

4th INTERNATIONAL CONFERENCE ON AI ML, DATA SCIENCE AND ROBOTICS

NOVEMBER 28-29 | PORTO, PORTUGAL



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A Systematic review of Machine Learning Models for Management, Prediction and Classification of ARDS

Abstract: Acute respiratory distress syndrome or ARDS is an acute, severe form of respiratory failure characterised by poor oxygenation and bilateral pulmonary infiltrates. Advancements in signal processing and machine learning have led to promising solutions for classification, event detection and predictive models in the management of ARDS. In this review, we provide systematic description of different studies in the application of Machine Learning (ML) and artificial intelligence for management, prediction, and classification of ARDS. We searched the following databases: Google Scholar, PubMed, and EBSCO from 2009 to 2023. A total of 243 studies was screened, in which, 52 studies were included for review and analysis. We integrated knowledge of previous work providing the state of art and overview of explainable decision models in machine learning and have identified areas for future research Gradient boosting is the most common and successful method utilised in 12 (23.1%) of the studies. Due to limitation of data size available, neural network and its variation is used by only 8 (15.4%) studies. Whilst all studies used cross validating technique or separated database for validation, only 1 study validated the model with clinician input. Explainability methods were presented in 15 (28.8%) of studies with the most common method is feature importance which used 14 times. In conclusion, for databases of 5000 or fewer samples, extreme gradient boosting has the highest probability of success. A large, multi-region, multi centre database is required to reduce bias and take advantage of neural network method. A framework for validating with and explaining ML model to clinicians involved in the management of ARDS would be very helpful for development and deployment of the ML model.

Keywords: crop stress sensing, early virus detection, portable spectrometer, hyperspectral sensor, multispectral sensor, remotely piloted aircraft system (RPAS)

Biography: A research student focusing on the use of machine learning and machine learning explainability in treatment and management of ARDS. R&D engineer at VentDx, developed data processing and calibration algorithms and contributed to the overall design of InspiWave, a device designed to monitor a multitude of facets around respiratory system health.