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# A Soft Computing Approach to Acute Coronary Syndrome Risk Evaluation

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**Abstract**

Acute Coronary Syndrome (ACS) is transversal to a broad and heterogeneous set of human beings, and assumed as a serious diagnosis and risk stratification problem. Although one may be faced with or had at his disposition different tools as biomarkers for the diagnosis and prognosis of ACS, they have to be previously evaluated and validated in different scenarios and patient cohorts. Besides ensuring that a diagnosis is correct, attention should also be directed to ensure that therapies are either correctly or safely applied. Indeed, this work will focus on the development of a diagnosis decision support system in terms of its knowledge representation and reasoning mechanisms, given here in terms of a formal framework based on Logic Programming, complemented with a problem solving methodology to computing anchored on Artificial Neural Networks. On the one hand it caters for the evaluation of ACS predisposing risk and the respective Degree-of-Confidence that one has on such a happening. On the other hand it may be seen as a major development on the Multi-Value Logics to understand things and ones behavior. Undeniably, the proposed model allows for an improvement of the diagnosis process, classifying properly the patients that presented the pathology (sensitivity ranging from 89.7% to 90.9%) as well as classifying the absence of ACS (specificity ranging from 88.4% to 90.2%).

**Keywords:** Artificial neuronal networks; Acute coronary syndrome; Acute myocardial infarction; Cardiovascular disease risk assessment; Knowledge representation and reasoning; Logic programming

## Abbreviations

ACS: Acute Coronary Syndrome; AMI: Acute Myocardial Infarction; ANNs: Artificial Neural Networks; AUC: Area Under the Curve; BMI: Body Mass Index; CK-MB: Creatine Kinase MB; cTnI: cardiac Troponin I; DoC: Degree-of-Confidence; ECG: Electrocardiogram; ELP: Extended Logic Program; FN: False Negative; FP: False Positive; HESE: Hospital do Espírito Santo de Évora; HRP: Horseradish Peroxidase; LP: Logic Programming; LSH: Life Style Habits; NPV: Negative Predictive Value; NSTE: Non-ST-segment Elevation; NSTEMI: Non-ST-segment Elevation Myocardial Infarction; PPV: Positive Predictive Value; QoI: Quality-of-Information; RCM: Related Clinic Manifestations; ROC: Receiver Operating Characteristic; STE: ST-segment Elevation; STEMI-ST: segment Elevation Myocardial Infarction; TN: True Negative; TP: True Positive




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