LARA - embracing almost fully automated experimentation from ground up by using semantic web technologies in Life Sciences

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Abstract

LARA (https://gitlab.com/larasuite) is an open source lab automation and research data management system of the next generation:

It utilises radical automation of most aspects of lab experimentation by applying standardised lab communication protocols, e.g. SiLA[1], between machines and human scientists, a new, Turing complete process- and procedure description language pythonLab [2], an open lab orchestrator [3] for running procedures and processes in the lab, open, JSON-LD based, linked data- and metadata formats, called SciDat [4], ontology based data representation and data synchronisation between different LARA instances and other repositories, like Dataverse and Zenodo (https://zenodo.org). Data / metadata can be queried through the LARA SPARQL endpoint. LARA strives for collecting and combining all data that is relevant to most common Life-Science experiments, like experiment planning, processes and procedures running the experiments (with their documented outcome), parts- and devices used in the experiments, substances, organisms, samples, etc.

It is designed to reduce data inputs of scientist to the bare minimum and make data accessible and findable through deep query infrastructures.

This also enables advanced Machine Learning and AI applications to access data in a machine-understandable, "semantic" form.

To illustrate this interoperability between the LARA database and Machine Learning algorithms, a demonstration with a newly developed Machine Learning Framework that uses semantic technologies is planned.

Keywords

semantic web, life science, labautomation, robotics, machine learning,

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