2019-01384 - PhD Position F/M Evolving ontologies through communication [PHD Campaign 2019 - Campagne Doctorants Grenoble Rhône-Alpes]

Type de contrat : CDD de la fonction publique
Niveau de diplôme exigé : Bac + 5 ou équivalent
Fonction : Doctorant

A propos du centre ou de la direction fonctionnelle
Grenoble Rhône-Alpes Research Center brings together a few less than 800 people in 35 research teams and 9 research support departments.

Staff is localized on 5 campuses in Grenoble and Lyon, in close collaboration with labs, research and higher education institutions in Grenoble and Lyon, but also with the economic players in these areas.

Present in the fields of software, high-performance computing, Internet of things, image and data, but also simulation in oceanography and biology, it participates at the best level of international scientific achievements and collaborations in both Europe and the rest of the world.

Contexte et atouts du poste
The work will be carried out in the mOeX team common to INRIA & LIG. mOeX is dedicated to study knowledge evolution through adaptation. It gather permanent researchers who have taken an active part these past 15 years in the development of the semantic web and more specifically ontology matching.

Mission confiée
Ontologies are representations of entities that can be found in the world. As the world and our standpoint on it change, ontologies cannot remain static. We aim at evolving ontologies while they are used by agents for communicating about the world they inhabit. This may be achieved by exchanging pieces of ontologies or by adapting those ontologies that prevent efficient communication.

These problems may be approached either theoretically or experimentally, through the framework of cultural evolution [Mesoudi 2008]. Experimental cultural evolution provides a population of agents with interaction games that are played randomly. In reaction to the outcome of such games, agents adapt their knowledge. It is possible to test hypotheses by precisely crafting the rules used by agents in games and observing the consequences.

Our ambition is to understand and develop general mechanisms by which a society evolves its knowledge. For that purpose, we adapt the successful cultural language evolution approach [Steele, 2012] to the evolution of the way agents represent knowledge [Euzenat, 2014; Anslow & Rovatsos, 2015; Chocron & Schorlemmer, 2016].

We have applied this approach to ontology alignment repair, i.e. the improvement of incorrect alignments [Euzenat, 2014; 2017]. We have performed experiments in which agents react to mistakes in ontology alignments —expressing relations across ontology concepts [Euzenat & Shvaiko, 2013]. Agents only know about their ontologies and alignments with others and they act in a fully decentralised way. We have shown that cultural repair is able to converge towards successful communication through improving the objective correctness of alignments.

This thesis proposal aims at developing the acquisition and evolution of ontologies through this approach more systematically. This covers learning ontologies from their environment, using them for communicating with others and evolving them through communication. Besides assertions across their ontologies, e.g. alignments, agents may exchange assertional knowledge, e.g. class membership of an individual, or terminological axioms, e.g. class subsumption or disjointness.

This involves designing new knowledge games and operators that agents use to adapt their knowledge with respect to the environment and interaction with others. This should contribute establishing if agents are able to reach perfect understanding if they are able to describe their environment at the level of precision they perceive it or if they are able to develop all the same a logically equivalent knowledge.

In addition to study operators independently, we aim at combining them in order to obtain pluripotent agents able to evolve their knowledge through playing to different games.

This work is part of an ambitious program towards what we call cultural knowledge evolution. Its results may be of experimental or theoretical nature and it may provide practical, e.g. new adaptation operators, or methodological, e.g. better experimental procedures, contributions.

References:
[Euzenat, 2017] Jérôme Euzenat, Communication-driven ontology alignment repair and expansion, in:
Compétences
Qualification: Master or equivalent in computer science.

Recherched skills:
- Curiosity and openness.
- Interaction with other researchers.
- Autonomous researcher.
- Taste for experimentation.
- Knowledge of multi-agent simulation and/or logic not required but a plus.
- Innovative.

Language: working English (written and spoken).

Avantages
- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking (after 6 months of employment) and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

Rémunération