# KTH Digitalization Platform & KTH Life Science Platform

## AI and data science for diagnostics and health decision support

This is one of five breakout sessions at the AI for Life Science Workshop @ KTH, Oct 14. The session is organized by Jayanth Raghothama, KTH, Biomedical Engineering and Health Systems.

In this breakout session, we will cover issues, methods and applications to support decision making in clinical settings, focusing on both clinicians and patients as user groups. Talks will cover early diagnostics and warning systems aimed at prevention and mitigation, natural language processing and cognitive support in intensive and critical care.

This will be a virtual event on zoom (link will be provided) between 14:25 – 15:55, Oct 14.

**Session outline:**

14.25 – 14.35 Introduction and Session Structure, Jayanth Raghothama

14.35 – 15.20 Short Pitches

*Ashish Kumar*, KI, Cross-trait analysis in respiratory and metabolic phenotypes – opportunities and challenges in correlating health outcomes and OMICs' public repositories

*Annaclaudia Montanino*, Getinge, Using machine learning to optimally adjust patient model parameters

*Saikat Chatterjee*, KTH, AI for Real-Time Early Warning Systems

*Jawad Elomari*, RISE, Early Warning Systems in Healthcare

*Petra Szeszula*, Andningmed, Smart intuitive inhaler for respiratory diseases

*Martin Jacobsson*, KTH, Using machine learning to predict and prevent perioperative hypotension and its complications

*Johan Lundin*, KI, Point-of-Care Diagnostics of Cancer and Infectious Diseases with AI-Supported Mobile Microscopy

15.20 – 15.25 Break, split into breakout rooms

15.25 – 15.55 Discussions in breakout rooms

# Abstracts

## Point-of-Care Diagnostics of Cancer and Infectious Diseases with AI-Supported Mobile Microscopy

Johan Lundin1,2

1Department of Global Public Health, Karolinska Institutet, Stockholm, Sweden 2Institute for Molecular Medicine Finland – FIMM, University of Helsinki, Helsinki, Finland,

E-mail: johan.lundin@ki.se

**Abstract:** The aim of our current studies is to assess the feasibility and diagnostic accuracy of mobile digital microscopy combined with artificial intelligence (AI) for improving access to diagnostics in resource-constrained settings. Our research group has developed mobile, microscopy diagnostics that can be used at the point-of-care (POC), especially in low-resource and expert-poor settings. The mobile microscopes are wirelessly connected for remote diagnostic support, either by AI or human expert assessment or a combination of both. The pitch describes our POC diagnostic platform for image-based diagnostics and how we have applied it to screening for cervical cancer, malaria and other parasitic infections. Experiences are shared from studies in rural Kenya and Tanzania. Current challenges of point-of-care pathology are highlighted, and some visions presented for future opportunities of AI-supported mobile microscopy diagnostics.

**Short bio:** Johan Lundin, MD, PhD is a Professor of Medical Technology at Karolinska Institutet, Stockholm and a Research Director at the Institute for Molecular Medicine Finland (FIMM), University of Helsinki, Finland. His overall research aims are to study the use of digital technologies and artificial intelligence for improvement of diagnostics and care of the individual patient. In addition to the research, Dr. Lundin has together with researchers at Karolinska Institutet and his research group at FIMM and developed technologies for diagnostic decision support, for example cloud-based and mobile solutions that allow the diagnostic process to be performed using automated computerized analysis. Dr. Lundin will pitch how the digital methods can enable task-shifting and improve access to diagnostics at the point-of-care, both in high and low resource settings.

## Early Warning Systems in Healthcare

Jawad Elomari

**Abstract:** Every day, thousands of people need a continuous monitoring of their health condition in Europe either during their whole life or during specific periods in medical care at hospitals, nursing homes or home nursing. There could be different reasons like chronic disease (such as cardiovascular diseases, diabetes, pneumonia, acute heart failure etc.), or they are recovering from medical operation, or they are under a psychological treatment, or just they are in a pregnancy period. Therefore, such prevalence of people needing continued medical support proposes a significant challenge and expenses for the entire healthcare system. Thereby, an early-warning platform is needed to enable at-risk patients to be continuously monitored and medically attended if needed, through different medical devices, home sensors, etc., and so, the need to go the hospital and need of dozens of manual daily measurements in more nursing-intensive cases are decreased. Furthermore, this platform provides the health care professionals (both medical and nursing) a way to predict and prevent severe situations for risk patients with less workload. As added value, this early-warning platform allows the healthcare system to decrease the number of expensive intensive

treatment periods implying huge savings for themselves while enhancing the patient safety by secured measurement results and minimize human errors.

## Smart intuitive inhaler for respiratory diseases - Andning Med

Petra Szeszula,

**Abstract:** Asthma and COPD (Chronic Obstructive Pulmonary disease) patients use an inhaler every day to get their medication, but only 30% have the correct inhalation technique. In fact, 70-90% make one or more critical errors, which means they don't deliver the correct dose of medication in their lungs. Even if patients learn how to use their inhaler correctly, within 3 months most people forget and return back to their old habits. Incorrectly inhaled medication leads to an increased number of breathless attacks - exacerbations, that often require hospitalization. With each exacerbation the probability of having another one increases. We develop an intuitive inhaler that doesn't require education. It is a medical device that guides patients through the process of inhalation with visual and haptic cues, so they can see and understand, what to do, to inhale correctly. The device can collect data about the use, based on which recommendations could be made. We aim to make a product that is both physical and digital, can be attached to the patient's inhaler and gives feedback. We aim to create an integrated service that would help patients manage their chronic disease better and make their everyday life easier.