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EDITORIAL

Beyond Distributed Artificial Intelligence

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Multi-Agent Systems is one of the most fascinating research areas in? With my Artificial Intelligence background, I am tempted to finish that sentence with Artificial Intelligence. Others would finish with "computer science", "economics",… Maybe this view is not fully up to date anymore? Started as Distributed Artificial Intelligence (DAI) in the 80s, Multi-Agent Systems as a research area has rapidly increased from the sub-area of DAI that deals with non-cooperative agents to a research field related to the theory and application of systems of interacting somehow autonomous actors. Interaction is the key. There are so many systems, in which the level of interaction that is addressed by Multi-Agent System approaches is the appropriate one for designing or analyzing them. Human–robot teams, massively open distributed systems based on internet, modern transportation or location-based systems, future energy systems, modern computer games… are just a few of the areas in which the usage of Multi-Agent Systems is based on or better said, contains interacting naturally or artificially intelligent systems. Maybe Multi-Agent Systems should be seen as an umbrella with AI as one of its sub-fields (beyond the view that S. Russell and P. Norvig built their AI books on)? I am not sure; the thing that I'm very sure about is that for me Multi-Agent Systems and Artificial Intelligence cannot be separated. Nobody uses the term Distributed AI any more. Yet, "All real systems are distributed." (F. Hayes-Roth 1980). So, why?

This is my last editorial as a member of the editorial team of Künstliche Intelligenz. After more than 10 years, I'm making room for somebody new. During that time while I grew from a rather naïve assistant professor in Würzburg to a full professor in Örebro, Sweden, the work for the Künstliche Intelligenz accompanied me not just with interesting activities, but also showing role models and making friends in the editorial team. During the last years it helped me maintaining a connection to the German AI scene. That I'm not available for a new period as a member of the editors' team shows partially that I finally arrived in Sweden, but it should not show that I'm cutting off my roots. You will still meet me at German AI and Multi-Agent Systems conferences which will hopefully continue their co-location in the future, at least from time to time.

The special issue Multi-Agent Decision Making was the last one that I supported as a "Pate". I'm very happy that in general there is finally again a special issue in the field of Multi-Agent Systems and in particular that Nils Bulling as guest editor did such a great job. Besides his survey article, contributions highlight different approaches and subfields of Multi-Agent Decision Making pointing to the current trends and challenges in the area. So, enjoy reading!

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Forthcoming Special Issues

1 Bio-Inspired Vision Systems

Much of early vision research drew inspirations from what was then known about biological vision. Progress was slow however, and over time machine learning in combination with features selected more on pragmatic grounds took over. Increasingly impressive results seem to justify that approach. The advent of affordable depth cameras further moved the field (certainly in robotics) away from biological considerations—why bother how the human brain arrives at 3D scene interpretations when the 3D data is just there?

Not all problems simply vanish however by throwing novel sensors and heavy machine learning at them. 3D sensors really only give 2.5D data. The backside, as well as sensor artefacts coming from physical limitations, still need to be filled in. And how meaning can be attached to visual percepts—2D or 3D—can not simply be explained by learning from large hand labelled data bases.

So there is still a lot to learn from biological vision systems. How to arrive at a sufficiently clear (whatever that means in detail) interpretation of the scene from several patchy cues? How to tightly couple vision to other aspects of a cognitive system? What is the right level of abstraction for representations?

In this issue we present current work in bio-inspired vision systems and explore the possibilities offered by new findings in biological vision systems as well as latest developments in machine vision.

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2 Health and Wellbeing

Health and Wellbeing: Our Ageing Population—What Role will You Play?

The EU28 population's annual healthcare expenditure has risen to € 1,085 billion, a substantial share of which arises through secondary prevention, long-term care and home- care (€ 90 billion). These costs are increasing towards 2020, while the available budget and the number of caretakers are shrinking. In developed countries around the world, an ageing population is the new reality. It's a reality that poses challenges to society, but also unique opportunities for artificial intelligence methods in health and wellbeing.

We should act on this challenge by offering AI-based solutions that respond to the demands for: (1) self-monitoring (quantified-self) related to health and habits, while these solutions will also reduce the costly demand for secondary prevention, cure and care for caretakers and insurers; (2) big health data analysis and clinical data intelligence for individualized treatment.

Themes of interest include, but are not limited to, the following areas of the patient/user centric view, the doctor/clinical view, or the combination of these two views.

Patient/User Centric View:

- Smart unobtrusive sensing of vital body signals (of care home residents)
- Event/task extraction from (video) life logging
- Data mining of contextual data
- Personalised associations between health and behaviour
- Vital signs and context data fusion & correlation
- Smart coaching algorithms (life-coaching) for wellbeing
- Intelligent User Interfaces for health and wellbeing
- Adaptive persuasion (based on a feedback loop) & persuasion technologies
- Adaptable interfaces that understand the physical and cognitive abilities of the user
- Adaptive interfaces that learn so that the user becomes more comfortable with the service over time
- Personalised schemes for behavioural change
- Health risk assessment for individuals and specific target groups
- Agents and Healthcare
- Embodied conversational agents (ECAs) in healthcare

Doctor/Clinical View:

- Smart (unobtrusive) sensing of vital body signals in clinical environments
- Data mining of contextual clinical data in different modalities (e.g., clinical records and medical images)
- Semantic annotation of medical texts and images related to the ageing population
- Text mining in the health and wellbeing domain

- Big data analysis and clinical data intelligence
- Personalised schemes for individualized treatment and medication
- Formalising clinical guidelines for health and wellbeing

Contributions can be from the following categories (for more detailed information please refer to the author instructions for each of these categories): technical contributions, research projects, discussions, and book reviews.

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3 Advances in Autonomous Learning

Autonomous Learning research aims at understanding how adaptive systems can efficiently learn from the interaction with the environment, especially by having an integrated approach to decision making and learning, allowing systems to decide by themselves on actions, representations, hyper-parameters and model structures for the purpose of efficient learning.

It addresses challenges such as how to autonomously learn representations for efficient model use, how to arrive at suitable cost functions from meta-objectives (generalizing inverse RL), how to autonomously choose model structures and hyper-parameters in possibly non-stationary environments, or how to design efficient actor-reward strategies which generalize across tasks.

Application scenarios which require these type of complex models span high-impact domains such as robotics, life-long learning, intelligent tutoring, or big data analytics.

We invite contributions related to the following non-exhaustive list of topics:

- Autonomous learning of rich data representations,
- Active learning in structured (e.g. hybrid, relational) interactive domains,
- Learning models with autonomous complexity adaptation,
- Transfer learning,
- Structure learning,
- Statistical relational learning,
- Theoretical advances to measure model autonomy,
- Applications and project reports in the field of autonomous learning.

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4 Higher-Level Cognition and Computation

Human higher-level cognition is a multi-faceted and complex area of thinking which includes the mental processes of reasoning, decision making, creativity, and learning among others. Logic, understood as a normative theory of thinking, has a widespread and pervasive effect on the foundations of cognitive science. However, human reasoning cannot be completely described by logical systems. Sources of explanations are incomplete knowledge, incorrect beliefs, or inconsistencies. Still, humans have an impressive ability to derive satisficing, acceptable conclusions. Generally, people employ both inductive and deductive reasoning to arrive at beliefs; but the same argument that is inductively strong or powerful may be deductively invalid. Therefore, a wide range of reasoning mechanism has to be considered, such as analogical or defeasible reasoning.

The topics of interest include, but are not limited to:

- Analogical reasoning
- Common sense and defeasible reasoning
- Deductive calculi for higher-level cognition
- Inductive reasoning and cognition
- Preferred mental models and their formalization
- Probabilistic approaches of reasoning

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