Self-supervised learning for the personalization of patient care

Summary of the postdoctoral subject

The eMOB project designs and experiments devices that measure the physical activity of individuals in sedentary situations, in order to provide healthcare professionals with tools to monitor patients affected by sedentary issues. The aim is to quantify fine motor activities by monitoring musculoskeletal behaviors. Various sensor devices are implemented to explore deep learning-based processing solutions.
As part of this project, a study on the mobility of patients suffering from comorbidities is conducted. The objective of the study is to monitor patient mobility using accelerometers to detect early and individualized signs of potential health deterioration.

The postdoctoral subject focuses on classifying 20 different physical movements (e.g., sitting, raising an arm, standing up, etc.) of individuals wearing the sensors. Five-minute experiments were conducted at the University Hospital (CHU), during which healthy individuals followed a scenario capturing all the labels to be predicted. For some data, a skeleton video is also available to precisely label the time series. However, this association process is too time-consuming to be applied to a large dataset.

The postdoc will be responsible for structuring and ingesting the collected data and developing human activity recognition (HAR) models. The goal of the postdoctoral work is to use self-supervised learning algorithms to automatically detect the labels. The results can then be automatically linked to the video to verify their validity. The implementation of domain adaptation techniques is also planned, as the number of individuals for the experiment remains small. Once validated, the model will be transferred to embedded devices to enable simple patient monitoring. The next step will be to implement these models in a distributed way across the sensor network between the devices worn by the patient and the cloud. Computational resources will be adjusted to create the most energy-efficient system for monitoring activity in the most prolonged and relevant manner possible.

Required Profile and Skills:

- PhD in computer science and data analysis, particularly deep learning
- French language notions
- Autonomy, ability to work in a team, interest in the applied health domain

Localization:

The subject is a collaboration between the CHU of Clermont-Ferrand, the LPC et the LIMOS. The work is located in the LPC at Montluçon.

Practical information:

- Duration : 18 month
- Desired starting date : January 2025
- Contacts :
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