern the modeling of noisy data related to cognitive, medical, biological and other processes. We are developing, testing and applying new approaches and algorithms for modeling from numeric, symbolic and pictorial data, and new approaches to building, evaluation and explanation of models, derived from data. Recent research is related to development of methods for evaluating the utility of ordinal attributes, for evaluating the reliability of single models' predictions in classification and regression, for evaluating the reliability of clustering, for explaining single predictions by arbitrary classification or regression model, and for efficient parametrization of images using a subset of possible image resolutions. LKM collaborates with psychologists, physicians, biologists, physicists and chemists. A notable aspect of much of this research is its application to problems in image analysis, medical diagnosis, ecological modeling, alternative medicine, and studies of consciousness.

RESEARCH PROJECTS

Artificial Intelligence and Intelligent Systems (P2–0209). Research Programme funded by Slovenian Research Agency (2009-2014).

Electricity load forecasting supported by prediction explanation and prediction reliability estimates, (BI-PT/10-11-007). Bilateral Collaboration Project (Slovenia-Portugal), Slovenian Research Agency (2010-2011).

Integration of data mining and high-performance computer modeling for coronary artery disease, (BI-SR/10-11-020). Bilateral Collaboration Project (Slovenia-Serbia), Slovenian Research Agency (2010−2011).

Machine Learning of Imbalanced Data, (BI-CZ/10-11-008). Bilateral Collaboration Project (Slovenia-Czech Republic), Slovenian Research Agency (2010−2011).

LABORATORY GUESTS

Prof. Dr. Petr Savicky, University of Prague, 23.8.2010−3.9.2010 and 11.11.2010−23.11.2010,

research collaboration on Learning in Imbalanced Data.

Dr. Pedro Pereira Rodrigues and Raquel Sebastião (PhD student): 13.9.2010-22.9.2010. research collaboration on data streams mining and electricity load forecasting.

Ercan Canhas, MSc, University of Priština, Kosovo, 1.1.2010-15.9.2010, PhD scholarship funded by EU, research in text mining.

INVITED TALKS AND LECTURES

PEVEC, Darko, BOSNIĆ, Zoran. *Estimating reliability of single classifications.* Porto: Artificial Intelligence and Decision Support Laboratory, University of Porto, 23rd of June 2010.
BOSNIĆ, Zoran, PEVEC, Darko. *Reliability, correction and explanation of individual predictions in machine learning*. Porto: Artificial Intelligence and Decision Support Laboratory, University of Porto, 23rd of June 2010.

SELECTED PUBLICATIONS

I. Kononenko, M. Kukar: *Machine Learning and Data Mining: Introduction to Principles and Algorithms*, Horwood publ., 2007 (454 pages).

E. Štrumbelj, I. Kononenko: An efficient explanation of individual classifications using game theory. *J. Mach. Learn. Res.* 2010, 11[1]:1-18

E. Štrumbelj, I. Kononenko, M. Robnik Šikonja. Explaining instance classifications with interactions of subsets of feature values. *Data & Knowledge Engineering,* 68(10):886-904, 2009.

I. Kononenko. Natural and Machine Learning, Intelligence and Consciousness, In: E. Žerovnik et al. (eds.) *Philosophical Insights about Modern Science,* NY: Nova Science publ., 239-258, 2009.

M. Robnik-Šikonja, I. Kononenko: Explaining classifications for individual instances. *IEEE Trans. Knowl. Data Eng.*, 2008, 20:589-600.

I. Kononenko:, M. Robnik-Šikonja: Non-myopic feature quality evaluation with (R)ReliefF. In: LIU, H., MOTODA, H.(Eds.). *Computational methods of feature selection*.. Boca Raton; London; New York: Chapman & Hall/CRC, 2008, pp. 169-191

P. Savicky, M. Robnik Šikonja. Learning random numbers: a MATLAB anomaly, *Applied artificial intelligence,* 22(3):254-265, 2008.

Z. Bosnić and I. Kononenko. Comparison of approaches for estimating reliability of individual regression predictions. *Data & Knowledge Engineering* , 67 (3)504-516, 2008,

L. Šajn, I. Kononenko: Multiresolution image parametrization for improving texture classification. *EURASIP J. Adv. Signal Process*, 2008, pp. 1-12.

M. Robnik-Šikonja, K. Vanhoof: Evaluation of ordinal attributes at value level. *Data Mining and Knowledge Discovery*, 14:225-243, 2007.

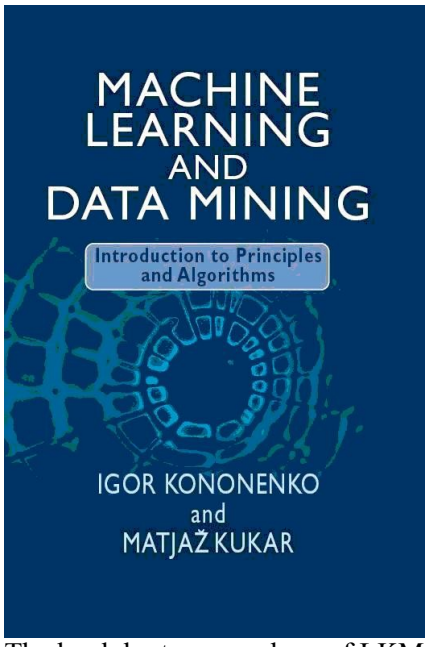
Z. Bosnić, I. Kononenko: Estimation of individual prediction reliability using the local sensitivity analysis. *Appl. Intell.*, 2007, 29(3)187-203

Z. Bosnić, I. Kononenko: Automatic selection of reliability estimates for individual regression predictions. *Knowl. eng. rev.*, , 25(1)27-47, 2010.

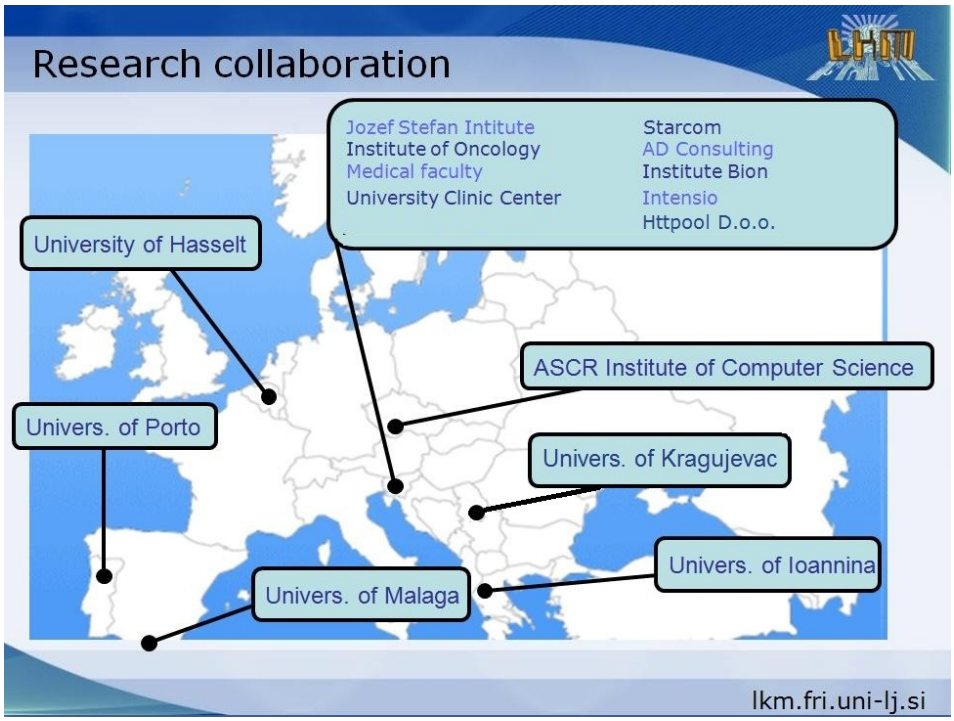
E. Štrumbelj, Z. Bosnić, I. Kononenko, B. Zakotnik, C. Grašič-Kuhar: Explanation and reliability of prediction models: the case of breast cancer recurrence. *Knowledge and information systems*, 24(2)305-324, 2010.

M. Kukar. Quality assessment of individual classifications in machine learning and data mining. *Knowledge and information systems*, 2006, 9(3) 364-384.

M. Robnik-Šikonja, I. Kononenko. Theoretical and Empirical Analysis of ReliefF and RReliefF, *Machine Learning Journal*, 53: 2369, 2003.



The book by two members of LKM was published by Horwood and represents the appreciation of our research work.



We collaborate with several Universities and Institutes from Greece, Portugal, Spain, Czech Republic, Serbia and Belgium.