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+1 (929) 224-5068

TITLE: MACHINE LEARNING IN MYOCARDIAL INFARCTION CLASSIFICATION USING SIGNAL DETECTION OF ST-SEGMENT ELEVATION ON ELECTROCARDIOGRAM AND CLINICAL DATA.

Name: Diandro Marinho Mota
Affiliation: Cardiologist at Dante Pazzanese Institute of Cardiology; Medical Director at Neomed
Country: Brazil
Email ID: diandro@neomed.tech

ABSTRACT

Cardiovascular diseases (CVDs) are the main cause of death in the world throughout the century. Despite advances in prevention, diagnosis, and treatment observed in recent decades, the global burden of CVD remains alarming. The incorporation of new technologies such as artificial intelligence (AI) emerges as a promising strategy in this field. However, there is still a need to increase confidence in AI models, especially Machine Learning (ML) models. In this context, some studies with signal processing already present high precision in the detection of cardiac anomalies, but without the high capacity to confirm the diagnosis of diseases, as they do not use clinical variables, such as Acute Myocardial Infarction (AMI). The aim of the present study was to develop an ML model, using clinical variables and processing mechanisms to detect ST-elevation myocardial infarction (STEMI) with high sensitivity compared to medical reports. The features used to train the models were age, presence of a pacemaker, symptoms such as breathlessness, chest pain, and comorbidities such as diabetes, dyslipidemia, arrhythmias, sedentary lifestyle, overweight, and smoking. The study sample consisted of 12,039 patients with and without myocardial infarction. A 2:1 resampling was performed in cases without AMI for cases with AMI. Logistic Regression, Random Forest, and Adaboost models were hyper-parameterized and trained with 5-fold Cross-Validation. The most important variables for the prediction of AMI were age, the extraction of SST on ECG, breathlessness, and chest pain. The best model for the problem was an LR with the best limit obtained with 97% sensitivity and 31% specificity, and the three models achieved an AUC-ROC of 0.80, resulting in great models for case screening. We conclude that ML models combining data from clinical analysis and complementary exams (ECGs) can be included in the arsenal of predictive methods for screening STEMI, making the algorithms more efficient.

Diandro Mota has completed his PHD at the age of 37 years from University of São Paulo, Brazil. He is the medical director of Neomed Healthtech and works as an assistant cardiologist at the Cardiovascular Emergency Department of Dante Pazzanese Institute of Cardiology, Brazil.

Presenter Name: Diandro Marinho Mota
Mode of Presentation: Oral/Poster.
Contact number: +55 11 99142-9119