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Energy-Aware Runtime for Wearable Smart Medical Sensors

ETH Zürich

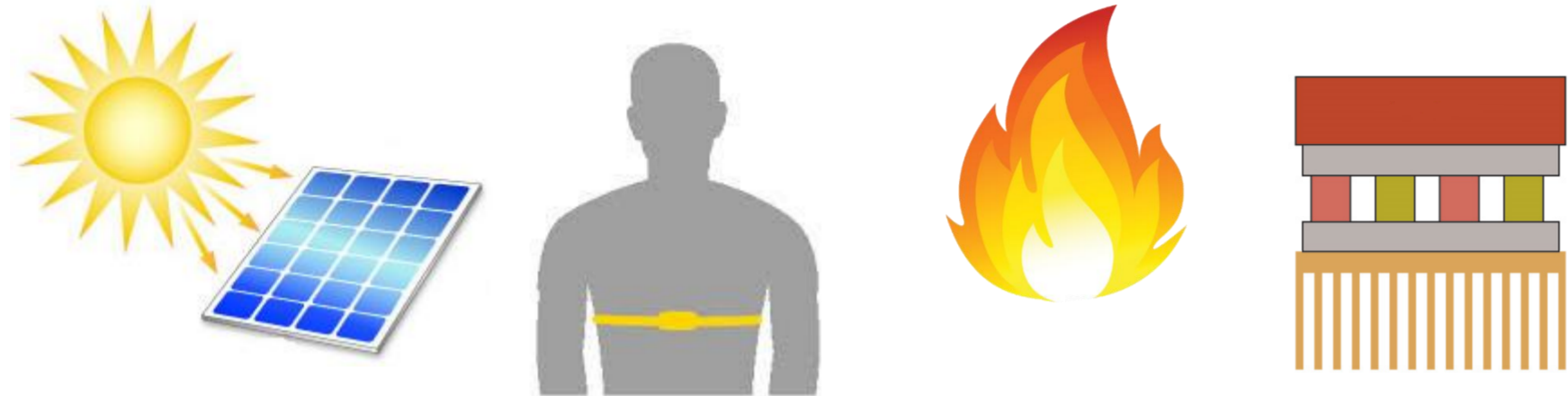
Ivana Unkovic, Dennis Majoe, Thomas Gross, Jürg Gutknecht

ETH Zurich

Energy Aspect

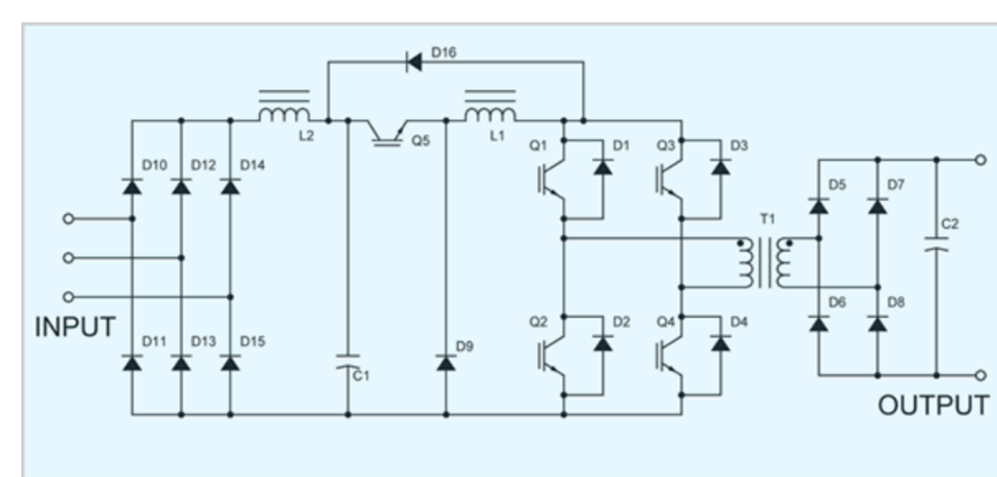
Energy Harvesting

- Solar
- Thermoelectric
- Piezoelectric



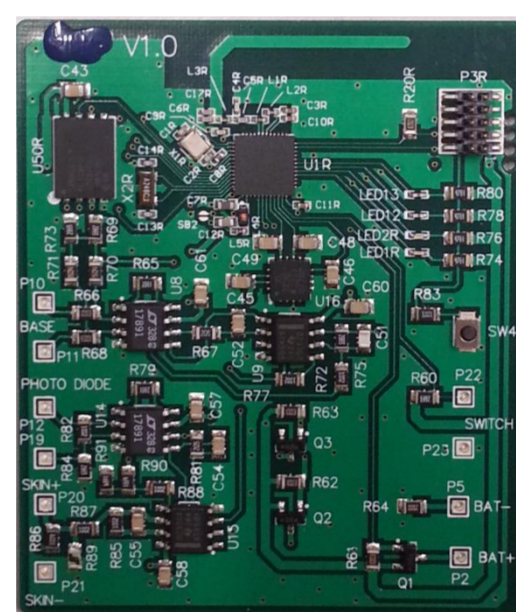
Power Conversion

- Energy harvesting profile
- Power efficiency
- Power consumption



Power efficient computation

- Algorithm energy profiling
- Power availability prediction
- Run time task management



Overview

Clinical Aspect

Diagnostics for Alzheimer's Disease in the elderly and Epilepsy in young children

Sensors

- EEG, ECG, Context

Clinical algorithms

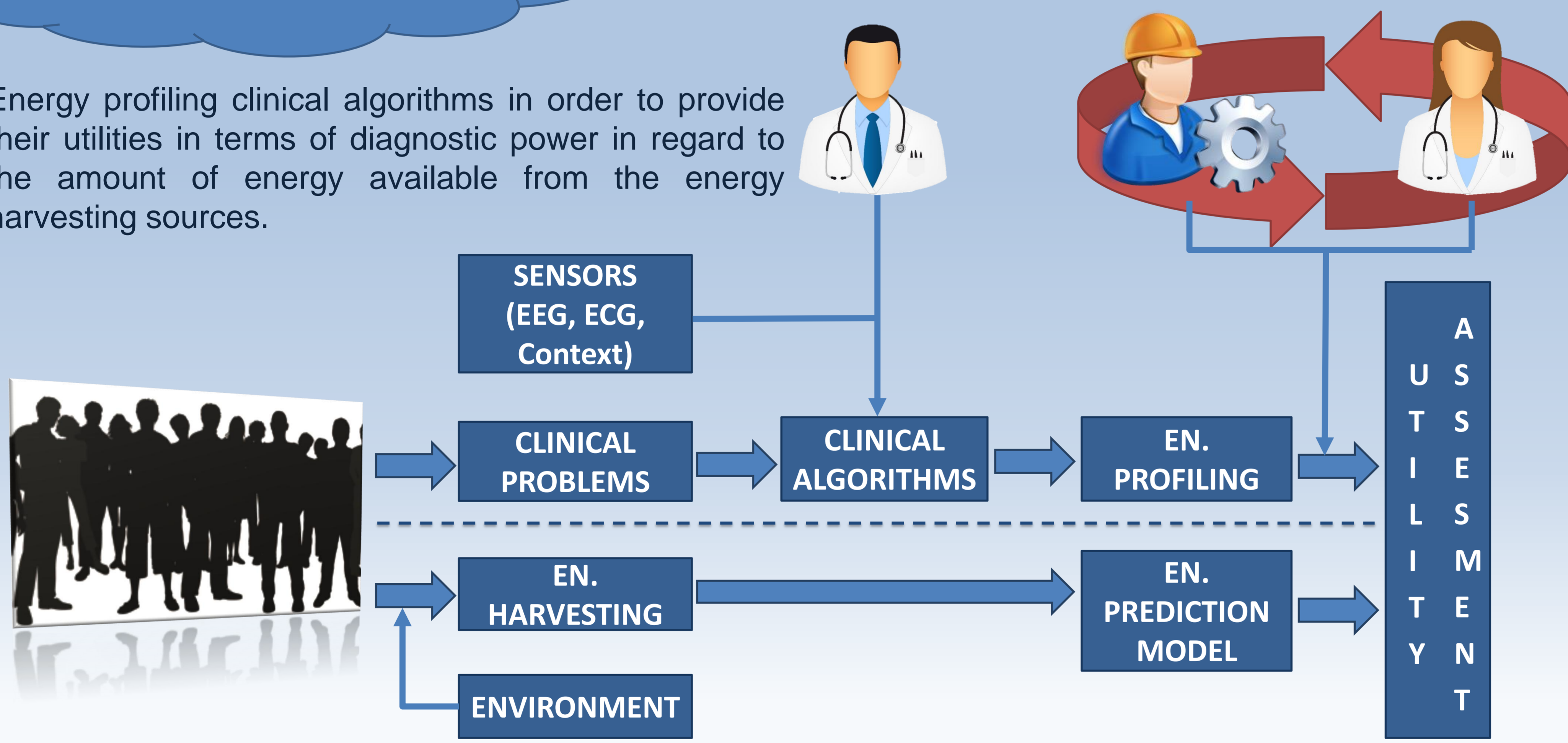
- Analysis of Brain activity
- Analysis of Affect through Heart Rate
- Analysis of the environment (activity, audio, video, location)

Algorithm characteristics

- Several different diagnosis
- Different feature extraction methods, compression
- Variation in precision, sample rate, data size

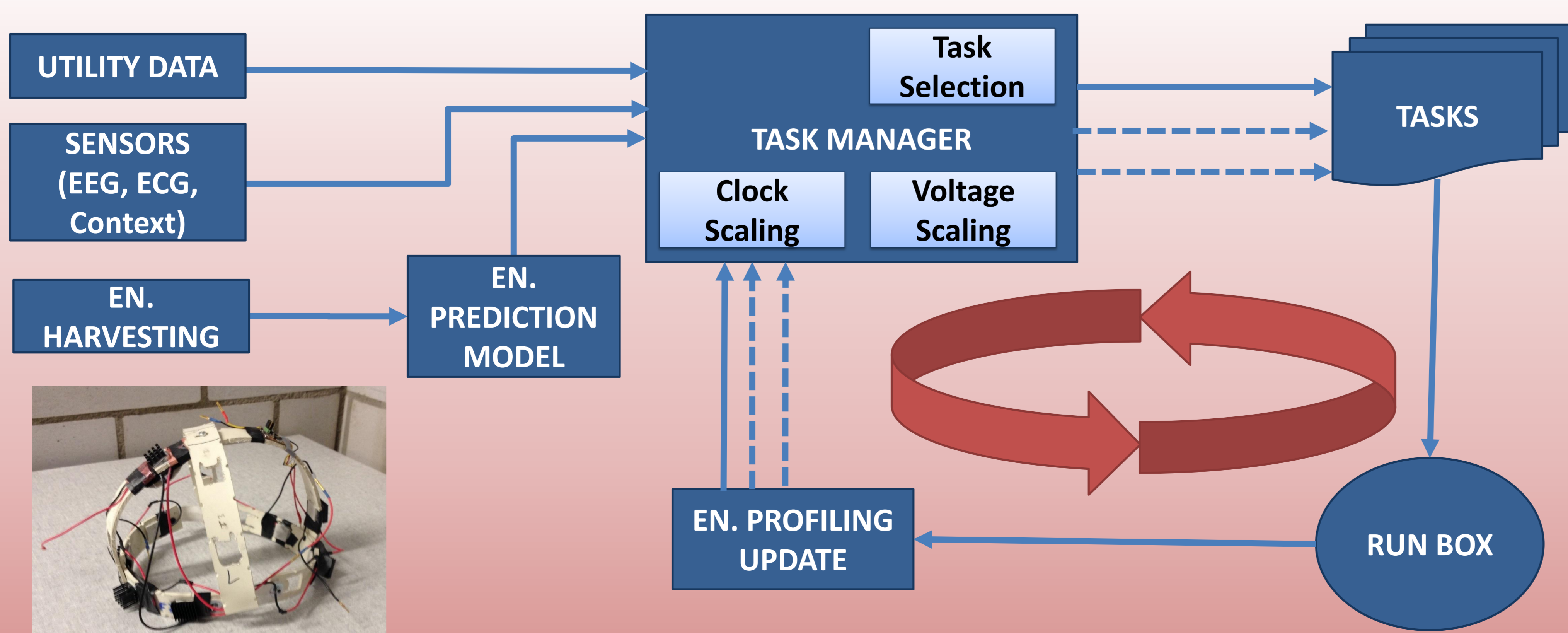
Design

Energy profiling clinical algorithms in order to provide their utilities in terms of diagnostic power in regard to the amount of energy available from the energy harvesting sources.

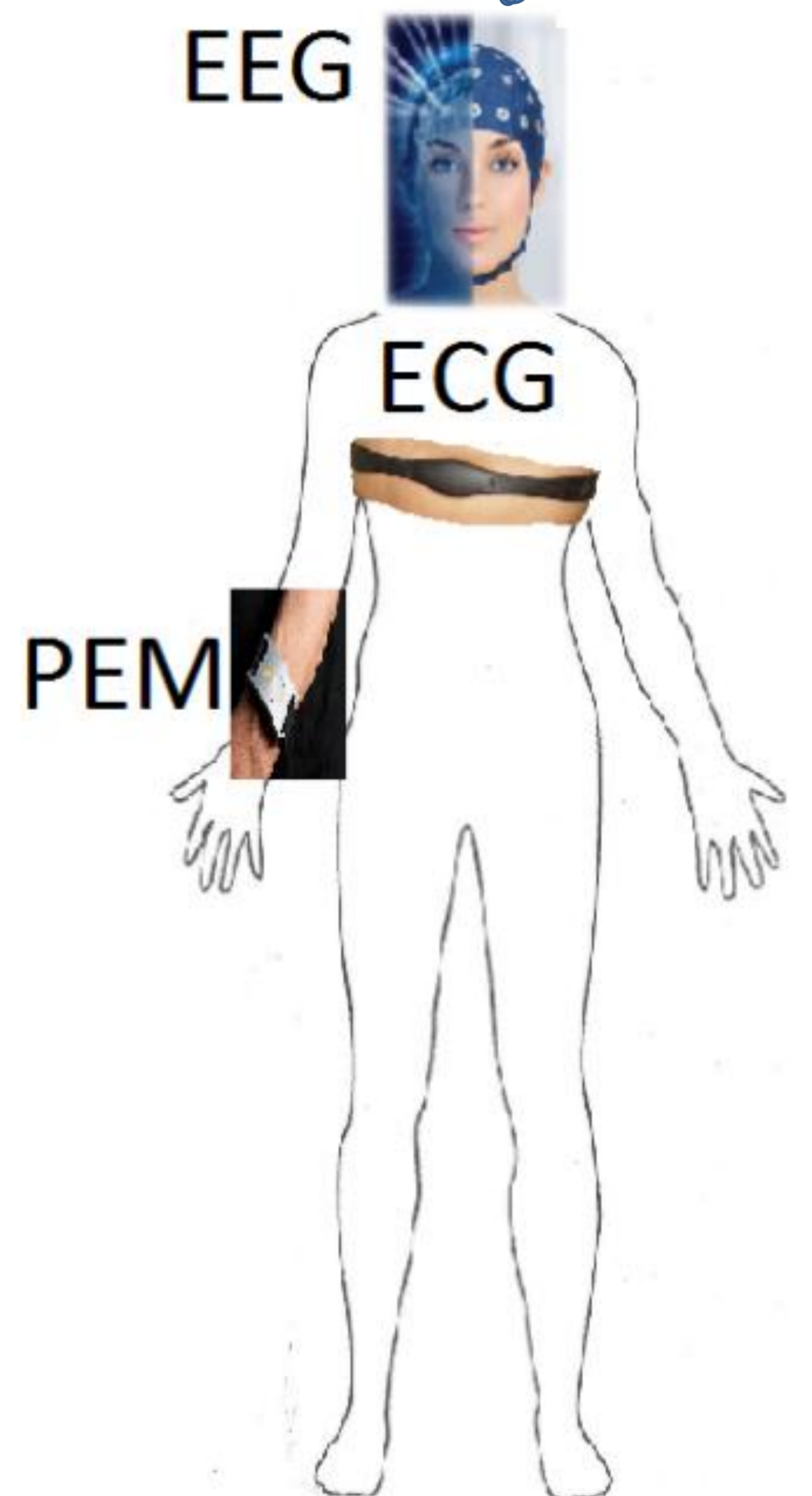


Run Time

The runtime will manage algorithm task allocation, clock speed and voltage in order to optimize the energy efficiency of the execution.



SMART Wearable sensors



This runtime represents the new approach of energy aware task allocation based on the optimal marginal utility which results in maximizing the overall utility through all selected tasks. This has been developed in parallel with understanding the requirements of the energy and the clinical aspects.