

RESEARCH TOPIC PRIME6

ECO-WEAR: An ecosystem of wearable devices for the perioperative monitoring of day surgery patients

Thematic field of the project

Wearable devices

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Main facility

Politecnico di Milano

Department of Electronics, Information and Bioengineering (DEIB)

Main field of interest

Wearable devices for perioperative monitoring

Abstract

The ECO-WEAR project aims to assess the feasibility of using an ecosystem of wearable devices for perioperative monitoring of day surgery patients. Three types of devices — a sensorized garment, a medical-grade smartwatch, and a custom-made body sensor network — will be tested on 90 patients. Data will be compared to standard clinical scales (6MWT, MET, DASI, CFS) to evaluate whether the devices are interchangeable in predicting surgical risk. Usability, compliance with prehabilitation protocols, and recovery to preoperative routines will also be assessed. The goal is to provide guidelines for integrating wearable data into clinical practice, improving care quality and reducing healthcare costs.

Main technical approaches

The project relies on the integration of multiple wearable technologies for physiological monitoring in the perioperative setting. The main technical approaches include: the use of wearable systems for continuous acquisition of physiological signals; synchronization and aggregation of heterogeneous data from multiple devices; and application of standardized clinical protocols (6MWT, MET, DASI, CFS) for surgical risk assessment; data collection and dataset creation. Data analysis will involve signal processing, statistical methods, and machine learning algorithms to estimate preoperative fitness and detect possible postoperative complications.

Required skills:

bioengineering, physiological signal processing, programming, fundamentals of data science and machine learning, ability to work in a multidisciplinary team.

Scientific references

- [1] A. Angelucci et al., "Fitbit Data to Assess Functional Capacity in Patients before Elective Surgery: Pilot Prospective Observational Study," J Med Internet Res, vol. 25, 2023, doi: 10.2196/42815.
- [2] M. Greco et al., "Wearable Health Technology for Preoperative Risk Assessment in Elderly Patients: The WELCOME Study," Diagnostics, vol. 13, no. 4, 2023, doi: 10.3390/diagnostics13040630.
- [3] T. Mishra et al., "Pre-symptomatic detection of COVID-19 from smartwatch data," Nature Biomedical Engineering 2020 4:12, vol. 4, no. 12, pp. 1208–1220, Nov. 2020, doi: 10.1038/s41551-020-00640-6.
- [4] E. Stamatakis, M. Hamer, G. O'Donovan, G. D. Batty, and M. Kivimaki, "A non-exercise testing method for estimating cardiorespiratory fitness: associations with all-cause and cardiovascular mortality in a pooled analysis of eight population-based cohorts," Eur Heart J, vol. 34, no. 10, p. 750, 2012, doi: 10.1093/EURHEARTJ/EHS097.

Type of contract

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