UNIVERSITÀ DEGLI STUDI DI MILANO BICOCCA

DIPARTIMENTO DI
INFORMATICA, SISTEMISTICA E
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ReGAInS

SEMINAR ANNOUNCEMENT

Wednesday, 2nd July 2025, at 10:00 am
Room "T024" - Abacus Building (ex U14)

Enhancing sleep medicine with explainable AI

Speaker: Dr Michal Bechny, University of Bern (Switzerland) and MeDiTech – SUPSI Lugano

Abstract

With increasing digitalization across industries, there is growing demand for process automation based on available data. This trend is also evident in the relatively conservative field of healthcare, which is highly regulated by ethical and legal standards such as the EU AI Act. Sleep medicine is no exception, facing a growing number of patients due to widespread sleep issues in today's population—caused by lifestyle, stress, mental health disorders, or comorbid clinical conditions beyond sleep diagnoses. The gold standard for sleep assessment is the sleep study (polysomnography), during which a patient's biosignals are monitored overnight and later scored into five sleep stages based on clinical rules. Manual scoring of one night takes 1–2 hours of clinical staff time. Clinical metrics are derived from the scored data and used for diagnosis. This talk briefly introduces modern deep learning approaches to automated sleep scoring and their integration into clinical workflows. The main focus is on deriving new digital biomarkers using probabilistic modeling of clinical parameters and sleep-stage dynamics, employing causal meta-learners and expert-informed Bayesian Networks. Applications are demonstrated in diverse populations with sleep apnea or chronic fatigue syndrome. The talk also includes prediction of long-term cardiovascular risk based on sleep parameters and discusses translational potential for wearable consumer devices.

Short bio

Michal Bechny is a PhD candidate in Computer Science at the University of Bern and a researcher at the Institute of Digital Technologies for Personalised Healthcare (MeDiTech) at SUPSI in Lugano. His work lies at the intersection of statistical modeling, machine learning, and sleep medicine, with a dual focus. Technically, he has developed frameworks for integrating deep learning-based sleep scoring algorithms into clinical workflows, including physician-AI collaboration pipelines based on uncertainty quantification and a general approach for bias quantification in predictive models. Clinically, his research explores novel digital markers for sleep disorders using causal meta-learners, probabilistic modeling of sleep-stage dynamics, and Bayesian Networks for decision support—covering effect quantification, diagnostics, and simulation of optimal interventions. He works with large observational clinical datasets and aims to make predictive models both interpretable and actionable. Michal collaborates closely with Inselspital Bern and maintains active international ties, including with the University of Tokyo. In parallel, he works as an external consultant in the dairy industry, leading development of predictive algorithms for cattle farming.

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