Master's Internship - Data Analysis and Services

I. Mission and Program Plan

Title

Development of a Service Composition Web Application

Internship Description

This internship is closely related to the use of the OpenCEMS platform (Open Solution for Easy Data Management in Connected Environments) [1]. OpenCEMS is a platform designed for data management and analysis in various domains, with a specific focus on connected environments and the analysis of their data, whether they come from real sources or simulations. This platform offers a variety of services, covering the entire data management process from initial preprocessing to further processing. These services are specially designed to handle and structure data from different parts of a connected environment, thereby facilitating communication and cooperation among these components. Additionally, OpenCEMS also allows for the generation of simulated data based on various parameters and contextualization of data collected from connected devices, taking into account environmental and sensory elements.

In the context of activities related to OpenCEMS, it is essential to identify and leverage the available services (also referred to as resources). To do this, it was necessary to describe these resources using an open, shared, and dynamic knowledge representation that enables interoperability. For this purpose, OpenCEMS has developed an ontology called WoR [2], a Web of Resources ontology that provides a modular and standardized vocabulary for describing web resources. WoR can achieve several objectives: (1) simplify the discovery, selection, and combination of different types of resources (whether exposed by connected web devices or web applications), (2) provide means of reasoning to discover new information, and (3) enable future scalability and adaptation to the needs of new domains. Experiments have been conducted to evaluate our proposed WoR ontology, showing promising results in terms of accuracy, clarity, and performance.

The primary objective of this internship is to conduct research and development aimed at describing and exploiting best the services within OpenCEMS. The ultimate goal is to create a robust and adaptable solution capable of meeting the diverse needs of users. To achieve this, the internship will be based on the service definitions available in the WoR ontology, thereby exploring the relationships between services to comprehensively describe the services developed within OpenCEMS. The core of the internship involves a deep understanding of the interrelationships between different services in OpenCEMS and how they can be optimally combined to meet user requirements. This understanding is crucial for developing appropriate service compositions. For example, in the context of data analysis in a connected environment, it is vital to know how to effectively associate preprocessing, analysis, and post-processing services to obtain relevant results. The development aspect of the internship will focus on creating a user-friendly interface composer, allowing users to select and organize services intuitively.

Mission - Main Activities

The student will be responsible for developing several web pages aiming at easily exploiting services and showing how they can be combined within the OpenCEMS platform. The primary goal of this

internship is to create a robust and flexible solution for platform users by providing reliable service composition. The student will be tasked with:

1. **Understanding the OpenCEMS platform**

   - Understand the platform features and ontology.
   - Explore best practices for service composition in similar environments: the student must conduct a small literature review and examine how other similar platforms, such as the Alteryx platform (https://www.alteryx.com/fr), manage service composition.

2. **Design and Development**

   2.1 Describing services using WoR Ontology

   The student will adopt WoR ontology to describe OpenCEMS platform services. This entails aligning WoR ontology concepts with the platform services. This pivotal phase strives to establish uniformity and enhance interoperability among services, simplifying user comprehension and utilization.

   2.2 Designing User-Friendly Interfaces

   Designing user-friendly interfaces is essential to enable users to intuitively compose services. Considerations include:

   - *Visual layout*: Design visual interfaces with a logical and easy arrangement of components. Users should be able to easily identify available services and how to combine them.
   - *User interaction*: Create a seamless user experience by allowing users to drag and drop services into a composition area. Use familiar interface elements such as buttons, icons, and context menus to make service composition intuitive.
   - *Real-time feedback*: Provide real-time feedback to guide users throughout the composition process.

3. **Testing and Optimization**
   - Test the development interfaces for usability, performance, and reliability.
   - Optimize the interfaces for responsiveness.
   - Debug and resolve any issues or bugs identified during testing.

II. Application Requirements and Criteria

Applicant‘s Profile:

- Solid knowledge in data modeling.
- Exceptional analytical skills with a keen interest in interdisciplinary research (Machine learning/Information retrieval).
- Proficiency in software engineering, including strong programming skills in Python and Angular.
- Excellent organizational and communication skills.
- Proficiency in English with the ability to work independently.
- Passion for developing and advocating for open-source projects.

Allowance

- Approximately 600 euros per month

Working Conditions

- Hosting laboratory: LIUPPA
- Location : Pavillon Montaury, Allée du Parc de Montaury, 64600 Anglet, France
- Laboratory expertise: Computer Science

Starting Date
February or March 2024

Duration:
Between 4 and 6 months

Application

The application should be submitted as a single PDF file and include the following:

- Curriculum Vitae (CV)
- Cover letter
- Transcript of master's degree grades and ranking
- Letter of recommendation (if available)
- Contact information for at least two professional references (if available)

Application must be sent to the following emails with the title "OpenCEMS-Master's Internship Application": richard.chbeir@univ-pau.fr and salma.sassi@univ-pau.fr.

Application Deadline
January 20, 2024

References

1. Chbeir, R. et al. (2022). OpenCEMS: An Open Solution for Easy Data Management in Connected Environments. In: Hameurlain, A., Tjoa, A.M. (eds) Transactions on Large-Scale Data- and Knowledge-Centered Systems LII. Lecture Notes in Computer Science(), vol 13470. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-662-66146-8_2
2. L. Kallab, R. Chbeir, S. Sellami and O. Boucelma, "WoR Ontology: Modeling Resources in Web Connected Environments," *2022 IEEE International Conference on Web Services (ICWS)*, Barcelona, Spain, 2022, pp. 286-295, doi: 10.1109/ICWS55610.2022.00050.