Newsletter N.5, November 2022

Dear reader,
For this fifth edition, the RE-SAMPLE project is moving forward. This month we will continue the presentations of our consortium members and of our PhD students! You will also join us on different events that happened in the last months!

Presentation of SIHTASUTUS TARTU ULIKOOLI KLIINIKUM (TUK)

Tartu University Hospital (TUK) is the largest provider of medical care in Estonia, covering all the specialties available in the country, including hightech procedures. It is the single university teaching hospital in Estonia, and thus a national reference centre for health and biomedical sciences. It is the national hub for development and implementation of e-health solutions in medical imaging,

The Clinic in charge of the RE-SAMPLE project is the lung clinic with 16 pulmonologists and 4 thoracic surgeons working in three departments and conducting over 15 000 outpatient visits per year. The Clinic has vast experience in conducting medical research in lung diseases, including COPD. In the frame of the Estonian programme 'COPD IN FOCUS' initiated by

patient health records and data collection, archiving and sharing for clinical and research purposes. With 955 beds, the hospital offers a wide range of diagnostic and treatment services, including specialised services within cardiac sciences, neurosciences, surgery, internal medicine, critical care, emergency and trauma care.

the Estonian Respiratory Society and the Estonian Connected Health Cluster, the Clinic has tested technical feasibility of home solutions for COPD patients.

Tartu University Hospital
Lung Clinic

Webinar: Managing Chronic Conditions Using Real World Data (MES-CoBraD, RETENTION, RE-SAMPLE)

On 20 September 2022, RE-SAMPLE participated in a joint webinar with the sister projects MES-CoBraD and RETENTION. The three projects derive from the same H2020 funding stream, which focuses on how real-world data (RWD) could be utilised in medical settings. This webinar was the occasion for the projects to introduce their work and to see how they use innovative developments with RWD in the medical settings. The projects' representatives discussed the critical developments and the challenges of applying data intensive models, utilsing machine learning, for improved health outcomes.

More information on the projects can be found on their websites:
MES-CoBraD: https://www.mes-cobrad.eu/

RE-SAMPLE First In-Person Consortium Meeting

On 27 and 28 September 2022, the RE-SAMPLE Consortium met for the first time in person in Enschede, at the University of Twente. It was really nice to see each other, and to discuss several issues on the project advancements.

The first day saw some clarifications on the status of RE-SAMPLE first periodic report. We also had a workshop regarding the observational cohort and discussed the follow-ups of the technical meeting with questions for the whole consortium.

The day ended with a social event where partners were able to discover their abilities with graffiti painting!

On the second day, partners participated in different workshops to give insights to the teams working on the different topics! The coaching workshop discussed five domains: sleep, self-management, physical activity, medication and coping. Then the participants worked in two parallel groups: one focused on innovation management, and another one on scientific coordination.

The last workshop was dedicated to the SROI (Social Return on Investment) analysis, before a closing session!

PhD corner

Meet our PhD students: Eline

Hi! Let me introduce myself: I'm Eline te Braake. I work as a PhD student at Roessingh Research and Development (RRD) in Enschede. RRD is an impact lab for personalized health technology and is one of the partners in the RE-SAMPLE project. In my PhD, I focus on the self-management of COPD in eHealth solutions. I think it's very important to help people with COPD to self-manage their disease in all different aspects of their lives. I, for example, think that accepting the disease is also part of the self-management of COPD, and together with other aspects, are very important to include.

I started working in the RE-SAMPLE project about a year ago. By the time I started, the project was already running for half a year and a lot of interesting studies were carried out. Luckily, since the start of my PhD, I had the chance to do a lot of fun and interesting studies with both patients with COPD and healthcare professionals. We did for example, end-user walkthroughs in which patients got to see potential wireframes of the technology, and studies for the development of the RE-SAMPLE service model.

During these studies, we gained much knowledge about living with COPD, preferences regarding the management of COPD, and the needs for the RE-SAMPLE technology.

As you may have already read by now, a lot of valuable information is collected, and the RE-SAMPLE project and my PhD benefited greatly from these conversations with patients and healthcare professionals. I am therefore very grateful for their time. I'm excited to continue working with all the amazing people within the RE-SAMPLE project and hope to continue learning from the experts living with COPD and their healthcare professionals. And who knows, maybe we will meet each other sometime soon!

Publications

Repeated Knowledge Distillation with Confidence Masking to Mitigate Membership Inference Attacks

On 11 November 2022, Federico Mazzone (University of Twente) presented his paper "Repeated Knowledge Distillation with Confidence Masking to Mitigate Membership Inference Attacks" at AISec'22, a workshop of the ACM CCS conference in Los Angeles.

The abstract of the paper is below:

Machine learning models are often trained on sensitive data, such as medical records or bank transactions, posing high privacy risks. In fact, membership inference attacks can use the model parameters or predictions to determine whether a given data point was part of the training set. One of the most promising mitigations in literature is Knwoledge Distillation (KD). This mitigation consists of first training a teacher model on the sensitive private dataset, and then transferring the teacher model on the sensitive private dataset, and then transferring the teacher knowledge to a student model, by the mean of a surrogate dataset. The student model is then deployed in place of the teacher model. Unfortunately, KD on its own does not provide users much flexibility, meant as the possibility to arbitrarily decide how much utility to sacrifice to get membership-privacy.

To address this problem, we propose a novel approach that combines KD with confidence score masking. Concretely, we repeat the distillation procedure multiple times in series and, during each distillation, perturb the teacher predictions using confidence masking techniques. We show that our solution provides more flexibility than standard KD, as it allows users to tune the number of distillation rounds and the strength of the masking function. We implement our approach in a tool, RepKD, and assess our mitigation against white-and black-box attacks on multiple models and datasets. Even when the surrogate dataset is different from the private one (which we believe to be a more realistic setting than is commonly found in literature), our mitigation is able to make the black-box attack completely ineffective and significantlty reduce the accuracy of the white box attack at the cost of only 0.6% test accuracy loss.

Link

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