A non-touch approach using AI to assist nursing intermittent visual observations

Initiative Type

Technology

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Summary

In-hospital suicides are often associated with occurring in the evening and during night shifts when there is reduced staff supervision. During these times of high risk, suicides occur in isolated areas of

the ward such as bathrooms and single rooms. In this study, a prototype for a Remote Patient Monitoring System (RPM) system was developed for early detection of suicidal behaviour in a hospital based mental health facility.

- Two radio frequency identification (RFID) reader antennas and stable passive tags for data collection were used.
- The reader-antennas were installed in different positions in a research laboratory.
- Along with received signal strength indicator (TRSSI) data, the distance between reader-antennas and tags were measured as Distance_1 and Distance_2.
- Statistical correlation between the features were derived using linear regression.
- Artificial Intelligence machine learning models were used to estimate optimum positions of the reader-antennas for maximum received signal strength indicator (RSSI).
- Decision Tree, random forest and XGBoost algorythm models were implemented to predict the optimum positions.
- Ensemble machine learning approach was employed to extract weighted average of the machine learning models.

Key dates

Nov 2023

Nov 2023

Implementation sites

Metro North Mental Health, Royal Brisbane and Women's Hospital

Partnerships

University of Southern Queensland and Queensland University of Technology

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Aim

To develop a prototype for Remote Patient Monitoring (RPM) system that will allow for early detection of patients' suicidal behaviour. It will be an integrated system with an iPad that nurses already use for visual observations.

Benefits

- alterations in respiratory rates and pulse could be used to predict serious clinical events
- radio frequency identification (RFID) technology can monitor accurate vital signs

Background

Healthcare technological innovations around the world are moving towards remote monitoring for early detection of illnesses. In-hospital suicides are often associated with occurring in the evening and during night shifts when there is reduced staff supervision. The goal of inpatient psychiatric care is to provide a safe environment for both patients and staff. Alterations in respiratory rates and pulse could be used to predict serious clinical events. Radio frequency identification (RFID) technology can monitor accurate vital signs such as heart rate monitoring and respiration monitoring, among other things. Passive RFID tags do not have a battery or other internal source. Instead of a battery, they rely on the energy received from RFID reader and its antenna for power.

Solutions Implemented

The system alerts nursing staff to assess the safety of a patient, based on the change in vital signs. The research study set a path to analise dynamic moving RFID tags. Extend the research to build an RPM system that will send patient's vital signs to a handheld tablet.

Evaluation and Results

- increase in tag distance led to a decrease in RSSI value
- the Decision Tree Algorithm outperformed the ensemble learning model

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