2018-00314 - Knowledge evolution in agent populations
MOEX - PHD Campaign - Campagne Doctorants Grenoble Rhône-Alpes

Contract type: Public service fixed-term contract
Level of qualifications required: Graduate degree or equivalent
Fonction: PhD Position

About the research centre or Inria department
Inria the French national institute for research in computer science and control, is dedicated to fundamental and applied research in information and communication science and technology (ICST). Inria has a workforce of 3,800 people working throughout its eight research centers established in seven regions of France.

Grenoble is the capital city of the French Alpes. Combining the urban life-style of southern France with a unique mountain setting, it is ideally situated for outdoor activities. The Grenoble area is today an important centre of industry and science (second largest in France). Dedicated to an ambitious policy in the arts, the city is host to numerous cultural institutions. With 60,000 students (including 6,000 foreign students), Grenoble is the third largest student area in France.

Context
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 from the Exmo team which has taken an active part these past 15 years in the development of the semantic web and more specifically ontology matching.

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.

Assignment
When two populations of agents encounter, they do not necessarily organise their knowledge about their environment in the same way. They may however attempt at communicating and progressively align their knowledge. We aim at studying the effectiveness and robustness of such a process.

These problems may be approached either theoretically or experimentally, through the framework of cultural evolution. 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 adapt the successful cultural language evolution approach [Steels, 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]. For that purpose, we performed a series of 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 showed that cultural repair is able to converge towards successful communication through improving the objective correctness of alignments.

This proposal focusses on the behaviour of populations of agents. Its goal is to study how agents in a population, sharing the same ontology, can take advantage of what is learnt by the others agents interacting with agents of another population. Games will have to be designed for agents to locally adapt alignments between their ontology and the one used by other populations. It is expected that different agents, in the same population, do not necessarily end up with the same alignments.

We want first to understand when this occurs as well as what can be done for the agents to share with their peers the correspondences that they found. Roughly, three modalities can be compared:
- Agents develop independent alignments which can be compared;
- Agents develop independent alignments, but from time to time, proceed to synchronisation when they exchange their findings (this synchronisation, in turn, may be global to the population or local to a pair of agents);
- Agents develop from the beginning shared alignments.

In the two latter modalities, different operations may be used to aggregate the results brought by other agents.

Finally, it is possible to consider more than two populations and/or ontologies, eventually by splitting and merging populations and to study its impact on the alignment process.

**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.

**Bibliography**


**Benefits package**

- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave
- Flexible working hours
- Sports facilities

**Remuneration**


Monthly salary after taxes: around 1596,05€ for 1st and 2nd year. 1678,99€ for 3rd year. (medical insurance included).