SynaptiQ: Detection and Prevention of Hospital Induced Delirium

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Hospital-induced Delirium (HID) affects 30% of patients causing fluctuating cognitive disturbances, tripling mortality risk and costing North American healthcare systems $164 billion annually. Despite the effectiveness of the Confusion Assessment Method (CAM), 72% of cases go undetected due to sporadic testing and staff limitations. To address this, SynaptiQ was developed, the first AI-powered monitoring system for HID detection and prevention. SynaptiQ integrates predictive modeling on electronic medical records (EMR), non-contact physiological monitoring, facial micro-expression recognition for cognitive assessment, and an AI chatbot to enhance delirium screening. A Non-linear Support Vector Machine trained on MIMIC-III EMR data achieved 93.0% accuracy in predicting delirium, identifying heart and respiratory rates as key predictive factors. Using real-time computer vision with wall or bed-mounted cameras, an algorithm for non-contact measurement of heart and respiratory rate was developed, while prioritizing patient comfort, achieving root mean square errors of 2.26 beats-per-minute and 0.58 breaths-per-minute. For micro-expression recognition to detect emotional cues tied to mental state, a hybrid ResNet18 and dual Long Short-Term Memory network was built, achieving 98.3% accuracy on the SAMM dataset, the highest reported results. The model achieved 93.0% accuracy on fully independent CASME-II testing, showing model robustness. An AI chatbot was built to automate the CAM, interact with patients and provide cognitive reorientation – interventions shown to reduce risk by 50%. By shifting reactive care to proactive, SynaptiQ enables early detection, reduces risk through automated preventive strategies, and transforms delirium management through AI-driven innovation.

Awards Won: