SepsiSense: A Sepsis Detection and Post-Sepsis Health Monitoring Application for Continuous Recovery Assessment

Khan, Bilal (School: Governor's School at Innovation Park)
Patel, Naman (School: Governor's School at Innovation Park)
Fianko, Belva (School: Governor's School at Innovation Park)

Sepsis is a life-threatening condition caused by an uncontrolled immune response to infection and remains a leading cause of death worldwide, affecting nearly 49 million people annually, where delayed diagnosis often stems from reliance on time-intensive laboratory tests. About 50% of survivors also develop Post-Sepsis Syndrome (PSS), a condition marked by long-term fatigue, cognitive impairment, and anxiety that is rarely supported after discharge. This study evaluates whether sepsis can be accurately detected using only vital signs and clinical data available within the first six hours of admission. De-identified ICU data from the PhysioNet 2019 dataset of over 40,000 patients were used to train and test three binary classifiers, XGBoost, Random Forest, and Extra Trees, while excluding delayed lab variables to reflect real-time clinical use. The XGBoost model achieved the strongest performance with approximately 98% accuracy and an AUROC of 0.72, within 0.1 of the PhysioNet Challenge winner despite using far fewer lab variables. A second phase expanded this work using the MIMIC-IV dataset of over 65,000 ICU patients, applying Naive Bayes and Neural Network classifiers trained on six key vital signs. To extend clinical impact beyond detection, these models are integrated into SepsiSense, a two-sided digital health platform where physicians can input patient vitals, monitor real-time sepsis risk, and receive early alerts, while patients and survivors access PSS recovery support through symptom tracking, medication reminders, and mental health check-ins. This combined approach has the potential to reduce diagnostic delays, improve patient outcomes, and lower sepsis mortality rates.

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