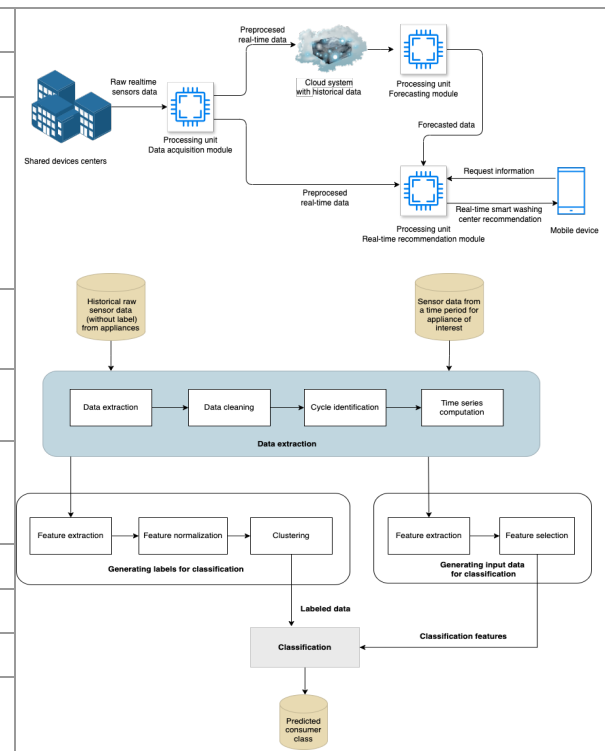


KNOWLEDGE ENGINEERING GROUP

Contact details

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Areas of expertise

Fundamental theoretical aspects:

Data analytics and processing methods for data with multiple complexities; learning models for natural language understanding and reasoning with large language models; computational neuroscience; explainability and bias reduction in language models; identifying and mitigating adversarial attacks on learning models.

Practical approaches:

Natural language understanding: language model reasoning, multi-task and multilingual models, topic extraction, sentiment analysis, contradiction detection, semantic role labeling, semantic parsing, intent detection and slot filling
 Graph analysis: community detection
 Heterogenous data (IoT): preventive maintenance, failure prediction, user profiling, forecasting, smart driving, real-time sensors data processing, generating artificial data
 Computational neuroscience: methods and models for brain activity identification and characterization (functional networks construction and analysis, spike sorting, burst detection, symbolic analysis, microstate analysis, LFP, and EEG data analysis).

Team

Prof. Eng. Rodica Potolea, PhD; Prof. Eng. Mihaela Dinsoreanu, PhD; Assoc. Prof. Eng. Camelia Lemnaru, PhD, Assist. Prof. Eng. Raluca Portase, PhD; Assist. Prof. Eng. Richard Ardelean, PhD

PhD Students: Cristian Lungu, Octavian Hasna, Florin Macicasean, Vlad Topan, Vasile Suciu, Lucian Cristea, Andrei Mihalca, Loredana Dan, Samuel Dolean, Vlad-Andrei Negru, Andrei-Cristian Rad, Alex-Mihai Lapusan, Diana Falamas, Andrei Herczeg, George Gabor

Representative projects

“**Electrolux AB - Recipe Importer I+II**”, international project with third parties (company Electrolux Italy), (2021-2023)
 UTCN id 31229/28.10.2021 (31229/28.10.2022)
 „**VOITA – Sistem informatic integrat de Voice to Text Analytics**” - SMIS 156387, PTI POC/1033/1/3/, 2023
 “**Appliance Data Analysis**”, international project with third parties (Electrolux Italy), 7981/27.03.2019, (2019-2020), (2021-2023)
ROBIN - “Robotii si Societatea: Sisteme cognitive pentru Roboti Personali si Vehicule Autonome”, PNCDI III, (2018-2020)
 “**Next generation product service**”, international project with third parties (company Electrolux Italy), (2014-2017)
SWARA – Sistem mobil de asistare vocala in Reintegrarea Persoanelor cu Afonii Chirurgicale, PCCA-2013-4 No. 6/2014 (2014-2016)
NOKIA, “Context-sensitive recommendation systems”, Bilateral grant, (2011-2012)
SEArCH, “Adaptive eLearning Systems using Concept Maps”, National research grant funded by CNMP Program 4:

Research partnership for priority domains, (2008-2011)

GridMOSI, “**Virtual Organization using Grid Technology for High-Performance Modeling, Simulation, and Optimization**”, National research grant funded by ANCS, CEEEX program, (2005-2008)

ArhiNet, “**Integrated System for developing semantically-enhanced archival content**”, National research grant funded by CNMP Program 4: Research partnership for priority domains,(2007-2010)

FOOD-TRACE, “**Integrated IT system for assuring traceability and quality control in food industry**”, National research grant funded by ANCS, CEEEX program, (2006 - 2008)

IntelPro, “**Intelligent system for assisting the therapeutic decision at patients with prostate cancer**”, National research grant funded by ANCS, CEEEX - INFOSOC, (2005-2008)

Significant results

The most representative publications of the past 5 years:

1. Vlad-Andrei Negru, Vasile Suciu, Alex-Mihai Lăpușan, Camelia Lemnaru, Mihaela Dînșoreanu, Rodica Potolea. Assessing language models' task and language transfer capabilities for sentiment analysis in dialog data. Computer Speech & Language, Volume 89, 2025, 101704, ISSN 0885-2308
2. Vlad-Andrei Negru, Robert Vacareanu, Camelia Lemnaru, Mihai Surdeanu, Rodica Potolea. From Text to Taste: Advancing Smart Appliances with Multilingual Recipe Interpretation. In 2024 IEEE 40th International Conference on Data Engineering Workshops (ICDEW), pp 13-20
3. Ardelean, E.R., Portase, R.L., Potolea, R. and Dînșoreanu, M., 2024. A path-based distance computation for non-convexity with applications in clustering. Knowledge and Information Systems, Springer, pp.1-39.
4. Portase, R.L.; Tolas, R.; Potolea, R. SmartLaundry: A Real-Time System for Public Laundry Allocation in Smart Cities. Sensors 2024, 24, 2159
5. Andrei-Victor Chisca, Andrei-Cristian Rad, Camelia Lemnaru. Prompting Fairness: Learning Prompts for Debiasing Large Language Models. In Proceedings of the Fourth Workshop on Language Technology for Equality, Diversity, Inclusion 2024, within EACL 2024, pp. 52-62
6. Ardelean Eugen-Richard, Ichim Ana-Maria, Dînșoreanu Mihaela, Mureșan Raul Cristian, Improved space breakdown method – A robust clustering technique for spike sorting, in Frontiers in Computational Neuroscience, Vol 17, 2023, doi:10.3389/fncom.2023.1019637, ISSN=1662-5188
7. Florin Macicasan, Alexandru Frasier, Nicoleta-Teodora Vezan, Camelia Lemnaru, Rodica Potolea. Evolving a Pipeline Approach for Abstract Meaning Representation Parsing Towards Dynamic Neural Networks. International Journal of Neural Systems, 17, Jun 2023, 33(7):2350040

Significant solutions:

Multi-task and multi-language NL understanding solutions

End-to-end explainable graph classification pipeline

Specific feature extraction, clustering, and analytic methods for brain activity identification and characterization

IoT data analytics

Real-time processing solutions for sensor data

Products and technologies:

1. Specific solutions in the Neuroscience domain (feature extraction, domain-specific clustering solutions, symbolic analysis)
2. Multi-task and multi-lingual NL understanding solutions: multi-task, multilingual classification models, keywords identification, intent detection and slot filling
3. Topic extraction and representation - identifying the topic polarity in a given document; projecting (very) large (un)structured data to relevant dimensions and providing representation to allow knowledge extraction
4. User/usage profiling - finding groups of individuals with similar features, finding/defining patterns for various profiles, predicting trends and future behavior
5. Community detection- identifying clusters from implicit and/or explicit connections; community detection in social data; opinion-driven community detection. Contradiction Detection - opinion mining-driven contradiction detection
6. Medical decision support systems - assisting medical diagnosis in prostate cancer and rheumatoid diseases

The offer addressed to the economic environment

Research & development	- End-to-end data analysis and (deep) machine learning pipelines for various tasks - SotA Natural Language Understanding solutions for multitask and multilanguage problems - Data and problem-specific feature extraction and clustering solutions applied to signal data (symbolic analysis, spectral analysis, neural networks, GAN-based architectures) - Data and problem-specific ML solutions applied on time series data (user/usage profiling, trend analysis, forecasting, predictive/preventive maintenance) - (Explainable) graph learning solutions
Consulting	Consulting, designing, researching, and prototyping ML solutions for multiple industrial and scientific fields.
Training	Data Analysis, Machine Learning, Deep Learning

Last updated: Jan 2025