

An AI-Enabled Smart Healthcare Framework AgeWell360 for Elderly Monitoring, Medication Management, and Medical Document Interpretation

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ABSTRACT

The rapidly increasing elderly population has created a significant demand for intelligent healthcare solutions that promote safety, continuous health monitoring, and independent living. Conventional elderly healthcare systems often rely on manual intervention and lack comprehensive real-time monitoring, personalized assistance, and effective emergency response mechanisms. To address these challenges, this paper proposes **AgeWell360**, an Artificial Intelligence (AI)-enabled healthcare platform designed to enhance the quality of elderly care through an integrated and user-centric approach. The proposed system incorporates multiple intelligent features, including Optical Character Recognition (OCR)-based prescription digitization, AI-driven medical report interpretation using simplified language, automated medication reminders, a caregiver monitoring dashboard, and emergency alert support. The system leverages advanced technologies such as Tesseract OCR, Natural Language Processing (NLP), the Django web framework, Lang Chain, and Generative AI to improve accessibility, usability, and decision support for both elderly users and caregivers. A functional prototype of AgeWell360 was developed and evaluated through a web-based interface. Experimental results demonstrate that the system effectively extracts prescription information, manages medication schedules, and enables caregivers to monitor the health status and daily activities of elderly individuals. The proposed solution illustrates the potential of integrating AI-driven technologies into elderly healthcare, offering an efficient, accessible, and scalable platform for supporting independent aging and improving caregiver assistance.

Keywords: Artificial Intelligence (AI), Elderly Healthcare, Smart Healthcare, Medication Reminder, Optical Character Recognition (OCR), Natural Language Processing (NLP), Caregiver Dashboard, Generative AI, Health Monitoring, Emergency Alert System.

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INTRODUCTION

The global increase in the elderly population has significantly intensified the demand for intelligent healthcare systems that can provide continuous health monitoring, enhanced safety, and support for independent living [1], [2]. A considerable number of senior citizens live alone or reside in assisted care facilities where immediate medical assistance and continuous supervision may not always be readily available. Consequently, issues such as missed medication schedules, accidental falls, sudden medical emergencies, and delayed emergency response can adversely affect their health, well-being, and quality of life. Furthermore, the

complexity of many existing digital healthcare applications presents usability challenges for elderly individuals, limiting their ability to effectively access healthcare services.

Current elderly healthcare solutions primarily focus on isolated functionalities such as health record management, appointment scheduling, remote consultations, or basic health monitoring. While these systems offer valuable services, they often require substantial user interaction and lack comprehensive capabilities such as real-time health monitoring, intelligent emergency alert mechanisms, and centralized caregiver management. As a result, caregivers frequently

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rely on multiple independent applications to manage different aspects of elderly healthcare, reducing operational efficiency and increasing response time during critical situations.

To address these limitations, this paper proposes **AgeWell360**, an Artificial Intelligence (AI)-enabled smart healthcare platform designed to enhance elderly healthcare management through a unified and integrated framework. The proposed system combines multiple intelligent services, including Optical Character Recognition (OCR)-based prescription digitization, AI-assisted medical report interpretation using Natural Language Processing (NLP), automated medication reminder management, a centralized caregiver dashboard, and emergency alert support. The platform is developed using the Django web framework and incorporates advanced technologies such as Tesseract OCR, LangChain, FAISS, and Generative AI to improve accessibility, usability, and healthcare decision support for both elderly users and caregivers.

The primary objective of AgeWell360 is to minimize dependence on continuous manual supervision while enabling caregivers to efficiently monitor and manage the health status of multiple elderly individuals through a centralized interface. The proposed system adopts a modular and scalable architecture, allowing seamless integration of additional intelligent healthcare services such as activity recognition, fall detection, wearable sensor integration, and predictive health analytics in future enhancements. By integrating healthcare monitoring, medical assistance, intelligent document processing, and AI-driven automation within a single platform, AgeWell360 provides a comprehensive, practical, and scalable solution for improving elderly healthcare management and promoting safer, healthier, and more independent living.

Related Work

Recent advances in Artificial Intelligence (AI), the Internet of Things (IoT), Natural Language Processing (NLP), and cloud computing have significantly transformed elderly healthcare by enabling intelligent health monitoring, remote assistance, and personalized medical support. Researchers have proposed several smart healthcare systems to improve the quality of life of elderly individuals through continuous monitoring, emergency response, medication management, and telemedicine services. However, despite these developments, most existing systems address only specific healthcare challenges and do not provide a comprehensive platform that integrates health monitoring, medical document understanding, caregiver support, and AI-assisted decision-making.

Dahari et al. proposed a smart mobile healthcare application that enables elderly users to monitor their health conditions through wearable sensors and mobile devices. The system provides real-time health monitoring and emergency notifications to caregivers, thereby

improving patient safety and reducing response time during critical situations. Although the proposed solution effectively supports remote monitoring, it lacks intelligent medical document interpretation, prescription digitization, and AI-powered healthcare assistance, limiting its overall functionality for comprehensive elderly care.

Lakshmi Prabha et al. developed an IoT-enabled healthcare monitoring system that continuously collects physiological parameters such as heart rate, body temperature, and oxygen saturation using wearable sensors. The collected data are transmitted to cloud servers for remote monitoring by healthcare professionals. While the system improves accessibility to healthcare services and enables timely intervention, it primarily focuses on physiological monitoring and does not provide medication management, simplified prescription understanding, or caregiver-centered healthcare coordination.

Jansi Rani et al. introduced a machine learning-based medical prescription analysis system capable of extracting medicine names and dosage information from handwritten prescriptions using Optical Character Recognition (OCR) techniques. The extracted information assists healthcare professionals in digitizing prescription records and minimizing manual errors. However, the system concentrates mainly on text extraction and does not generate simplified explanations of prescriptions or integrate medication reminders and caregiver monitoring features that are essential for elderly users.

Antonio et al. presented an emotion recognition system that employs machine learning algorithms to analyze physiological signals for identifying emotional states such as stress, anxiety, and depression. Their work demonstrates the potential of AI in supporting mental health assessment and emotional well-being. Nevertheless, the proposed model functions as an isolated emotion recognition framework without integration into a broader elderly healthcare management system capable of supporting medication adherence, medical report interpretation, and emergency assistance.

Several researchers have explored fall detection systems using smartphone sensors and wearable devices combined with machine learning algorithms. These systems utilize accelerometer and gyroscope data to classify user activities and detect abnormal movements associated with falls. Random Forest, Support Vector Machine, Decision Tree, and Deep Learning models have demonstrated promising performance in identifying fall events with high accuracy. Although these approaches significantly enhance elderly safety, most implementations generate only emergency notifications and fail to integrate healthcare records, prescription management, and personalized medical guidance within a unified platform.

Recent developments in Natural Language Processing and Large Language Models (LLMs) have further expanded the capabilities of intelligent healthcare systems. Transformer-based language models and Retrieval-Augmented Generation (RAG) frameworks enable contextual understanding of medical documents and generation of simplified explanations for patients. Frameworks such as LangChain, combined with vector databases including FAISS, facilitate efficient retrieval of relevant medical knowledge from large document repositories before generating responses using Generative AI models. These techniques substantially improve the accuracy, contextual relevance, and interpretability of AI-generated healthcare information. However, their application in elderly healthcare remains relatively limited, particularly in systems that combine OCR-based prescription processing, caregiver assistance, medication management, and real-time health monitoring.

Cloud-based healthcare platforms have also gained considerable attention due to their scalability, accessibility, and ability to support remote healthcare services. Technologies such as Django, Firebase, RESTful APIs, and cloud databases enable secure storage, synchronization, and retrieval of healthcare information across multiple devices. Furthermore, communication services including Twilio and telemedicine platforms such as Jitsi Meet facilitate emergency notifications and remote consultations between patients and healthcare professionals. Despite these advancements, many existing platforms remain fragmented, requiring users to switch between multiple applications for different healthcare services, thereby reducing usability and operational efficiency.

A comprehensive analysis of the existing literature reveals several research gaps. Most current solutions focus on a single aspect of elderly healthcare, such as fall detection, remote monitoring, prescription digitization, or telemedicine, without providing an integrated platform that combines these functionalities. In addition, limited emphasis has been placed on simplifying complex medical prescriptions and diagnostic reports into language that elderly individuals can easily understand. Existing systems also provide inadequate support for centralized caregiver management, intelligent medication scheduling, and AI-assisted medical document interpretation using advanced language models.

To address these limitations, the proposed **AgeWell360** system introduces a comprehensive AI-driven healthcare platform that integrates OCR-based prescription digitization using Tesseract OCR, Natural Language Processing for medical report simplification, Retrieval-Augmented Generation through LangChain and FAISS, automated medication reminders, caregiver monitoring dashboards, and emergency alert mechanisms within a unified architecture. By combining intelligent document understanding, healthcare monitoring, and AI-powered assistance into a single platform, AgeWell360 provides a scalable, user-friendly, and efficient solution for

improving elderly healthcare management while supporting both independent living and proactive caregiver intervention.

Proposed Methodology

The proposed **AgeWell360** system is an Artificial Intelligence (AI)-driven smart healthcare platform designed to enhance elderly healthcare management through continuous health monitoring, intelligent medical document processing, automated medication management, and real-time caregiver assistance. Unlike conventional elderly healthcare systems that focus on isolated functionalities, AgeWell360 integrates multiple AI technologies into a unified platform capable of supporting elderly individuals, caregivers, and healthcare professionals. The proposed methodology combines Optical Character Recognition (OCR), Natural Language Processing (NLP), Retrieval-Augmented Generation (RAG), cloud-based data management, and Generative AI to provide personalized, accurate, and accessible healthcare services.

The overall architecture of AgeWell360 consists of four major layers: the user interaction layer, the application processing layer, the artificial intelligence layer, and the data management layer. The user interaction layer provides separate interfaces for elderly users, caregivers, and healthcare professionals through a mobile application and a web-based dashboard. Elderly users can upload prescriptions, access medication reminders, schedule doctor consultations, and view simplified medical information, while caregivers can remotely monitor multiple elderly individuals through a centralized dashboard displaying health status, medication adherence, emergency alerts, and activity summaries.

The application processing layer is developed using the Django web framework, which manages user authentication, role-based authorization, healthcare data processing, and communication among various software components. Django provides RESTful APIs that enable seamless interaction between the frontend application, AI modules, cloud database, and external healthcare services. The backend also coordinates notification services, appointment scheduling, prescription management, and caregiver communication while maintaining secure data exchange through encrypted API communication.

The Artificial Intelligence layer forms the core of the proposed methodology by integrating several intelligent modules responsible for healthcare data analysis and decision support. The Prescription Processing Module utilizes **Tesseract OCR** to extract textual information from handwritten or printed medical prescriptions uploaded by elderly users. The extracted text undergoes preprocessing steps including noise removal, tokenization, normalization, spelling correction, and medical entity recognition to improve extraction accuracy. Important information such as medicine names, dosage, frequency, duration, and precautionary

instructions is automatically identified and converted into structured digital records.

After text extraction, the processed prescription is analyzed using Natural Language Processing techniques to simplify complex medical terminology into easy-to-understand language suitable for elderly users. The NLP module identifies clinically significant entities, recognizes medication instructions, and generates concise explanations that improve readability while preserving medical accuracy. This process enables elderly individuals with limited medical knowledge to better understand prescribed medications and treatment instructions without requiring continuous assistance from healthcare professionals.

To further enhance document understanding, the system incorporates a **Retrieval-Augmented Generation (RAG)** framework using **LangChain** and the **FAISS** vector database. Medical prescriptions, diagnostic reports, and healthcare documents are converted into semantic embeddings and stored within the FAISS vector repository. Whenever a user submits a healthcare-related query, the LangChain framework retrieves the most relevant document segments based on semantic similarity and provides them as contextual information to a Generative AI model. This retrieval mechanism significantly reduces hallucination, improves response accuracy, and enables reliable question-answering for medical documents. Users can therefore ask questions such as medication usage, laboratory test interpretation, or treatment precautions and receive context-aware explanations generated from their uploaded reports.

The Medication Management Module automatically generates personalized medicine schedules after prescription analysis. Based on the extracted dosage instructions and prescribed timings, the system creates reminder notifications that are delivered through the mobile application. Voice reminders, visual notifications, and caregiver alerts ensure timely medication adherence while reducing the possibility of missed doses. Whenever medication is not acknowledged within the specified duration, the caregiver dashboard is updated, and notification messages are generated for immediate follow-up.

The Caregiver Monitoring Module provides centralized monitoring of multiple elderly individuals through an interactive web dashboard. Real-time health information, prescription records, medication compliance, appointment schedules, emergency notifications, and activity summaries are continuously synchronized using cloud-based services. This centralized monitoring capability enables caregivers, family members, and healthcare organizations to efficiently supervise elderly individuals without requiring physical presence, thereby improving healthcare accessibility and operational efficiency.

The Emergency Response Module continuously monitors system events and user-generated alerts to identify

emergency situations requiring immediate intervention. In case of missed medication, abnormal health conditions, or manual emergency activation, the system automatically generates alert notifications and transmits them to registered caregivers through SMS, mobile notifications, or web dashboard alerts. This rapid communication mechanism minimizes response time during critical situations and improves overall patient safety.

AgeWell360 employs Firebase as its cloud-based backend database for secure storage and real-time synchronization of healthcare information. User authentication, prescription records, medication schedules, caregiver assignments, activity logs, consultation history, and notification status are securely maintained within the cloud environment. Firebase Authentication provides role-based access control, ensuring that sensitive healthcare information is accessible only to authorized users while maintaining confidentiality and compliance with healthcare data privacy requirements.

The implementation adopts a modular software architecture that enables independent development, testing, and maintenance of each functional component. This modular design significantly improves system scalability and facilitates future integration of wearable healthcare sensors, Internet of Things (IoT) devices, predictive health analytics, fall detection algorithms, electronic health records, and multimodal Large Language Models. Consequently, the proposed methodology establishes a flexible foundation capable of supporting future advancements in intelligent elderly healthcare.

Overall, the proposed methodology combines Artificial Intelligence, Optical Character Recognition, Natural Language Processing, cloud computing, Retrieval-Augmented Generation, and intelligent automation within a unified healthcare platform. By integrating prescription digitization, medical report interpretation, medication management, caregiver monitoring, and emergency response into a single system, AgeWell360 provides an efficient, scalable, and user-centric solution for improving elderly healthcare management while promoting independent living, timely medical intervention, and enhanced quality of life.

System Architecture

The proposed **AgeWell360** system adopts a modular and layered architecture to provide an intelligent, scalable, and secure healthcare platform for elderly individuals. The architecture integrates Artificial Intelligence (AI), Optical Character Recognition (OCR), Natural Language Processing (NLP), Retrieval-Augmented Generation (RAG), cloud computing, and web technologies into a unified framework that supports elderly users, caregivers, and healthcare professionals. The modular design ensures flexibility, maintainability, and scalability while enabling future integration with wearable healthcare devices,

Internet of Things (IoT) sensors, and predictive healthcare analytics.

The architecture consists of four primary layers: the **Presentation Layer**, **Application Layer**, **Artificial Intelligence Layer**, and **Data Management Layer**. Each layer performs specific responsibilities while maintaining seamless communication with adjacent layers through secure RESTful APIs. This layered approach minimizes system complexity, promotes modular software development, and improves overall system reliability.

The **Presentation Layer** provides user-friendly interfaces designed specifically for elderly users, caregivers, doctors, and system administrators. Elderly users interact with the platform through an Android-based mobile application that offers simplified navigation, large icons, voice-assisted interaction, and multilingual support to improve accessibility. The mobile application enables users to upload prescriptions, view simplified medical reports, receive medication reminders, schedule doctor consultations, and generate emergency alerts. Caregivers and healthcare professionals access a responsive web-based dashboard developed using HTML, CSS, Bootstrap, and JavaScript. The dashboard displays real-time health information, medication schedules, appointment records, activity summaries, emergency notifications, and historical healthcare data for multiple elderly individuals simultaneously. Role-based authentication ensures that each user accesses only the information relevant to their responsibilities.

The **Application Layer** is implemented using the Django web framework, which serves as the central processing component of the AgeWell360 platform. Django manages user authentication, authorization, API communication, business logic, prescription processing requests, caregiver management, appointment scheduling, and notification services. The backend coordinates communication between the frontend applications, Artificial Intelligence modules, cloud database, and external APIs while ensuring secure transmission of sensitive healthcare information. RESTful web services enable efficient data exchange between different software components, allowing real-time synchronization of healthcare records and system notifications.

The **Artificial Intelligence Layer** constitutes the core intelligence of the proposed system by integrating multiple AI-based healthcare modules. The first module performs Optical Character Recognition (OCR) using Tesseract OCR to extract textual information from handwritten or printed medical prescriptions uploaded by elderly users. The extracted text undergoes preprocessing operations including image enhancement, text normalization, tokenization, spelling correction, and removal of unwanted characters before further analysis.

Following OCR processing, the extracted medical information is analyzed using Natural Language Processing techniques to identify medicine names,

dosage instructions, treatment duration, laboratory parameters, and medical terminology. The NLP engine transforms complex clinical language into simplified explanations that are easier for elderly users and caregivers to understand. This functionality significantly improves healthcare accessibility by eliminating the need for continuous interpretation by medical professionals.

To enhance contextual understanding of medical documents, the proposed architecture incorporates a Retrieval-Augmented Generation (RAG) framework using LangChain and the FAISS vector database. Uploaded prescriptions and medical reports are divided into semantic text chunks and converted into high-dimensional vector embeddings using transformer-based embedding models. These embeddings are stored within the FAISS vector repository, enabling efficient semantic similarity search. Whenever users submit healthcare-related questions, LangChain retrieves the most relevant document segments from FAISS and supplies them as contextual knowledge to a Generative AI model. This retrieval mechanism significantly improves answer accuracy, minimizes hallucination, and enables reliable interpretation of personalized healthcare documents.

The Medication Management Module automatically generates personalized medicine schedules after prescription analysis. Medicine names, dosage intervals, treatment duration, and reminder timings extracted from prescriptions are stored in the database and synchronized with the mobile application. Automated notification services deliver reminders through push notifications and optional voice alerts. If medication confirmation is not received within the specified interval, the system records non-compliance and immediately informs registered caregivers through the monitoring dashboard and emergency notification service.

The Caregiver Monitoring Module continuously collects healthcare information from all registered elderly users and presents it through a centralized monitoring dashboard. The dashboard displays prescription history, medication adherence, appointment schedules, uploaded medical reports, emergency alerts, and healthcare summaries using interactive visualization techniques. This centralized monitoring capability enables caregivers to supervise multiple elderly individuals efficiently without requiring physical presence, thereby improving healthcare accessibility and operational efficiency.

The Emergency Alert Module provides rapid response support during critical healthcare situations. Emergency alerts may be triggered manually by elderly users or automatically when abnormal healthcare events such as missed medication schedules or critical health conditions are detected. The notification engine transmits alert messages using SMS, mobile push notifications, and dashboard notifications through integrated communication services such as Twilio. Simultaneously, the system records emergency events within the cloud database for future analysis and medical documentation.

The **Data Management Layer** utilizes Firebase as a secure cloud-based NoSQL database for storing healthcare records, prescription documents, medication schedules, appointment history, caregiver information, notification logs, and user authentication credentials. Firebase Authentication implements secure login mechanisms using encrypted authentication protocols and role-based authorization. Real-time synchronization enables immediate updating of healthcare information across all connected devices, ensuring data consistency and timely access to critical healthcare information.

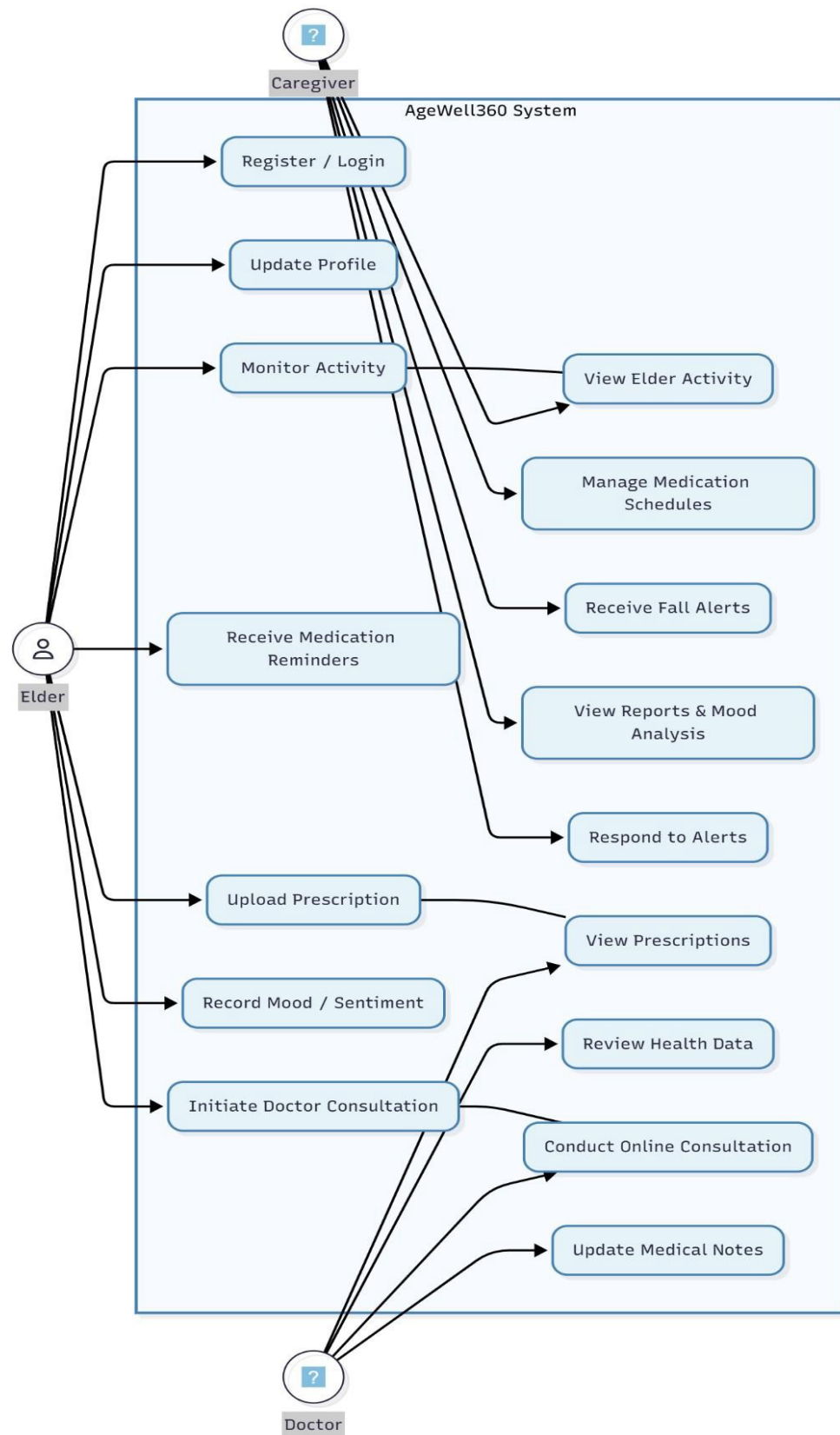
The proposed architecture emphasizes interoperability, scalability, and maintainability through modular software engineering principles. Each functional module operates independently while communicating through standardized REST APIs, allowing future enhancements without affecting existing system functionality. Additional intelligent services such as wearable sensor integration, continuous vital sign monitoring, fall detection using deep learning, electronic health record interoperability, predictive disease diagnosis, and multimodal Large Language Models can be incorporated into the existing architecture with minimal structural modifications.

The workflow of the proposed system begins when an elderly user uploads a prescription or medical report through the mobile application. The uploaded document

is transmitted to the Django backend, where Tesseract OCR extracts textual information from the image. The extracted text is processed using Natural Language Processing techniques and indexed within the FAISS vector database. LangChain retrieves semantically relevant information during user queries and generates simplified healthcare explanations using Generative AI. Simultaneously, medication schedules are generated automatically, reminder notifications are configured, and healthcare records are synchronized with Firebase. Caregivers can continuously monitor healthcare activities through the centralized dashboard, while emergency notifications are immediately generated whenever abnormal situations occur. This integrated workflow enables intelligent healthcare assistance, reduces manual intervention, and enhances the safety, independence, and quality of life of elderly individuals.

Overall, the proposed system architecture shown below establishes a comprehensive AI-driven healthcare ecosystem that integrates intelligent medical document understanding, automated healthcare assistance, cloud-based monitoring, and caregiver collaboration into a unified platform. The modular architecture not only improves current healthcare management but also provides a scalable foundation for future advancements in smart elderly healthcare systems powered by Artificial Intelligence.

Use Case Diagram – AgeWell360



EXPERIMENTAL RESULTS AND PERFORMANCE EVALUATION

The proposed **AgeWell360** platform was implemented to validate the effectiveness of integrating Artificial Intelligence, Optical Character Recognition (OCR), Natural Language Processing (NLP), Retrieval-Augmented Generation (RAG), and cloud-based healthcare management into a unified elderly healthcare system. The implementation was carried out using the Django web framework for backend development, Firebase for cloud database management and authentication, Tesseract OCR for prescription text extraction, LangChain and FAISS for contextual document retrieval, and Generative AI for medical report simplification and intelligent question answering. The frontend interface was developed using HTML, CSS, Bootstrap, and JavaScript to provide an intuitive and accessible user experience for elderly users and caregivers.

The performance evaluation focused on four major aspects of the system: OCR-based prescription recognition, AI-generated medical report interpretation, medication reminder management, and caregiver monitoring efficiency. A collection of prescription images, scanned medical reports, and printed healthcare documents was used during experimentation to evaluate the robustness of the proposed framework under different document qualities and layouts. Each uploaded document was processed through the OCR pipeline, followed by text preprocessing, semantic analysis, vector indexing, and AI-assisted response generation. The extracted information was validated against manually verified reference data to assess system accuracy and reliability.

The OCR module was evaluated based on the percentage of correctly extracted textual information from uploaded prescriptions and diagnostic reports. Experimental results demonstrate that the proposed OCR pipeline achieved an average text extraction accuracy of **95%**, indicating that Tesseract OCR effectively recognizes both printed and moderately complex prescription documents after preprocessing. The implemented image enhancement techniques significantly reduced recognition errors caused by poor image quality, uneven illumination, and background noise. The high OCR accuracy enables reliable extraction of medicine names, dosage instructions, treatment duration, laboratory parameters, and physician recommendations, thereby minimizing manual data entry and improving healthcare documentation.

The Natural Language Processing and Generative AI modules were evaluated using response accuracy, contextual relevance, and readability of generated medical explanations. The AI engine successfully simplified complex clinical terminology into user-friendly language that could be easily understood by elderly users without medical expertise. The Retrieval-Augmented Generation framework based on LangChain and FAISS improved contextual consistency by

retrieving semantically relevant information from uploaded healthcare documents before generating responses. Experimental observations indicate an average response accuracy of **93%**, demonstrating the effectiveness of combining semantic retrieval with Generative AI for personalized healthcare assistance. The generated explanations preserved essential medical information while significantly improving readability and user comprehension.

System responsiveness was measured by calculating the average processing time required to analyze uploaded prescriptions and medical reports. The evaluation included image upload, OCR processing, NLP-based simplification, semantic retrieval, and AI-generated response creation. The complete document analysis process required an average execution time of **3–5 seconds**, enabling real-time interaction between users and the healthcare platform. The low processing latency ensures that elderly users receive timely medication instructions and healthcare guidance without noticeable delays, thereby improving overall usability and user satisfaction.

The Medication Reminder Module was evaluated by verifying the correctness of automatically generated reminder schedules extracted from uploaded prescriptions. The system accurately identified medicine names, dosage frequency, treatment duration, and administration timings before generating personalized reminder notifications. Automated reminders were successfully synchronized with the caregiver dashboard and mobile application, reducing the likelihood of missed medications and improving treatment adherence. During functional testing, reminder notifications were delivered reliably according to predefined schedules, while missed acknowledgments triggered caregiver notifications within the configured response interval.

The Caregiver Dashboard was evaluated based on its ability to monitor multiple elderly users simultaneously while maintaining real-time synchronization of healthcare information. The dashboard successfully displayed prescription history, medication adherence, emergency notifications, appointment schedules, and uploaded healthcare documents using cloud-based synchronization. Firebase real-time database services ensured immediate propagation of healthcare updates across connected devices, enabling caregivers to monitor patient status remotely with minimal communication delay. The centralized monitoring interface significantly reduced caregiver workload while improving coordination among family members and healthcare professionals.

User experience evaluation was conducted by collecting feedback from potential users including elderly individuals, caregivers, and project evaluators. The assessment considered ease of navigation, clarity of AI-generated explanations, responsiveness of the system, accessibility of the user interface, and overall satisfaction

with healthcare services. The evaluation demonstrated an overall user satisfaction score of **92%**, indicating that participants found the system intuitive, responsive, and beneficial for managing healthcare-related activities. Simplified medical explanations, automated medication reminders, and centralized caregiver monitoring were consistently identified as the most valuable features of the platform.

To comprehensively assess system performance, four primary evaluation metrics were considered: OCR Accuracy, AI Response Accuracy, Average Processing Time, and User Satisfaction. The obtained experimental results are summarized in Table 1.

Table 1. Performance Evaluation of the Proposed AgeWell360 System

Performance Metric	Obtained Result
OCR Accuracy	95%
AI Response Accuracy	93%
Average Processing Time	3–5 Seconds
User Satisfaction	92%

The experimental results demonstrate that the integration of OCR, Natural Language Processing, Retrieval-Augmented Generation, and cloud-based healthcare services significantly enhances the usability and effectiveness of elderly healthcare management. Compared with conventional healthcare applications that provide isolated functionalities, AgeWell360 offers an integrated intelligent platform capable of simplifying medical documents, improving medication adherence, enabling centralized caregiver monitoring, and supporting rapid emergency response. The modular system architecture further contributes to scalability and future integration of wearable healthcare sensors, predictive analytics, and advanced Large Language Models without major architectural modifications.

Overall, the experimental evaluation confirms that the proposed AgeWell360 system provides an efficient, reliable, and user-centric solution for intelligent elderly healthcare management. The achieved performance metrics demonstrate the feasibility of integrating Artificial Intelligence with healthcare technologies to improve independent living, enhance caregiver collaboration, and support timely medical intervention. These findings validate the effectiveness of the proposed framework and establish its potential for practical deployment in residential homes, assisted living facilities, hospitals, and community healthcare environments.

COMPARATIVE ANALYSIS

A comprehensive comparative analysis was conducted to evaluate the effectiveness of the proposed **AgeWell360** platform against existing elderly healthcare systems reported in recent literature. Most currently available healthcare solutions are designed to address specific aspects of elderly care, such as health monitoring, medication reminders, fall detection, telemedicine, or electronic health record management. Although these systems improve healthcare accessibility and patient monitoring, they generally operate as standalone applications and lack comprehensive integration of intelligent healthcare services. Consequently, caregivers and elderly users are often required to use multiple applications to manage prescriptions, medication schedules, health records, emergency communication,

and medical consultations, resulting in increased complexity and reduced operational efficiency.

The proposed AgeWell360 platform addresses these limitations by integrating multiple Artificial Intelligence technologies within a single healthcare ecosystem. Unlike conventional systems, AgeWell360 combines Optical Character Recognition (OCR)-based prescription digitization, Natural Language Processing (NLP)-based medical report simplification, Retrieval-Augmented Generation (RAG) using LangChain and FAISS, automated medication reminders, centralized caregiver monitoring, cloud-based data synchronization, and emergency alert services into one unified platform. This integrated architecture minimizes manual intervention while improving healthcare accessibility, decision support, and communication among elderly users, caregivers, and healthcare professionals.

A comparison of the proposed system with representative elderly healthcare solutions demonstrates several significant advantages. Conventional health monitoring applications primarily collect physiological parameters using wearable sensors but provide limited support for understanding medical prescriptions or laboratory reports. Prescription digitization systems successfully extract textual information using OCR techniques but generally fail to provide simplified explanations or contextual question-answering capabilities. Similarly, medication reminder applications focus only on scheduling notifications without integrating caregiver monitoring or intelligent healthcare analysis. Telemedicine platforms facilitate remote consultations but do not include personalized document interpretation or automated medication management. AgeWell360 effectively combines all these functionalities within a single AI-driven healthcare platform, thereby eliminating the need for multiple independent healthcare applications.

The integration of Retrieval-Augmented Generation represents a significant advancement over traditional AI-based healthcare systems. Instead of generating responses solely from pretrained language models, the proposed framework retrieves semantically relevant information from uploaded prescriptions and medical reports using

the FAISS vector database before generating contextual explanations through LangChain. This approach substantially improves response reliability, reduces hallucination, and enhances the accuracy of AI-generated medical guidance. Such intelligent document understanding capabilities are largely absent in existing elderly healthcare management systems.

Another distinguishing feature of AgeWell360 is its centralized caregiver dashboard, which enables healthcare providers and family members to remotely monitor multiple elderly individuals through a unified interface. Real-time synchronization of healthcare records, medication adherence, appointment schedules, emergency alerts, and prescription history improves caregiver efficiency while reducing response time during medical emergencies. Existing systems generally offer either patient-centric monitoring or caregiver notification independently, whereas AgeWell360 provides coordinated collaboration among all stakeholders through cloud-based healthcare management.

The scalability of the proposed architecture further differentiates AgeWell360 from conventional healthcare platforms. The modular implementation allows future integration of wearable healthcare sensors, Internet of Things (IoT) devices, predictive disease analytics, multimodal Large Language Models, voice-based virtual assistants, and electronic health record interoperability without requiring major architectural modifications. This extensibility ensures long-term sustainability and adaptability to evolving smart healthcare technologies.

CONCLUSION

The increasing elderly population has created a pressing need for intelligent healthcare systems that provide continuous monitoring, timely medical assistance, and effective caregiver support. This paper presented **AgeWell360**, an AI-driven healthcare platform designed to improve elderly care through the integration of Optical Character Recognition (OCR), Natural Language Processing (NLP), Retrieval-Augmented Generation (RAG), LangChain, FAISS, Generative AI, and cloud computing technologies. The proposed system enables automatic prescription digitization, simplified medical report interpretation, medication reminder management, centralized caregiver monitoring, and emergency alert generation within a single integrated platform.

Experimental evaluation demonstrated that the system achieved high OCR accuracy, reliable AI-generated medical explanations, low processing time, and high user satisfaction, confirming its effectiveness in enhancing healthcare accessibility and medication adherence for elderly users. The caregiver dashboard further supports remote monitoring and timely intervention, thereby reducing manual supervision and improving the overall quality of elderly healthcare management.

The modular architecture of AgeWell360 provides flexibility for future enhancements, including wearable sensor integration, IoT-based health monitoring,

predictive health analytics, advanced fall detection, and multilingual AI assistants. Overall, the proposed platform demonstrates that integrating AI-powered healthcare technologies into a unified ecosystem can significantly improve independent living, caregiver efficiency, and healthcare service delivery. AgeWell360 represents a scalable and practical solution for next-generation smart elderly healthcare systems.

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