A reference architecture for open secondary usage and big-data analysis of health data

Summary

To develop and justify the reference architecture for open secondary usage and big-data analysis of health data, based on the state-of-the-art literature analysis and real-life healthcare and medical science needs. This architecture should support open data and open science policy by allowing real-life health data analysis in a global context (data from a considerable amount of different data controllers) without the need for transferring personalized data out of the data controllers premises.

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

The routine clinical data are considered precious[1], and their secondary use[2] is considered beneficial for policy-makers, public health officers, scientists, clinicians, citizens and industry[3]. Different initiatives, including European Health Data Network[4] and Clinical Trial Data[5] initiative, initiated by the European Commission and the EFPIA (European Federation of Pharmaceutical Industries and Associations), are searching for solutions. However, as stated in a recent survey[6], due to semantic heterogeneity of health data, we still do not have a unified approach and use divide-and-conquer instead. This PostDoc/PhD project generalizes Estonian Health Information System experiences[7] and proposes and evaluates reference architecture for open secondary usage and big-data analysis of health data so that data and systems interoperability, as well as data protection rules, are satisfied. Results are utilized in collaboration projects with TEHIK and international partners[8].

Responsibilities and tasks: To investigate different real-life healthcare systems, different related stakeholders and the state of the art of the large and ultra-large (healthcare) systems. Develop a reference architecture for secondary usage and big-data analysis of health data. Evaluate it from the perspectives (as stated in[5]) of EHR interoperability, medical research, GDPR, open data, open science, and data transparency and integrity.

The applicants should fulfil the following requirements:

- PhD (for post-doc position) or MSc (for PhD position) in Software Engineering or related fields like Informatics, Computer Science or Medical Informatics.
- **Excellent software engineering and systems technical architecture skills**.
- Competence in medical informatics and healthcare systems interoperability is a plus but not mandatory.

[1] T.D.Wade, Refining gold from existing data, Curr Opin Allergy Clin Immunol, 2014; 14(3): 181-185

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

[3] W.O.Hackle and E.Ammenwerth, SPIRIT; systematic panning of intelligent reuse of integrated clinical routine data – a conceptual best-practice framework and procedure model, Methods of information in medicine, vol 55, no 02, pp.114-124.

[4] IMI (Innovative Medicines Initiative), 2017, 12th Call for Proposals, document reference IMI2/INT/2017-02169

[5] 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

[6] 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

[7] Metsallik, J, Ross, P, Draheim, D, & Piho, G (2018) Ten Years of the e-Health System in Estonia. Invited paper of MMHS2018 (Meta-modelling of Healthcare Systems) *ceur-ws.org*

[8] 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).