TAL TECH

A unified semantic model for open secondary usage and big-data analysis of health data

Summary

To develop and justify the Unified Semantic Model (USM) for open secondary usage and big-data analysis of health data, based on the state-of-the-art literature analysis and real-life healthcare data models. This model should allow semantically homogeneous, open, secure and anonymous secondary usage and big-data analysis of real health and medical data in a global context (data from a considerable amount of different data controllers) without the need for software development from the health data controllers (hospitals, laboratories, registers, etc).

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

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 (issue is also stated in the IMI future research topics[4]) despite different interoperability standards in the medical domain. This PhD Project combines domain analysis, archetypes[5] and Single Unified Model[6] approaches, and proposes a Unified Semantic Model for health data. Results are utilized in collaboration projects with TEHIK and international partners[7].

Responsibilities and tasks: To investigate the state of the art of the interoperability of the healthcare data and systems and analyze health data models of different real-life healthcare systems. Based on the acquired knowledge, develop a unified semantic model for health data analysis and evaluate this model's usability based on real-life software systems[8] and from the perspectives (as stated also in[5]) of medical research, GDPR, open data, open science, data transparency and integrity.

he 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 systems 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

[4] IMI (Innovative Medicines Initiative), https://www.imi.europa.eu/sites/default/files/uploads/documents/apply-for-funding/future-topics/DraftTopic_ReturningTrialData_v6April.pdf, Future topics of 23th Call, 2020

[5] Piho, G.; et al (2015). Business Archetypes and Archetype Patterns from the HL7 RIM and openEHR RM Perspectives: Towards Interoperability and Evolution of Healthcare Models and Systems, *Procedia Computer*, Elsevier.

[6] Meier, Johannes & Klare, Heiko & Tunjic, Christian & Atkinson, Colin & Burger, Erik & Reussner, Ralf & Winter, Andreas. (2019). Single Underlying Models for Projectional, Multi-View Environments. 119-130. 10.5220/0007396401190130.

[7] Prof. Martin Leucker (https://www.isp.uni-luebeck.de/leucker, Institute for Software Engineering and Programming Languages at University of Lübeck; google hi – 35), Prof. Yngve Lamo (https://www.isp.uni-luebeck.de/leucker, Department of Computing, Mathematics and Physics at Western Norway University of Applied Science; google hi – 16), University Medical Centre of Schleswig-Holstein (Germany), Houkeland University Hospital (Norway), and Zealand University Hospital (Denmark)

[8] Estonian Health Information System (EHIS), health systems developed by Estonian companies Medisoft, GennetLab, Nortal, etc. Systems used by the University Medical Centre of Schleswig-Holstein (Germany), Houkeland University Hospital (Norway), and Zealand University Hospital (Denmark).

To get more information or to apply online, visit https://taltech.glowbase.com/positions/74 or scan the the code on the left with your smartphone.