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Paper Title: Development of Symbolic Signal Processing and Transformer Models for Predicting Respiratory System Mechanics in Mechanical Ventilation

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Abstract

This paper focuses on the assessment of respiratory mechanics, i.e., compliance (C) and resistance (R) on the analysis of respiratory signals. Inspired by the growing use and success of the Transformer model in fields such as natural language processing (NLP), image recognition, and signal analysis, we have devised an innovative method that leverages automatic feature extraction via Transformers to predict C and R. While, the use of transformer in respiratory signals has not been widely used yet, we demonstrate in this paper their efficacy in extracting relevant features from respiratory signals. As Transformer require a lot of memory, we have developed a symbolic approach to process the signal, which significantly reduces the size of input data and results in a more compact model. Our experimental findings show that the proposed algorithms achieve mean absolute errors of 6.91 mL/cmH₂O and 3.01 cmH₂O.s/L when determining respiratory C and R respectively. The outcomes show the potential of the proposed method for developing a new generation of ventilation techniques that enhance the care given to specific ICU patients.
