

A domain-specific language for supporting semantic mapping in open secondary usage and big-data analysis of health data

Summary

To develop and justify the domain-specific language (DSL) for supporting semantic mapping in open secondary usage and big-data analysis of health data, based on the state-of-the-art literature analysis and real-life healthcare systems. This DSL must equip data controllers with a tool (also stated in the IMI future research topics) that allows them to describe their data formats and communication protocols, according to the Unified Semantic Model (developed according to the other subproject of the Open Health Data for the Open Science project) with minor or without software development.

Research field:	Information and communication technology
Supervisors:	Gunnar Piho Peeter Ross
Availability:	This position is available.
Offered by:	School of Information Technologies Department of Health Technologies
Application deadline:	Applications are accepted between June 01, 2020 00:00 and July 03, 2020 23:59 (Europe/Zurich)

Description

Secondary use[1] of health data is an active research area in medical informatics. However, as stated in a recent survey[2], due to semantic heterogeneity of health data, we still do not have a unified approach and use divide-and-conquer methods instead. The review[3] conducted a year later, concludes that no “big data” analytics will happen without optimised data sharing and reuse, what we still lack despite different interoperability standards in the medical domain. This PhD Project is analysing different healthcare data mapping tools and communication protocols. The ultimate aim is that not only the point-to-point communication between two healthcare institutions is possible, as for instance the NextGen (formerly Mirth) Connect and Microsoft BizTalk allows, but that secure and dependable open secondary use of medical data is possible globally by medical research communities. Results are utilized in collaboration projects with TEHIK and international partners[4].

Responsibilities and tasks: To investigate the state of the art of the interoperability protocols and data mapping tools of the healthcare data and systems and analyze their use in different real-life healthcare systems. Based on the acquired knowledge, develop or propose a DSL and supporting tools for mapping the data formats and communication protocols to unified model and vice versa. This tool is responsible for query/response system, between data controllers and Open Health Data for Open Science (OPEN) system, and performs needed semantic translations. It is needed for data controllers, who want to be part of this OPEN system. To evaluate the DSL and mapping tools from the perspectives of medical science, software dependability, interoperability and from the possibility to change software evolutionary.

The applicants should fulfil the following requirements:

- MSc in Software Engineering or related fields like Informatics, Computer Science or Medical Informatics.
- Excellent software engineering skills.
- Competence in medical informatics and healthcare interoperability is a plus but not mandatory

[1] PricewaterhouseCoopers, 2009, Transforming healthcare through secondary use of health data.

[2] B.Shickel, P.J.Tighe, A.Bihorac, and P.Rashidi; Deep EHR: A Survey of Recent Advances in Deep Learning Techniques for Electronic Health Record (EHR) Analysis, 2018, IEEE Journal of Biomedical and Health Informatics, vol 22, no 5, pp 1589-1604

[3] X, Gansel, M. Mary, and A. van Belkum; Semantic data interoperability, digital medicine, and e-health in infectious disease management: a review; 2019, European Journal for Clinical Microbiology and Infectious Diseases, 38: 1023-1034

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