Multi-parametric Data Analysis and Use in Clinical Practice

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Nowadays a large number of medical tests are available in order to identify the majority of diseases in individuals and help practitioners to determine the required course of action. Moreover, new tests with increased specificity and sensitivity ratios are entering clinical practice.

In most cases, for the extraction of accurate diagnosis, a combination of two or more medical tests is required and several studies exist for the evaluation of combined indexes in the diagnostic process.

In a general prediction framework, a large number of currently adopted tests can be performed on patients and the results of their combined prediction value can be analyzed using generic computational procedures. In this way, extraction of the most useful combination in terms of sensitivity and specificity can be performed and provide a hierarchical classification of different types of combined tests. This approach can result in the creation of multi-parametric subsets, which can be used taking into account additional factors like availability, cost and reliability.

The increased computational power offered by modern systems in combination with current feature extraction and classification algorithms allow the use of such systems in such multi-parametric spaces like the ones discussed above. As a demonstration of this procedure the well known from the area of unsupervised classification applications, k-means algorithm was adopted for the trial of different multi-parametric subsets and the estimation of both sensitivity and specificity for every subset. This approach led to a significant reduction in space dimensionality for given degrees of sensitivity and specificity.