BAYESIAN AND ARTIFICIAL NEURAL NETWORKS ALGORITHMS AT MYOCARDIAL PERFUSION IMAGING

Vieira D.[1], Nogueira F.[1], Metello, L.F.[1];

1. Dep.of Nuclear Medicine, High Institute for Allied Health Technologies of Porto, Polytechnic Institute Porto, Vila Nova de Gaia, Portugal.

Introduction: One major focus of data mining process - especially Machine Learning researches - relates to automatically learn to recognize complex patterns and help to take the adequate decisions strictly based on the acquired data. In a preliminary study, advantages on Computerized Analysis of data over Human Analysis in MPI - Myocardial Perfusion Imaging context were identified (shorter time, homogeneity and consistency, automatic recording of analysis results, relatively inexpensive, etc), especially when considering the use of Naïve Bayes algorithm.

Objectives: This study pretended to compare and evaluate the efficacy of BN - Bayesian Networks and ANN - Artificial Neural Networks when applied to MPI Stress studies and the process of decision taking about the continuation - or not - of the assessment of each patient. According with the first part of the study, it has been pursued has an objective to automatically classify each of the patients MPI in one of three groups: “Positive” (directly concluding with the study continuation, to the Rest part of the test) “Negative” (directly exempting the patient from continuation) and “Indeterminate” (requiring the clinician analysis and final decision). Methods:WEKA v3.6.4 open source software was used to produce a comparative analysis of four WEKA algorithms (“Naïve Bayes”, “BayesNet-K2”, “BayesNet-TAN” and “ANN - Multilayer Perceptron”) - on a retrospective study using the comparison with correspondent clinical results as reference, signed by nuclear cardiologist experts - on “SPECT Heart Dataset”, available on University of California - Irvine, at the Machine Learning Repository. For evaluation purposes, criteria as “Precision”, “Incorrectly Classified Instances” and “Receiver Operating Characteristics (ROC) Areas” were once again considered.

Results: The interpretation of the data suggests that the ANN - Multilayer Perceptron algorithm possess the best performance among the four selected algorithms.

Conclusions: The findings seems to support that BN and especially ANN machine learning algorithms could significantly assist, at least in an intermediary level, on the analysis of the scintigraphic data obtained on MPI, in terms of economy of Nuclear Cardiologists’ time and effort, as well as increasing workflow fluidity at Technologist’s level, due to reducing time, while also increasing comfort to the patients directly involved.In the expected continuation of this study, it is planned to analyze the chosen ANN algorithm in more detailed parameters (pretending to obtain improvements on system accuracy) and also implement this methodology in medical imaging software in order to test it in real medical practice.

Foi decidido que não será apresentada a versão integral deste documento.

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