

Laboratory for Cognitive Modeling

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RESEARCH ACTIVITIES

Laboratory for Cognitive Modelling (LKM) was officially founded in 2001. LKM carries out research in cognitive modelling, machine learning, neural networks, picture and data mining. Research results concern the modelling of noisy data related to cognitive, medical, biological and other processes. We are developing, testing and applying new approaches and algorithms for modelling from numeric, symbolic and pictorial data, and new approaches to building, evaluation and explanation of models, derived from data. Recent research is related to evaluating the utility of ordinal attributes, evaluating the reliability of single models' predictions in classification and regression, evaluating the reliability of clustering, explaining single predictions by arbitrary classification and regression model, text summarization using archetypal analysis, analysing and modelling of sport data, user profiling by mining the web-logs, recommendation systems, learning of imbalanced classification problems, applying evolutionary computation to data mining focused on using ant colony optimization, prediction intervals which represent the distribution of individual future points in a more informative manner, spatial data mining with multi-level directed graphs, employing background knowledge analysis for search space

reduction in inductive logic programming, detection of (non)-ischemic episodes in ECG signals, heuristic search methods in clickstream mining and mining of data streams. A notable aspect of much of this research is its application to problems in image analysis, medical diagnosis, ecological modelling, marketing and financial modelling.

RESEARCH PROJECTS

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

A component for intelligent analysis of data streams. Industry-Funded Project, Optilab (2012-2013).

LABORATORY GUESTS

Prof. Dr. Zikrija Avdagić, University of Sarajevo, BIH, 27.05. 2013 – 29.5.2013. Research collaboration on using AI for lung cancer diagnosis

Dr. Aida Hajdarpašić, University of Sarajevo, BIH, 27.05. 2013 – 29.5.2013. Research collaboration on using AI for lung cancer diagnosis

Dino Kečo, MSc, University of Sarajevo, BIH, 27.05. 2013 – 29.5.2013. Research collaboration on using AI for lung cancer diagnosis

Prof. Dr. Tatjana Zrimec, Univerza na Primorskem, Koper, 20. 5. 2013 - 29. 5. 2013. Research collaboration on machine learning from lung cancer image data.

Ercan Canhas, MSc, University of Prizren, Kosovo. 4. 11. 2013 - 7. 11. 2013. Research collaboration on multidocument summarization based on archetypal analysis.

SELECTED PUBLICATIONS

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

OCEPEK, Uroš, BOSNIĆ, Zoran, NANČOVSKA ŠERBEC, Irena, RUGELJ, Jože. Exploring the relation between learning style models and preferred multimedia types. *Computers & Education*, Nov. 2013, vol. 69, pp. 343-355.

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M. Robnik-Šikonja, I. Kononenko, E. Štrumbelj. Quality of classification explanations with PRBF. *Neurocomputing*, Nov. 2012, vol. 96, pp. 37-46, 1A2

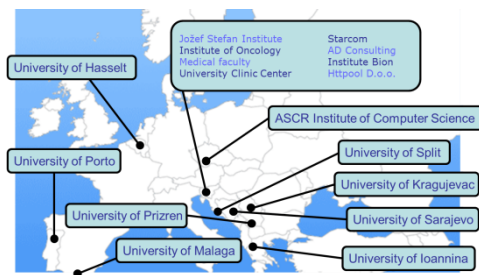
E. Štrumbelj, P.Vračar. Simulating a basketball match with a homogeneous Markov model and forecasting the outcome. *Int. j. forecast.*. 2012, vol. 28, no. 2, pp. 532-542. 1A1

M. Kukar, I. Kononenko, C. Grošelj. Modern parameterization and explanation techniques in diagnostic decision support system : a case study in diagnostics of coronary artery disease. *Artif. intell. med.*. Jun. 2011, vol. 52, no. 2, pp. 77-90, 1A2

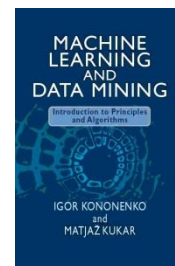
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E. Štrumbelj, I. Kononenko: An efficient explanation of individual classifications using game theory. *J. Mach. Learn. Res.* 2010, 11[1]:1-18. 1A1

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. 1A1



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



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