

# **PhD scholarships, Internships, Postdoc and Research Engineer Positions**

LIRIS research laboratory (Lyon University, France) has launched a new 3 years project on next generation of conversational AI and cognitive services engineering, a project funded by IDEXLyon. A number of positions PhD scholarships, internships, postdoc and research engineers positions are available in this project.

## **Project - Short description**

Cognitive services and their instantiation in the form of messaging or chat bots, digital or virtual assistants, are today used by a large number of users. Conversational AI is already recognised as a strategic priority for modern enterprises. Increasingly, organisations have started or plan to use capabilities arising from advances in conversational AI and cognitive services. As economies undergo significant structural change, digital strategies through integration of conversational AI with application and processes, must provide industries across the spectrum with tools to create a competitive edge and build more value into their services. Sustaining conversational and cognitive services involves advanced techniques such as natural language processing, rule-based languages, machine learning, entity extraction and recognition. In addition, obtaining a large number of high quality annotated utterances (annotation with user intents and entities) and recognising entities in these utterances are key techniques for building conversational cognitive services. These annotated utterances are used to train machine learning models which can recognise intents and entities in user utterances.

Our broad objective is to enable the scalable integration of a cognitive service with a potentially large and evolving set of APIs, applications and processes. Several difficult challenges need to be addressed to achieve this objective.

- A core challenge is the lack of latent and rich intent and APIs knowledge to effectively and efficiently support dynamic mapping of probabilistic and ambiguous cognitive service abstractions (i.e., ambiguous natural language user utterances, complex and context-specific user tasks) to low-level, precise and deterministic API and programming abstractions (i.e., developer-oriented, structured and low-level API description models, e.g., JSON or XML descriptions of API methods, input and output parameters, code snippets).
- User intent may be context-dependents and complex. Therefore its realization may require composition of multiple APIs (e.g., triggering multiple APIs to control IoT devices using one user utterance) and sophisticated context management.
- Effective integration of conversational and AI-based services with APIs requires large amounts of high-quality and diverse sets of annotated user utterances, to learn mappings between utterances and API-powered intents.

We aim at designing, building and maintaining flexible and scalable cognitive services and APIs integration techniques. Identified research areas include developing:

- **Intent Latent Knowledge – Structure Embeddings:** Novel types of intent and API element (e.g., slots, parameters, methods, domain) representation and semantic vector space models, i.e., structure neural embeddings inspired by advances in word embedding techniques (e.g., word, phrase, relation embeddings) to facilitate the integration of a conversational cognitive service with a potentially large and evolving set of APIs
- **User-cognitive service Interaction Patterns and Conversation Models:** Declarative abstractions, models and techniques to capture interaction patterns among users, cognitive services, APIs and their compositions.
- **Complex Intent Synthesis:** Dynamic intents synthesis techniques to rewrite cognitive service tasks, expressed as natural language user utterances, into composition of API calls to address complex user needs that cannot be met by a single API call.
- **Robust and Scalable User Utterance Paraphrasing:** Scalable crowdsourcing and automated paraphrasing techniques to obtain labelled utterances.
- **Training data Quality:** Quality control techniques in developing cognitive services including training data, models and process quality assessment and assurance methods.

If you are interested to join our project and collaborate with leading scientists and organisations across several countries in creating the next generation of cognitive services, integrating conversational AI and APIs, send to us your CV and please come to discuss with us.

Contact: Prof. Boualem Benatallah ([boualem.benatallah@univ-lyon1.fr](mailto:boualem.benatallah@univ-lyon1.fr))