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Replicating Human Expertise of Mechanical Ventilation Waveform Analysis in Detecting Patient-Ventilator Cycling Asynchrony Using Machine Learning

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Abstract

Background— Acute respiratory failure is one of the most common problems encountered in intensive care units (ICU) and mechanical ventilation is the mainstay of supportive therapy for such patients. A mismatch between ventilator delivery and patient demand is referred to as patient-ventilator asynchrony (PVA). An important hurdle in addressing PVA is the lack of a reliable framework for continuously and automatically monitoring the patient and detecting various types of PVA.

Methods— The problem of replicating human expertise of waveform analysis for detecting cycling asynchrony (i.e., delayed termination, premature termination, or none) was investigated in a pilot study involving 11 patients in the ICU under invasive mechanical ventilation. A machine learning framework is used to detect cycling asynchrony based on waveform analysis.