

ABSTRACT

LIMA, Allan Danilo de. *Detection of respiratory changes in sarcoidosis by forced oscillation technique and machine learning algorithms*. 111 f. Dissertação (Mestrado em Engenharia Eletrônica) - Faculdade de Engenharia, Universidade do Estado do Rio de Janeiro (UERJ), Rio de Janeiro, 2020.

In this work, many machine learning classifiers are developed to assist the diagnosis of respiratory changes associated to sarcoidosis, based on results from the Forced Oscillation Technique (FOT), which is a non-invasive method used to assess pulmonary mechanics. In addition to accurate results, there is a special interest in their interpretability, so several forms of Genetic Programming are used since the classification is made with intelligible expressions. Its traditional tree form, grammar-based form, and also quantum-inspired linear (QILGP) are used. To check if interpretable results are competitive, they are compared to performance with K-Nearest Neighbors, Support Vector Machine, AdaBoost, Random Forest, LightGBM, XGBoost, and Logistic Regressor. To bring even more interpretability, the experiments are also performed with fuzzy features. The use of a feature selection technique and a synthetic oversampling technique is also tested. Besides using QILGP directly for classification, it is also tested to use it to build features to be used by other methods. The data used to feed the classifiers come from the FOT exams in 72 individuals, from which 25 were healthy and 47 were diagnosed with sarcoidosis. Among the latter, it was verified by spirometry that 24 showed normal conditions and 23 showed respiratory changes. The results achieved high accuracy ($AUC \geq 0.90$) in the three analyzes performed (controls vs. individuals with sarcoidosis, controls vs. individuals with sarcoidosis and altered spirometry, and controls vs. individuals with sarcoidosis and normal spirometry).

Keywords: Sarcoidosis; Forced Oscillation Technique; FOT; Machine Learning; AUC.