

A Systematic Review on Elderly Behavior Analysis Technologies: Bridging the Gaps in Safety and Personalization

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Abstract

The increasing elderly population, particularly those living alone, faces significant challenges related to health monitoring and emergency response. Existing technologies often lack personalization and generate false alerts, hindering their effectiveness in ensuring the safety and well-being of elderly individuals. This review explores and analyzes various technologies employed for monitoring behavioral patterns in elderly individuals, focusing on smartwatch-based systems, machine learning integration, and indoor localization techniques. A systematic examination of the literature was conducted, highlighting the strengths and limitations of existing solutions. It was found that while smartwatch-based systems demonstrate promising capabilities in detecting falls and tracking health metrics, they frequently struggle with false alerts and limited contextual integration. Machine learning algorithms, although highly accurate in identifying behavioral anomalies, often rely on manually labeled data, restricting their adaptability. Furthermore, indoor localization technologies present privacy challenges that impact user acceptance. To bridge personalization and safety, this review clusters its analysis into technology-wise, software-wise, and instrumental-wise categories. The review emphasizes the need for more accurate and reliable solutions, calling for advancements in personalization, real-time contextual awareness, and enhanced privacy measures. Key findings suggest that integrating advanced AI techniques and secure data handling processes will be crucial for the future development of elderly monitoring systems.

Keywords: *AI in elderly care, Wearable technology, Neural networks, Behavioral analysis, Context-aware monitoring*