

Our research is at the crossroad of Distributed Artificial Intelligence, Human Computer Interaction and Cognitive Computing, focusing on Knowledge Engineering and Symbolic AI, Multi-Agent Systems, Human and Context Awareness and Internet of Things, supported by Edge and Cloud computing. Building on our main expertise fields, we investigate several research challenges as listed below, and we explore new research areas such as:

- Agent-based Cognitive IoT, Distributed and Collective AI and Distributed cognitive Systems, to bring collective intelligence capabilities to connect things, increasing their autonomy and decision-support possibilities. Increase resilience, avoid single point of failure of centralized, cloud-based analysis and control

- Hybrid logic-based – Machine Learning (ML) approaches, exploring the mix of knowledge representation / reasoning and other AI approaches (Intelligent Agents, Neural Networks) including ML techniques, for example when not enough training data is available for deep learning, or explanations are desired for agent decisions.

- Cyber-Physical social Systems and Systems theory
- Personalised recommender systems (graph and semantic -based)
- User Modelling
- Knowledge modelling and formalisation (Ontologies, Knowledge graphs)
- Knowledge Representation and reasoning
- Knowledge discovery, revision, evolution, fusion
- Natural Language Processing for Knowledge Management
- Multi-Agent Systems

- How to design computer systems that are able to adapt to users and context, taking into account the dynamics and complexity of multi-user environments and heterogeneous knowledge sources?
- How to handle systems impacted by the behaviour of individuals, balancing the interests of the individuals and the system?
- What model for a human digital twin to implement the human-in-the-loop paradigm in smart environments?
- How to manage knowledge graphs and knowledge-based reasoning in dynamic and distributed systems?
- How to bring cognition capabilities to IoT objects in complex cyber-physical-social spaces, supported by hybrid edge-cloud IT infrastructures, to ensure natural interaction with humans?
- How can Multi-Agent Systems and Knowledge-based Reasoning support cognition and collaborative intelligence in Cyber-Physical and Social systems?

- Health Techs
- Industry 4.0/5.0
- Education Technologies
- Digital Twin
- ICT
- RegTechs

• [CognitiveIoT](#) (Intelligent Agents for IOT, LIST, 2020, Coordinator) - Cognitive IoT, Human Digital, Agent platforms for IoT and Digital Twin, Human-Cognitive Thing Interaction

• [Basica](#) ([Maintenance of Semantic Annotations](#)?, FNR PoC, 2020, Coordinator) - Ontology evolution

• [Lifeline](#) ([Lifeline Food and Nutrition Assistance](#)?, AAL Programme, 2018-2020, Coordinator) - Personalised meal recommendations, food knowledge graph, automated recipe processing with Wikifood tools

• [Lifelines](#) ([How to Integrate Smart Home IoT?](#))

• [Cocoon4all](#) (Empowering users of digital cultural heritage in context-aware crosscuts of European history, H2020, 3.7MEur, 2016-2019, Coordinator) - Personalised crowd systems, smart guiding, Knowledge-Based Recommender Systems, Micro-services Cloud Platform

• [LIFE ASSISTANCE](#) (EU LIFE Programme), see also [Lifelines](#)

• [Lifelines of Semantic Annotations](#), FNR COG 2015-2018, Coordinator) - Semantic interoperability, Semantic Web, Ontology evolution, semantic annotation, medical informatics

• [Goliath](#) (Global Evolved Layered system for interoperable Ubiquitous Things), 2014-2016, 211KEur, FNR-INTER Pilot, Coordinator) - Context-awareness, Intelligent IoT, Smart Home, Multi-Agent Systems

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