

Implementation of Embedded System in Effective Recognition: A Study

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Abstract: *The project is focused on the strategic deployment of Affective Computing within clinical settings, establishing a smart, emotionally-aware healthcare environment through sophisticated embedded systems and machine learning (ML). The core purpose is to move beyond conventional, reactive patient care by providing continuous, non-invasive, and objective monitoring of psychological well-being, specifically targeting critical emotional states like stress and anxiety. The architecture relies on a multi-modal data fusion approach, utilizing a sensor suite including heart rate monitors and skin conductance sensors for physiological signals, and microphones and cameras for behavioural cues to capture a comprehensive profile of the patient's state. This heterogeneous data is processed locally on high-efficiency embedded devices, such as microcontrollers (Raspberry Pi or Arduino) coupled with dedicated edge AI processors. By performing feature extraction and running trained ML models directly at the edge, the system ensures real-time analysis with minimal latency and enhanced data privacy. This investigation centres on incorporating affective computing into medical environments to build intelligent, emotion-sensitive healthcare setups via advanced embedded platforms and machine learning techniques. The main goal is to advance past standard reactive patient management by offering ongoing, unobtrusive, and unbiased tracking of mental health, particularly focusing on key emotional conditions such as tension and worry. The setup employs a combined data approach, drawing from various sensors like pulse trackers and skin resistance detectors for bodily signals, alongside audio recorders and visual capture devices for conduct indicators to form a complete view of the individual's condition. This varied information is handled directly on efficient local devices, including small controllers like Raspberry Pi or Arduino paired with specialized on-site AI units. Through local feature identification and executing prepared ML algorithms at the periphery, the framework guarantees immediate evaluation with low delay and better information protection. By minimizing data transmission to external servers, this method not only enhances response times critical for timely interventions but also addresses growing concerns over patient confidentiality in digital health records. Ultimately, this system paves the way for more empathetic and personalized care, where technology anticipates emotional needs before they escalate into clinical issues.*

Keywords: Affective Computing, clinical settings, emotionally-aware healthcare, embedded systems, Continuous monitoring, Edge AI, Medical Environments, Emotion-Sensitive Care, Local Devices, Machine Learning (ML), Ongoing Tracking, Peripheral AI, Multimodal Sensors, Data Privacy, Real-Time Analysis

