

HORIZON-HLTH-2023-STAYHLTH-01-01: The Silver Deal - Person-centered health and care throughout the EU

HORIZON-HLTH-2023-DISEASE-03-01: Novel approaches for palliative and end-of-life care for non-cancer patients

Unobtrusive monitoring of vital functions and behaviour changes

Onset of various diseases, including mental disease, are connected to changes in vital functions, circadian rhythm, and behavioural changes. Modern smart solutions can monitor alterations in all of these and give an early warning on disease onset as well as monitor disease progression.

The project team has wide experience in remote monitoring and evaluation of vital data using modern smart solutions. We are focused on remote diagnostics methods using micro-vibration data generated by heart movement, blood flow (ballistocardiography) and respiration analysis from wearable sensors and sensors in beds. We can offer special unobtrusive pads for detailed monitoring of vital functions – heart rate, breath rate, heart rate variability (HRV), arrhythmias, apnea, heart failure before death and pain monitoring, which is related to HRV changes. The pads are also suitable for palliative care for long term vital function monitoring, notification and prediction.

We own server solutions for vital data gathering, evaluation, reacting, reporting, and have led a research study in the field. Our server systems are also capable of working and reacting on data gathered from commercial solutions, such as FitBit or Apple Watch. We have also developed a smartphone application for automatic surveys of study participants, with personalized questionnaires and prompts reacting nearly in real time on the measured data.

Applications – project ideas focused on unobtrusive monitoring:

- early disease onset notification and monitoring of disease progression
- unobtrusive monitoring of pain and drug effects
- pharmacodynamics monitoring - unobtrusive evaluation of effect of drugs on vital functions in real time (anti depression, sedatives, anti-inflammatory)
- detailed HRV analysis
- respiratory effort changes for evaluation of respiratory diseases, detection of various types of breathing
- improved accuracy of atrial fibrillation monitoring
- personal blueprint of human cardiovascular system and its changes

What we bring into consortium:

- Hardware solution for unobtrusive data collection and evaluation: sensor pads under mattress and/or wearables measuring HRV, respiration rate, micro-vibrations, pulse wave velocity, ABI index, tremor.
- Software tools for remote vital signs monitoring and mHealth interventions.
- Infrastructure for long-term training of neural networks and high-performance computing (HPC) cluster.
- Team experienced in vital data analysis, machine learning methods, development of algorithms.

Recent related projects:

- NU21-09-00007 → mHealth intervention delivered in general practice to increase physical activity and reduce sedentary behaviour of patients with prediabetes and type 2 diabetes
- TL03000520 → Smart solutions across continual care of elderly people
- FV40231 → Innovative platform for the determination of bioactive substances
- HDHL-INTIMIC 2021 8F22001 → Standardized measurement, monitoring and/or biomarkers to study food intake, physical activity, health (STAMIFY). Wearable sensors for assessment of physical and eating behaviours (WEALTH)
- Subcontracts/cooperation
 - HAIE CZ.02.1.01/0.0/0.0/16_019/0000798 → Healthy Aging in Industrial Environment HAIE
 - Marie Skłodowska-Curie Actions co-funded by the South Moravian Region → mHealth Active

Contacts with industrial partners:

TESLA a.s., Trilab Group s.r.o., EMPLA AG spol. s r. o., ESSENCE LINE, s.r.o., DERS s.r.o., Anume s.r.o.

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