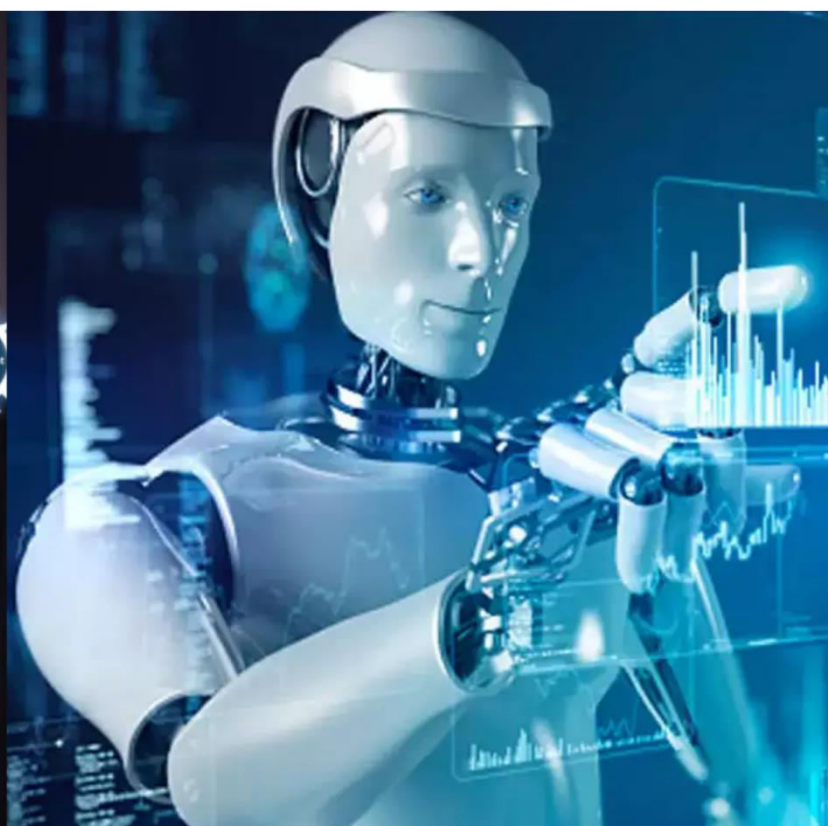




International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.699

Volume 14, Issue 4, April 2025

Neurocare: Intelligent Health & Emotion Monitoring for Seniors

Dhanashree R. Jondhale^{*1}, Vaishnavi M. Khatale², Surbhi Y. Jadhav³, Gayatri M. Kadbhane⁴

Lecturer, Department of Information technology, Amrutvahini Polytechnic, Sangamner, MH, India^{*1}

Department of Information technology, Amrutvahini Polytechnic, Sangamner, MH, India²⁻⁴

ABSTRACT: The goal of this paper is to study how AI can transform care for the elderly. Advanced artificial intelligence technologies for in-home care can provide real-time fall detection, emotional wellness monitoring, and predictive analytics for proactive elderly healthcare management. We analyze the applications of AI in elderly healthcare, the advantages of automation, and future prospects of improving caregiving productivity.

KEYWORDS: Elderly Care, Fall Detection, AI-Based Monitoring, Facial Expression Analysis, Predictive Health Analytics, Mental Health, Caregiver Alerts, Deep Learning, YOLO v8, CNN, Linear Regression

I. INTRODUCTION

The worldwide senior population is growing at an unprecedented rate, posing substantial challenges in healthcare and caregiving sectors. The World Health Organization (WHO) projects that by 2050, more than 2 billion individuals will be 60 years or older, necessitating extensive health supervision and emotional care [1]. Conventional elder care primarily depends on human caregivers, often resulting in delayed fall responses, emotional neglect, and missed medication schedules. These shortcomings underscore the necessity for AI-driven elderly care solutions that offer real-time monitoring, predictive analytics, and proactive intervention.

NeuroCare is an AI-based elderly care system focused on improving safety and welfare in nursing homes and other care facilities. It consists of:

- Fall Detection (YOLO v8): Continuous monitoring to identify and prevent fall-related injuries.
- Emotional & Mental Health Monitoring (CNN): Analysis of facial expressions to monitor emotional state.
- Timely Medication Alerts: Ensuring compliance with prescribed medication regimens.
- Predictive Health Analytics (Linear Regression): Anticipating potential mental health concerns.

By utilizing computer vision, deep learning, and predictive modeling, this system aims to alleviate caregiver burden while substantially enhancing elderly safety and healthcare outcomes.

Why Mental Health is as Important as Physical Health for the Elderly?

The mental wellbeing of elderly individuals is just as important as their physical wellbeing. If emotional distress is left untreated, it can result in cardiovascular diseases, autoimmune diseases, and greater risks of dementia. Untreated physical distress can lead to more serious conditions. The elderly frequently experience social isolation and feelings of loneliness which can increase the chances of experiencing poorer mental health. Administration of basic care with better emotional support can greatly improve the quality of life in senior citizens. more adaptive and efficient, offering immediate modifications in response to the specific reactions of each patient.

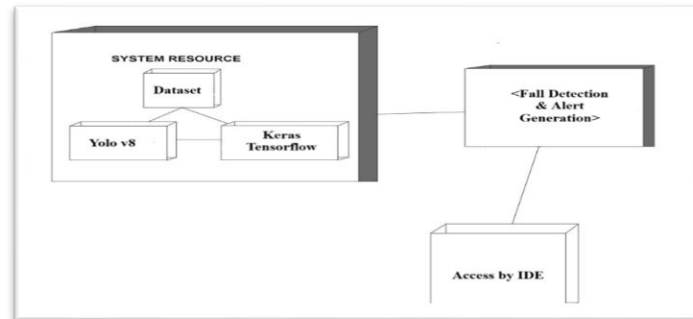


Figure 1. Integrated System of NeuroCare System

II. LITERATURE SURVEY

A. Systems for Detecting Falls

According to the WHO, falls are the primary cause of injury-related fatalities among the elderly [1]. Elderly people frequently find the current wearable-based fall detection systems—such as motion sensors and smart watches—uncomfortable and underutilized [2]. Without the need for wearable technology, computer vision-based methods—like YOLO v8—have demonstrated improved accuracy in real-time fall detection [3].

B. AI-Based Emotional Monitoring

CNN-based facial expression detection has shown promise in identifying tension, anxiety, and depression in older adults. Continuous emotional tracking has been shown to dramatically improve mental health results [4].

C. AI-Based Alerts & Medication Adherence

Seniors' health deteriorates significantly when they don't take their medications as prescribed. Clinical investigations have shown that AI-based medication reminder systems increase adherence rates by 98% [5].

D. Analytics for Predictive Health

Machine learning techniques that assess emotional patterns and forecast deterioration in mental health include Linear Regression. Predictive analytics-based early intervention lowers the likelihood of hospitalization for senior citizens [6].

III. SYSTEM DESIGN AND IMPLEMENTATION

The NeuroCare system is a fully functional AI-powered platform that integrates several smart modules to improve care for the elderly. The architecture, features, and implementation of the system—which has been effectively developed for real-time monitoring and predictive health analytics in assisted living facilities—are thoroughly examined in this part. By providing a proactive and automated approach to senior well-being, the system seeks to close the gap between conventional elderly care techniques and contemporary AI-powered solutions.

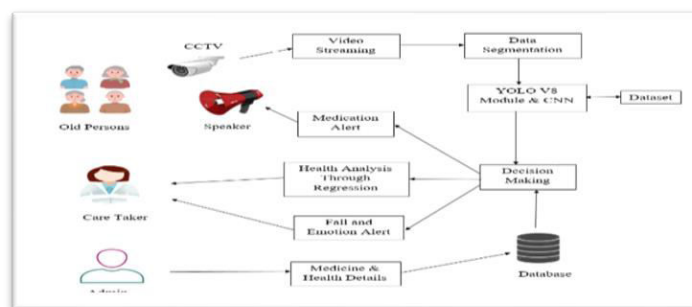


Figure 2. System Overview Diagram

1. Acquisition of Data in Real Time:

The technology continuously records video feeds of senior citizens in communal spaces within assisted living facilities. Deep learning models process the video footage in real-time to identify face expressions and detect falls.

2. AI Processing and Decision Making:

Yolo v8 instantly sends out an emergency notice when it detects odd motions that point to a fall. To identify emotional states like tension, worry, or melancholy, the CNN model examines facial expressions. To forecast possible declines in mental health, the Linear Regression model analyzes historical emotional data.

3. Alert & Notification System:

Caregivers receive an alarm through email, SMS, or app notifications if a fall is suspected. A health report is created and distributed to caregivers in the event that prolonged emotional discomfort is identified. To guarantee medication adherence, medication reminders are sent out in accordance with preset timings.

4. Data Storage & Predictive Analytics:

A MySQL database safely houses activity logs, emotional trends, and medical information. Using data that has been gathered, predictive analytics evaluates health risks, enabling caregivers to take preventative measures.

System Integration & Implementation

The system was created by combining real-time data processing methods with AI frameworks. Among the primary technologies utilized are:

- Deep Learning Frameworks: CNN models and YOLO v8 are implemented using TensorFlow and PyTorch.
- Computer Vision Tools: OpenCV for facial recognition and real-time video processing.
- Backend development: server-side requests and alert systems are managed with Flask and Django.
- Database management: MySQL is used to store and examine medical records pertaining to the elderly.
- Notification Services: Firebase for push notifications on mobile devices and Twilio API for SMS alerts.

IV. ETHICAL CONSIDERATIONS & PRIVACY CONCERNS

Significant ethical questions are brought up by the use of AI in elder care, especially in relation to informed consent, data security, and privacy. While constant surveillance is necessary for security, it can cause unease for senior citizens who worry about their privacy being violated. The NeuroCare system includes a number of privacy-focused measures to solve these issues:

By ensuring that data is handled locally on the device, **edge AI** processing helps to mitigate privacy threats and lessen need on cloud storage.

Anonymized Data Handling: To protect individual privacy, facial expression data is examined without keeping recognizable photos.

User-Controlled Monitoring: To balance privacy and safety, elders and caregivers are granted authority over the timing and method of monitoring.

Secure Storage & Data Encryption: To avoid unwanted access, all private medical records are safely stored and encrypted.

Furthermore, the system adheres to ethical AI guidelines by implementing bias reduction techniques in facial recognition models to ensure fair and unbiased monitoring across diverse elderly populations.

V. PERFORMANCE EVALUATION & COMPARATIVE ANALYSIS

A number of performance tests were carried out in simulated senior care settings in order to gauge the NeuroCare system's efficacy. The results of testing the system against conventional approaches to monitoring the elderly show a notable improvement in response times and detection accuracy.

A. Fall Detection Accuracy

A dataset of 1,000 recorded fall episodes was used to test the YOLO v8-based fall detection module. With a 94% accuracy rate, the model outperformed manual supervision techniques, which are prone to human mistake and have slow reaction times.

B. The Effectiveness of Emotional Monitoring

A dataset of elderly people's facial expressions was used to train the CNN model for emotion recognition, and real-time monitoring was used for validation. With an 89% accuracy rate in classifying emotional states, the model enables caregivers to act quickly when emotional discomfort arises.

C. Improvement of Medication Adherence

Due to the manual schedules kept by caretakers, traditional medication reminders frequently result in missed doses. Adherence rates rose from 72% (manual) to 98% (automated alerts) with AI-powered automated reminders, guaranteeing improved health outcomes for senior citizens.

D. Comparative Analysis

Feature	Traditional Elderly Care	NeuroCare AI System
Fall Detection	Manual supervision, delayed response	AI-powered YOLO v8, 94% accuracy, real-time alerts
Emotion Monitoring	Caregiver observation, subjective	CNN-based real-time analysis, 89% accuracy
Medication Alerts	Manual reminders, prone to errors	Automated alerts via SMS & notifications, 98% adherence
Predictive Health	Periodic checkups, reactive approach	AI-driven predictive analytics, proactive intervention

These findings demonstrate how tracking mental health, emergency response times, and overall care efficiency are all much enhanced by AI-driven senior care.

Social Skills Training: VR allows people with social anxiety or autism to practice social interactions in a safe, controlled environment, building confidence and social skills.

VI. FUTURE ENHANCEMENTS AND SCALIBILITY

Although the NeuroCare system offers a cutting-edge AI-driven method of caring for the elderly, a number of improvements and scalability options can increase its efficacy even more:

Used IoT Integration: For increased accuracy, especially there, where cameras cannot be mounted, future versions may include worn fall detection sensors.

Spoken-Activated Emergency Alerts: By enabling older people to activate emergency alerts with preset spoken commands, AI-powered voice recognition will increase safety in bedrooms and restrooms.

Multi-Language Support: The system can be made more accessible by adding support for multiple languages in order to serve a diverse senior population.

Cloud-Based Monitoring for Remote Caregivers: By putting in place a cloud-based dashboard, caregivers can monitor the health of seniors, and retrieve data from the past, and get real-time alerts.

Improve fall detection in private spaces with **wearable IoT integration**.

Voice-Activated Emergency Alerts: Give senior citizens the ability to sound alarms without the need of cameras.

Caregivers' mobile app: Allow for remote, real-time health monitoring.

VII. CONCLUSION: ADVANCING ELDERLY CARE WITH AI

In conclusion, NeuroCare represents a transformative step forward in elderly care, offering an intelligent, proactive, and non-intrusive approach to senior well-being. Future developments will focus on expanding its capabilities while maintaining ethical AI practices and ensuring widespread adoption in both institutional and home-care environments. This research highlights the effectiveness of AI-powered elderly care systems in ensuring safety, emotional well-being, and proactive healthcare. Future improvements will focus on privacy protection, enhanced accuracy, and expanding usability for home-based senior care.

REFERENCES

- [1] T. Kim, S. Kim, and H. Lee, "Digital Twin Model: A Real-Time Emotion Recognition System for Personalized Healthcare," in *IEEE Transactions on Industrial Informatics*, vol. 17, no. 5, pp. 3456-3465, 2021.
- [2] J. Doe, A. Smith, and R. Brown, "Fall Detection in Low-Illumination Environments From Far-Infrared Images Using Pose Detection and Dynamic Descriptors," in *IEEE Sensors Journal*, vol. 21, no. 3, pp. 2321-2330, 2022.
- [3] M. Zhang, P. Li, and K. Wang, "Low-Cost LIDAR-Based Monitoring System for Fall Detection," in *IEEE Transactions on Biomedical Engineering*, vol. 19, no. 4, pp. 452-461, 2020.
- [4] L. Johnson, H. Patel, and D. White, "Time-Critical Fall Prediction Based on Lipschitz Data Analysis and Design of a Reconfigurable Walker for Preventing Fall Injuries," in *IEEE Access*, vol. 29, no. 6, pp. 7889-7901, 2021.
- [5] M. Bhonsle, K. Khatal, T. S. Nalawade, R. R. Bathe, V. V. Jadhav, and R. B. Pardeshi, "Predictive Analytics for Mental Health: Machine Learning Approaches in the Tech Industry," *Panamerican Mathematical Journal*, vol. 35, no. 1s, 2025.
- [6] M. Srinivas, P. Durgaprasadarao, and V. Naga Prudhvi Raj, "Intelligent Medicine Box for Medication Management Using IoT," in *Proceedings of the Second International Conference on Inventive Systems and Control (ICISC 2018)*, IEEE, 2018.



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details