

Emotion-Aware AI Pet Companionship for Elderly Care: A Real-Time Voice System with Memory-Augmented Dialogue and Graded Care Alerts

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Abstract:

In long-term care facilities, residents typically outnumber care staff, who must prioritize the frail and unstable. Subtle declines, such as loneliness, low mood, poor sleep, and reduced appetite, often go unreported until they become serious. This paper presents an emotion-aware AI pet companion system that integrates real-time voice interaction, long-term memory, and graded care alerting in a single mobile application. Residents converse naturally with an on-screen AI pet, which also serves as the care staff's eyes and ears. The system uses a Flutter front end and a Node.js backend, the OpenAI Realtime API with WebRTC for near-real-time speech, and PostgreSQL with pgvector for retrieval-augmented long-term memory. Emotion and risk are analyzed from each conversation, producing four-level Care Alerts that are pushed to staff in real time via Telegram. A functional prototype has been implemented and validated end-to-end; preliminary measurements show an average voice round-trip latency of 3.02 seconds, with all trials below five seconds. We further define an evaluation protocol covering emotion-classification accuracy, alert miss and false-alarm rates, multilingual robustness, memory retrieval, and user satisfaction, establishing baselines for future field deployment.

Keywords:

AI Companionship, Elderly Care, Real-Time Voice Interaction, Emotion Analysis, Care Alert.