



University of Ljubljana
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The [Laboratory for Cognitive Modeling](#) (LKM) is a research laboratory of the [Faculty of Computer and Information Science](#), at the [University of Ljubljana](#), Slovenia. LKM excels in research areas of machine learning, neural networks, image and data mining, and cognitive modeling. In relation with cognitive, medical, biological, technical, financial and other processes, LKM members perform data analytics in complex and advanced applications.

OUR MISSION AND MAIN FOCUS OF WORK

Data analytics, machine learning and data mining search for patterns and regularities in moderate to large databases by learning predictive and descriptive models of data. Generated models can be used for explanation of data, simulations, process control, prediction, and solving new related problems.

The applications of our work reach to all fields where data are being collected and need to be analyzed, such as: **medicine** (diagnostics, prognostics), **finance** (banking, insurance, risk analysis), **social**, **psychological** and **cognitive** sciences, **industrial** and **monitoring** applications.

OUR EXPERTISE AND COMPETENCES

Laboratory for cognitive modeling (LKM) at the University of Ljubljana performs the state-of-the-art research and applications in data analytics, data mining and big data. The main field of our work includes:

- data mining, machine learning and statistical analyses,
- modeling of numerical, symbolic, spatial, textual and image data,
- data analytics,
- big data and modeling in the cloud,
- transparent explanation of predictions,
- estimation of data quality and data importance,
- estimation of prediction reliability,

- interactions of various parameters,
- recommendation systems, e-learning,
- user profiling (web, both client and server-side),
- modeling of geographical data.

REFERENCES AND KEY ACHIEVEMENTS

LKM collaborates with several European universities and research institutions. In the last 10 years we have participated in 6 international projects with partners from more than 20 universities. List of past and current projects includes:

- Artificial intelligence and intelligent systems, National Research Programme, 2004–2014,
- Machine Learning of Probabilities with Applications to Web Portals and Medical Diagnostics, 2006–2008,
- Machine Learning of Imbalanced Data, 2010–2011,
- Integration of data mining and high-performance computer modeling for coronary artery disease, 2010–2011,
- Electricity load forecasting supported by prediction explanation and prediction reliability estimates, 2010–2011.

Members are (co)authors of over 360 scientific papers and 11 books that were cited over 1200 times by international researchers and practitioners. The most cited references include

- Kononenko, Igor. Machine learning for medical diagnosis : history, state of the art and perspective. *Artificial intelligence in medicine*, 2001,23(1):89-109.
- Robnik Šikonja, Marko, Kononenko, Igor. Theoretical and empirical analysis of ReliefF and RReliefF. *Machine learning*, 2003, 53(1):23-69.
- Bosnić, Zoran, Kononenko, Igor. Comparison of approaches for estimating reliability of individual regression predictions. *Data & Knowledge Engineering*, Dec. 2008, 67(3):504-516

The University of Ljubljana has extensive experiences in participating in international projects which are supported by a project support office. List of the past and ongoing EU projects includes 131 COST and 153 FP7 projects.

PARTICIPATION IN EU FUNDED PROJECTS

Laboratory for Cognitive Modeling (LKM) is looking for participation in EU-funded projects which need support with data analytics, data mining, or big data analyses. We offer our collaboration as a consortia partner in projects from various fields that require our expertise, such as ICT, medicine, societal challenges, transport, cognitive modeling, industry, finance, and others, within topics such as (non-exhaustive list):

- *FETHPC 1 - 2014: HPC Core Technologies, Programming Environments and Algorithms for Extreme Parallelism and Extreme Data Applications,*

- *FETPROACT 2 – 2014: Knowing, doing, being: cognition beyond problem solving,*
- *EINFRA 1-2014 – Managing, preserving and computing with big research data,*
- *EINFRA 3-2014 – Towards global data e-infrastructures – Research Data Alliance,*
- *ICT 15 – 2014: Big data Innovation and take-up,*
- *ICT 16 – 2015: Big data – research,*
- *ICT 20 – 2015: Technologies for better human learning and teaching,*
- *ICT 21 – 2014: Advanced digital gaming/gamification technologies,*
- *ICT 32 – 2014: Cybersecurity, Trustworthy ICT,*
- *EUB 1 – 2015: Cloud Computing, including security aspects,*
- *EUB 2 – 2015: High Performance Computing (HPC),*
- *EUJ 1 – 2014: Technologies combining big data, internet of things in the cloud,*
- *FoF 8 – 2015: ICT-enabled modelling, simulation, analytics and forecasting technologies,*
- *PHC 21 – 2015: Advancing active and healthy ageing with ICT: Early risk detection and intervention,*
- *PHC 28 – 2015: Self-management of health and disease and decision support systems based on predictive computer modelling used by the patient him or herself,*
- *PHC 30 – 2015: Digital representation of health data to improve disease diagnosis and treatment,*
- *LCE 7 – 2015: Distribution grid and retail market, where the scope takes into account the contribution of ICT infrastructure to smart grids and smart metering.,*
- *MG.5.3-2014 Tackling urban road congestion.*

Our role in the projects can be to lead analytical, research, development and evaluation activities, as well as dissemination of the results.