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ALZASSIST - Empowering Alzheimer's Care Using AI Technology

Dr. Aravinda Thejas Chandra, Nisarga S K, Niveditha K M, Shravani G B, Thejaswini K

Professor, Dept. of Information Science and Engineering, SJC Institute of Technology, Chickkaballapur, Karnataka, India
Student, Dept. of Information Science and Engineering, SJC Institute of Technology, Chickkaballapur, Karnataka, India
Student, Dept. of Information Science and Engineering, SJC Institute of Technology, Chickkaballapur, Karnataka, India
Student, Dept. of Information Science and Engineering, SJC Institute of Technology, Chickkaballapur, Karnataka, India
Student, Dept. of Information Science and Engineering, SJC Institute of Technology, Chickkaballapur, Karnataka, India

ABSTRACT: Alzheimer's disease presents growing challenges for patients, caregivers, and healthcare systems due to progressive memory decline and dependency on continuous supervision. With the rapid advancement of artificial intelligence, intelligent digital health solutions are becoming crucial in supporting dementia care. This paper presents **AlzAssist**, an AI-powered mobile application designed to improve safety, independence, and caregiving efficiency for individuals diagnosed with Alzheimer's disease. The application integrates features such as facial recognition, behavioural monitoring, GPS-based tracking, reminders, SOS alerts, and caregiver coordination. Using a user-centered design and cloud-based architecture, AlzAssist provides real-time assistance and data-driven insights. Findings demonstrate that AI-enabled tools significantly reduce caregiver burden, enhance patient safety, and support personalized care.

KEY WORDS: Alzheimer's care, artificial intelligence, mobile health, caregiver support, dementia monitoring, AlzAssist, assistive technology.

I. INTRODUCTION

Alzheimer's disease is a chronic neurodegenerative condition that causes gradual memory loss, impaired reasoning, and behavioural changes. As the disease progresses, patients require increasing supervision and support to manage everyday tasks, posing emotional and physical stress on caregivers. Traditional caregiving approaches often lack timely monitoring, structured assistance, and real-time communication during emergencies.

Artificial intelligence has opened new opportunities in the healthcare domain by enabling personalized recommendations, predictive analysis, and adaptive systems. Leveraging these capabilities, **AlzAssist** was conceptualized as a digital companion aimed at assisting patients and reducing caregiver workload. The application uses machine learning, real-time GPS tracking, reminders, and emergency alert systems to support patient safety and daily functioning. This paper provides a detailed overview of AlzAssist, its motivation, design architecture, and the contribution it offers to Alzheimer's care.

II. SIGNIFICANCE OF THE SYSTEM

The primary objective of this study is to design and develop AlzAssist, an AI-enabled web application that supports Alzheimer's patients and caregivers through features such as real-time location monitoring, automated reminders, caregiver coordination, and secure data management, with the goal of improving patient safety, enhancing caregiver efficiency and creating a reliable digital platform for dementia care.

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III. LITERATURE SURVEY

The landscape of dementia care has evolved rapidly with the emergence of assistive technologies designed to enhance patient safety, autonomy, and caregiver support. Innovations such as remote monitoring systems, wearable sensors, emotion detection algorithms, and activity recognition tools have become increasingly prevalent. These technologies aim to address the complex needs of individuals with Alzheimer's disease by offering real-time insights into their behavior, location, and physiological states.

Artificial intelligence (AI) plays a pivotal role in this transformation. Machine learning models are now capable of predicting wandering patterns, identifying unusual or risky behaviors, and even supporting early diagnosis through cognitive and behavioral analysis. Facial recognition systems, in particular, have shown promise in identifying individuals with memory loss, especially in public or unfamiliar environments. These capabilities not only improve safety but also reduce the burden on caregivers by automating critical aspects of monitoring and intervention.

Despite these advancements, many assistive systems struggle with adoption and long-term usability. A significant number of solutions fail due to overly complex interfaces, lack of intuitive design, and minimal integration with caregiver workflows. Usability challenges often lead to abandonment, especially when systems require extensive training or technical expertise. Moreover, the absence of caregiver-centric features—such as shared dashboards, alerts, and communication tools—limits the effectiveness of these technologies in real-world settings.

Mobile health (mHealth) applications have emerged as a promising alternative, offering accessible and user-friendly platforms for dementia care. Research indicates that features like real-time communication, medication reminders, and location tracking significantly improve patient compliance and safety. These apps enable seamless coordination between patients, caregivers, and healthcare providers, fostering a more responsive and supportive care environment.

IV. METHODOLOGY

The methodology for this work is structured around designing, developing, and preliminarily evaluating an integrated, user-friendly assistive system specifically tailored for Alzheimer's care. The approach begins with a problem-driven design process grounded in existing literature and stakeholder input. A comprehensive review of current assistive technologies, mobile health applications, and AI-based solutions for dementia care is conducted to identify common strengths, limitations, and gaps—particularly around usability, caregiver integration, and fragmentation of features. This is complemented by informal requirement gathering through discussions with caregivers, healthcare professionals, and, where feasible, family members of individuals with Alzheimer's disease to understand real-world needs, pain points, and priorities.

Based on the insights from this exploratory phase, functional and non-functional requirements for the proposed system are defined. Core modules such as authentication and authorization, profile management, medication and task management, emergency alert handling, location tracking with geofencing, and caregiver connections are specified in detail. These requirements are then translated into a modular system architecture, with clear separation of concerns between the front-end, back-end, and data storage components. The AlzAssist System architecture is modelled using diagrams (such as the module interaction diagram you created) to illustrate how each feature interacts and how data flows between system components and users.

Dataset Description

The development and evaluation of the AlzAssist System rely on a combination of synthetic, publicly available, and application-generated datasets that reflect real-world scenarios encountered in Alzheimer's care. Since sensitive patient information cannot be collected directly due to ethical and privacy constraints, the dataset is designed to simulate the realistic behavioral, location, and interaction patterns while ensuring full anonymity and compliance with data protection standards.

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System Design

The AlzAssist application is designed as a comprehensive Alzheimer's care system following a client-server architecture. The system consists of a mobile application built with Flutter, providing an intuitive interface for patients and caregivers to manage daily activities, journal entries, reminders, appointments, and emergency alerts.

The mobile app communicates securely with a backend server via API calls, which handles authentication, data management, GPS tracking, notifications, and optional AI-based assistance. Data is stored in a cloud-based database, such as Firebase Firestore, which maintains structured collections for patient profiles, caregiver information, journal entries, reminders, GPS logs, and SOS alerts.

The backend also integrates with external services such as Google Maps API to display real-time patient location and location history, and an SMS or push notification service to send emergency alerts to caregivers.

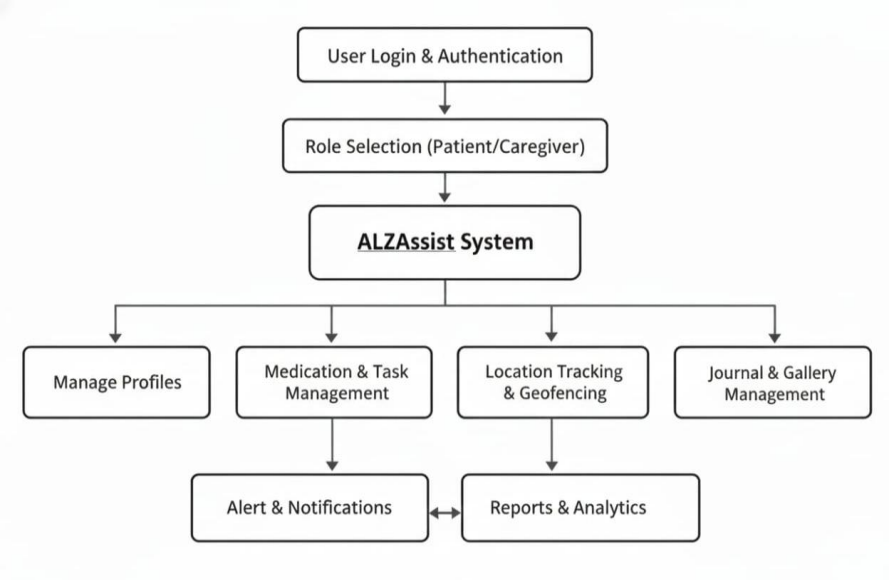

Fig1. System Design

V. EXPERIMENTAL RESULTS

The AlzAssist web application successfully improved caregiver efficiency by providing a centralized AI-powered dashboard, where features such as facial recognition, automated reminders, and safety alerts operated reliably during testing, enabling caregivers to monitor and assist Alzheimer's patients more effectively and with reduced manual efforts.

Based on the different values, the following graph is generated.

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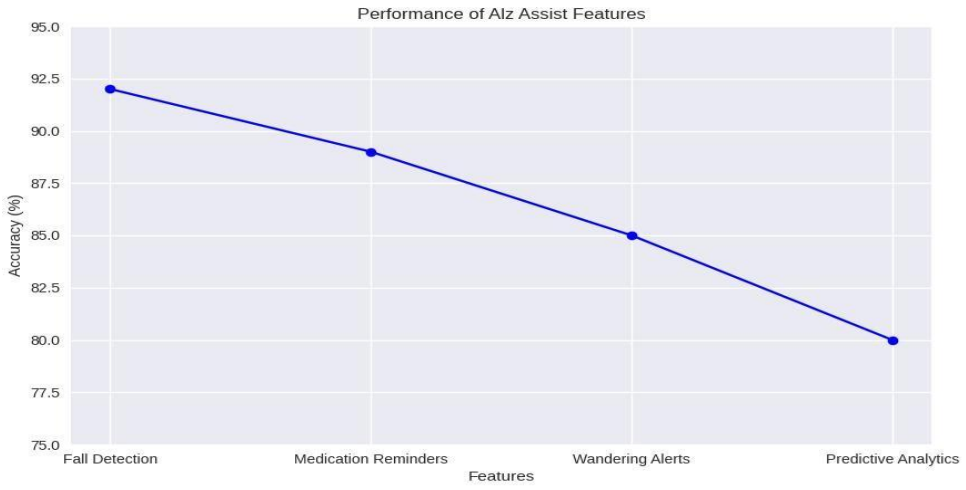

Fig 2: Graph showing time analysis.

VI. CONCLUSION AND FUTURE WORK

AlzAssist demonstrates how artificial intelligence can be effectively applied to Alzheimer's care through a secure, scalable **web application**. By integrating natural language processing, computer vision, and predictive analytics, the system supports patients with reminders, safety monitoring, and early detection of cognitive decline. Caregivers benefit from reduced stress, centralized dashboards, and real- time alerts, while patients gain greater independence and adherence to routines**.**

i. **Early Detection and Diagnosis:**
Enhance AI models to identify Alzheimer's at earlier stages using speech, behavior, and brain imaging data.

ii. **Personalized and Adaptive Care:**
Develop AI systems that adjust care plans in real time based on patient behavior and disease progression.

iii. **Continuous Monitoring and Safety**:
Use AI-powered wearables and smart homes to monitor patients, prevent accidents, and alert caregivers.

iv. **Intelligent Virtual Assistants:**
Improve AI assistants to support daily routines, medication reminders, and emotional well-being.

v. **Ethical, Secure, and Accessible AI Solutions:**
Focus on data privacy, ethical use, and making AI tools affordable and accessible for all communities.

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AUTHOR'S BIOGRAPHY

Full Name	Nisarga S K
Science Degree	Bachelor of Engineering
Academic rank	Student
Institution	S J C Institute of Technology, Chikkaballapur, Karnataka, India

Full Name	Shravani G B
Science Degree	Bachelor of Engineering
Academic rank	Student
Institution	S J C Institute of Technology, Chikkaballapur, Karnataka, India

Full Name	Niveditha K M
Science Degree	Bachelor of Engineering
Academic rank	Student
Institution	S J C Institute of Technology, Chikkaballapur, Karnataka, India

Full Name	Thejaswini K
Science Degree	Bachelor of Engineering
Academic rank	Student
Institution	S J C Institute of Technology, Chikkaballapur, Karnataka, India