



OO/UC3M/36- AUTOMATIZATION TECHNIQUES FOR PROCESSING BIOMEDICAL SIGNALS USING MACHINE LEARNING METHODS

The Signal Processing Group (Department of Signal Theory and Communications, University Carlos III, Madrid, Spain) offers the expertise of its members in the automatic processing of biomedical signals. The main advantages in this technology are the decreased cost, the time saved and the increased reliability of the results. Technical cooperation for the research and development with internal and external funding is sought.

Description and special features
<p>Machine learning methods, in which the group is specialised, allow the processing of data both for regression and detection/classification applications.</p> <p>In the first case, the goal can be to recover (i.e. estimate) some missing data, filtering or smoothing signals corrupted by noise, the separation of the desired signal or signals from the interfering ones, or the extraction of the relevant information from the observations. Examples of this case are the automatic separation of the heartbeat of the fetus from that of the mother in an electrocardiogram (ECG), or the removal of interference and noise from an electroencephalogram (EEG) or a biomedical image (e.g. radiography, angiography or tomographic image).</p> <p>In the second case, the goal can be the detection of strange phenomena or bodies in the signals, or their classification according to some prefixed or learned criterion. Examples of this case are the construction of an automatic detector (or even predictor) of epileptic seizures from a multichannel EEG signal, the development of a monitoring system for the automatic detection of ventricular arrhythmias in cardiac patients, or the programming of an interactive application for bacillus labelling from images of biological cultures for automatic patient diagnosis.</p> <p>In any case, the tools used in both cases belong, as it has already been mentioned, to the area known as machine learning methods: neural networks, support vector machines (SVMs), Gaussian processes (GP), etc. In general, these methods try to build, usually from labelled examples by an expert in the field, a machine (software or hardware) that extracts all the relevant information from the available samples. Once that machine has been trained, it will be able to generalize well for new unlabelled examples, providing right labels for them (e.g. the presence or not of an arrhythmia or an epileptic seizure).</p> <p>The members of the group are experts in machine learning techniques, and have an ample experience in dealing with biomedical signals, both in the case of one-dimensional multi-channel signals (e.g. ECG or EEG), and in the case of multidimensional signals (images).</p>

Innovative aspects
<p>Regarding automatic processing of biomedical signals, there are many examples of the application of machine learning techniques. Nevertheless, there are still many areas where they have not been applied. Besides, this is a very dynamic field, with new more sophisticated methods constantly appearing.</p> <p>The difference is given by the ample experience of the members of the group in the development and validation of algorithms, endorsed by the participation in many research projects and industrial contracts, as well as the multiple publications in international conferences and journals.</p>

Competitive advantages
<p>Regarding automatic processing of biomedical signals, there are many examples of the application of machine learning techniques. Nevertheless, there are still many areas where they have not been applied. Besides, this is a very dynamic field, with new more sophisticated methods constantly appearing.</p>



Universidad
Carlos III de Madrid

Competitive advantages

The difference is given by the ample experience of the members of the group in the development and validation of algorithms, endorsed by the participation in many research projects and industrial contracts, as well as the multiple publications in international conferences and journals.

Technology Keywords

Image, image processing, model recognition; Signal processing; Medical technology; Biomedical engineering.

Contact Person: María Dolores García-Plaza

Phone: + 34 916249016

E-mail: comercializacion@pcf.uc3m.es