
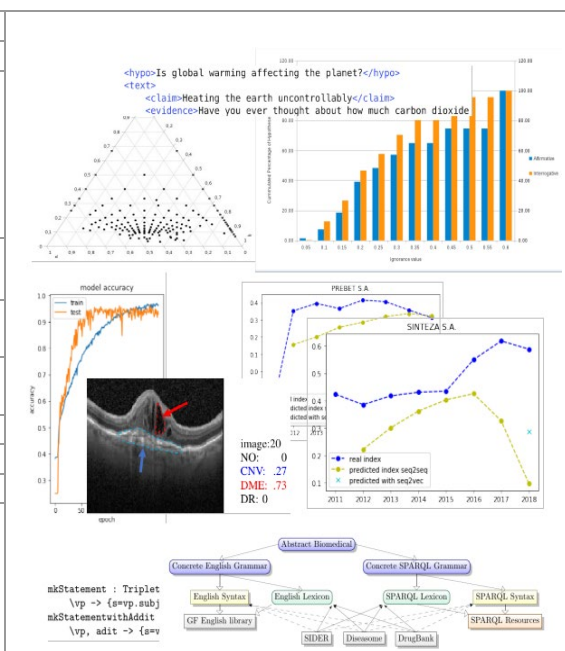


# INTELLIGENT SYSTEMS GROUP

## Contact details

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## Areas of expertise

**Explainable Artificial Intelligence - Knowledge representation and reasoning** - Semantic Web; Ontology engineering; Expert systems; Model checking  
**Natural Language Processing** - Machine comprehension, Chatbots, Commonsense reasoning.  
**Multi-agent systems** - Logic-based agents; Agreement technologies; Trust modelling; Ethics for AI, Dialogue protocols  
**Business processes re-engineering.** - Decision support systems; Norm Compliance, E-contracts, Bayesian networks

## Team

**Prof. Dr. Eng. Ioan Alfred Letia;** Assoc. Prof. eng. Emil Chifu, Prof. eng. Adrian Groza, Prof. eng. Radu Razvan Slavescu, Assoc. Prof. eng. Anca Marginean

## Representative projects

**“New Optical Coherence Tomography Biomarkers Identified with Deep Learning for Risk Stratification of Patients with Age-related Macular Degeneration, PED616, 2022-2024**  
**“Extensive Capitalization of Experience in Spatial and Security Activities (VESS),** project PN-III-P1-1.2-PCCDI-2017-0371 (2018-2020) - member  
**“Increasing understanding on climate change through public discourse analysis and stakeholders modelling”,** EEA Grant Romania-Norway, <http://users.utcluj.ro/~agroza/projects/argclime/> (2016)  
**ARGSAFE, “Using Argumentation for Justifying Safeness in Complex Technical Systems”,** PNII-Capacitati, <http://users.utcluj.ro/~agroza/projects/argsafe/> (2013-2015)  
**ASDEC, “Structural Argumentation for Decision Support with Normative Constraints”,** PNII-Capacitati, <http://users.utcluj.ro/~agroza/projects/asdec/> (2013-2014)  
**LELA, “Collaborative Recommendation System in the Tourism Domain Using Semantic Web Technologies and Text Analysis in Romanian Language”,** PNII-INOVARE, <http://users.utcluj.ro/~agroza/projects/lela> (2013-2014)  
**GREEN-VANETS, “Improving Transportation Using Car-2-X Communication and Multi-Agent Systems”,** Intern project -Technical University of Cluj-Napoca, <http://users.utcluj.ro/~agroza/projects/vanets>  
**SmartCoDrive – Cooperative Advanced Driving Assistance System Based on Smart Mobile Platforms and Road Side Units”,** national research project (2012-2016) - member  
**ARGNET, “Structured Argumentation in a Web Context”,** PNII-IDEI 170, <http://users.utcluj.ro/~agroza/argnet.html> (2009-2011)  
**“Automating Online Dispute Resolution for B2B using multi-agent systems”,** CNCSIS-534 <http://users.utcluj.ro/~agroza/odr.html> (2007-2008)  
**“Collaborative/Competitive Multi-Agent System Oriented on E-Business”,** CNCSIS, (2005-2007)  
**“Software Agents for Processing the Semantic Web”,** CNCSIS, (2002-2004)

## Significant results

**The most representative publications of the past 5 years:**  
 1. **“The Predictive Capabilities of Artificial Intelligence-Based OCT Analysis for Age-Related Macular Degeneration Progression—A Systematic Review”,** Muntean, G.A.; Marginean, A.; Groza, A.; Damian, I.; Roman, S.A.; Hapca, M.C.; Muntean, M.V.; Nicoară, S.D, *Diagnostics* Vol. 13, Iss. 14, 2023

2. "[Artificial Intelligence for Personalised Ophthalmology Residency Training](#)", Muntean, George Adrian and Groza, Adrian and Marginean, Anca and Slavescu, Radu Razvan and Steiu, Mihnea Gabriel and Muntean, Valentin and Nicoara, Simona Delia, *Journal of Clinical Medicine* Vol. 12, Iss. 5, 2023
3. "[The profile: unleashing your deepfake self](#)", Cheres, Ioana and Groza, Adrian, *Multimedia Tools and Applications* Springer Nature, pp. InPress, 2023
4. A. Groza, A. Marginean, S.D. Nicoara: *An ontology for age-related macular degeneration using ophthalmologists and language models, Semantic web applications and tools for health care and life sciences, Basel, feb. 13-16, 2023.*
5. V.Mercea, A.R. Paraschiv, D.A.Lacatus, A.Marginean, D. Besliu-Ionescu: A Machine Learning Enhanced Approach for Automated Sunquake Detection in Acoustic Emission Maps. *Solar Physics* 298, 4, 2023
6. I.A. Letia, A. Groza: Modeling and simulation with ontology streams for agents Interactions, European Simulation and Modelling conference, Porto, Portugal, oct. 26-28, 2022
7. A. Groza: Detecting fake news using machine learning and reasoning in description logic, Florence, jul. 18-20, 2022
8. A. Groza, A. Katona: *FACE: fact checker with explanations, Linz, Austria, sep. 12-15, 2022*
9. B.A. Marginean, A. Groza, G. Muntean, S.D. Nicoara: *Predicting acuity in patients treated for AMD, Diagnostics MDPI, vol. 12, 2022*
10. A. Groza, L. Todorean, G. Muntean, S.D. Nicoara: *Agents that argue and explain opinion for retinal conditions, Journal of Medical and Biological Engineering, vol 41, 2021*
11. A.N. Marginean, D.D. Muntean, G.A. Muntean, A. Priscu, A. Groza, R.R. Slavescu, ...: *Reliable learning with PDE-based CNNs and DenseNets for detecting COVID-19, pneumonia, and tuberculosis from chest X-ray images, Mathematics, vol. 9, 2021*
12. C. Nica, V. P. Almasan, A. Groza. *FastRCA-Seq: An efficient approach for extracting hierarchies of multilevel closed partially-ordered patterns, Knowledge-Based Systems, vol. 210, 106533, 2020.*
13. A. Groza, P. Ozturk, R.R. Slavescu, A. Marginean. "Climate Change Opinions in Online Debate Sites", In *Computer Science and Information Systems*, vol. 17 (1), 2020
14. A. Groza. *Interleaved Argumentation and Explanation in Dialog in Logic, Cognition, Games, College Pub., 2020*

#### Significant solutions:

Automatic Diagnosis of retina conditions using deep learning; Analysing arguments on social media; Machine comprehension and natural language processing for chatbots; Recurrent networks for pedestrian identification with pose estimation; Crop classification from satellite images using ensemble learning; Checking compliance of business processes with description logic; Checking compliance against safety standards (e.g. Hazard Analysis at Critical Control Points); Contributions to fundamental research in argumentation and demonstrate innovative technologies validated in real-world scenarios such as safety standards, justifying audit decisions, and structured arguments for medical decision support. Controlled Natural Languages with Grammatical Framework.

#### Products and technologies:

1. Train and visualize deep neural network for OCT B-scans ([https://github.com/ancamarginean/retina\\_amd](https://github.com/ancamarginean/retina_amd))
2. Chemical Reaction Network analysis tool (<http://cs-gw.utcluj.ro/~anca/tools.html>) CoNtRol
3. GFMEd (<http://cs-gw.utcluj.ro/~anca/tools.html>) - translating questions about drugs and diseases from English to SPARQL.
4. PEARLS (<http://cs-gw.utcluj.ro/~srazvan/prj/perlas/>) - Personal Expectations Aware Recommender of Landmarks and Sites
5. OntoEG (Ontology-based Essay Grading), 2015 (<http://users.utcluj.ro/~agroza/tools/ontoeg/>) Automated essay grading using ontologies and textual entailment.
6. AHP-OntoEval (AHP Ontology Evaluation), 2014, (<http://users.utcluj.ro/~agroza/tools/ahp>) Ontology evaluation system based on analytic hierarchy process.

#### The offer addressed to the economic environment

Research & development	<p>Medical data and financial data analysis with machine learning. Natural language processing</p> <p>Norm compliance: verifying business processes against norm compliance and quality standards like HACCP or ISO 22000. Model checking of business processes against ISO-like quality standards.</p> <p>Support for dispute resolution for Small and Medium Enterprises in case of contract breach.</p> <p>Semantic-based business process re-engineering.</p> <p>Decision support systems based on domain-based safety arguments. Logistic planning.</p> <p>Agent oriented technology in support of e-business.</p> <p>Representing and reason on business rules for e-commerce applications.</p> <p>Modelling and simulating trust on the Web.</p> <p>Semantic search of business products. Opinion mining for e-business.</p>
Consulting	<p>Machine learning: design, train and evaluate models</p> <p>Consulting, design, research and prototyping on development of semantic-based intelligent systems.</p> <p>Applied engineering services: engineering safety critical systems, business process re-engineering, model checking verification, ontology engineering.</p>
Training	<p><b>Explainable Artificial Intelligence: human-agent models for XAI</b></p> <p><b>Semantic Technologies:</b> ontology engineering, reasoning on ontologies, linked data, OWL, RDF</p> <p><b>Model checking:</b> Computation Tree Logic, Kripke models, hybrid logics.</p> <p><b>Agent-based programming:</b> Semantic Web services, multi-agent technologies</p>

Last update on January 2024