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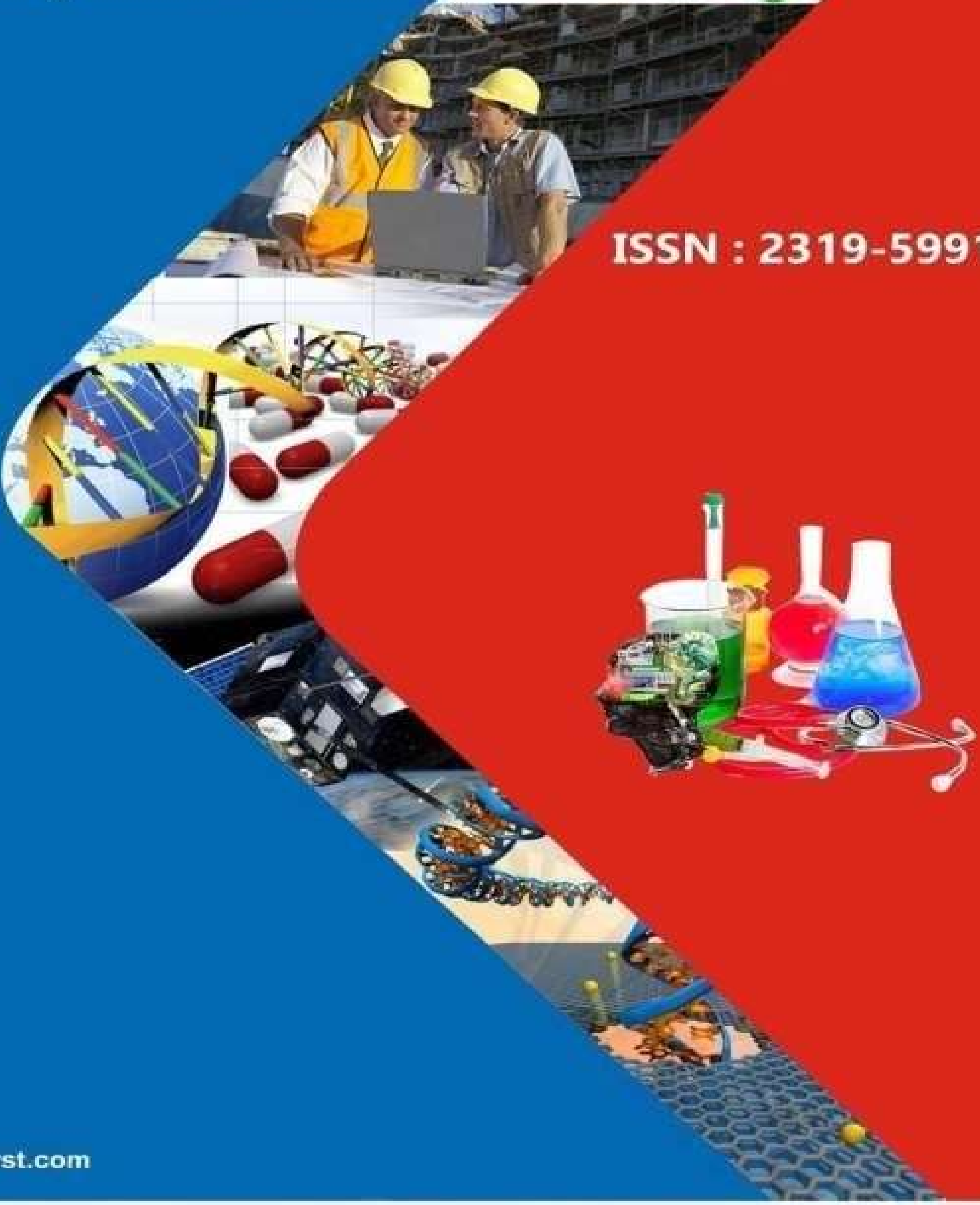

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Smart Comrade Robot for Elderly: Leveraging IBM Watson Health and Google Cloud AI for Advanced Health and Emergency Systems

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ABSTRACT

This research explores the integration of artificial intelligence (AI) in enhancing prostate cancer therapy and elderly care.

Objectives: This include increasing the precision of radiation therapy for prostate cancer and improving elderly care through advanced AI-driven systems.

Methods: This involves two primary AI applications: the US-Guided Radiation Therapy Optimization system, which uses AI to refine radiation dose distribution, and the Smart Comrade Robot, utilizing Google Cloud AI and IBM Watson Health for real-time health monitoring and emergency alerts.

Results: The final outcome reveal that the AI-enhanced radiation therapy achieves a 97% dose accuracy, while the Smart Comrade Robot demonstrates a 95% health monitoring accuracy and a 98% emergency alert sensitivity. The system's response time is under 5 seconds, with a 99.9% uptime, indicating high reliability and effectiveness.

Conclusion: This indicates that AI significantly improves the precision and responsiveness of healthcare interventions, resulting in better treatment outcomes for prostate cancer and enhanced care for the elderly.

Keywords: Artificial Intelligence, Prostate Cancer Therapy, Elderly Care, Radiation Dose Optimization, Health Monitoring, Emergency Alerts, AI Algorithms.

1. INTRODUCTION

Technological developments in robots and artificial intelligence (AI) are drastically changing the healthcare industry and improving patient care, treatment planning, and diagnostic precision. AI-enabled solutions, such as Google Cloud AI and IBM Watson Health, are finding their way into medical applications more frequently, opening up new possibilities to improve care for the elderly. In order to address the difficulties associated with managing chronic health issues and emergency responses in the aging population, this article presents the Smart Comrade Robot for the Elderly, an AI-driven health and emergency response system. With real-time monitoring, data analysis, and automatic emergency reactions, AI-enabled robots like

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the Smart Comrade Robot provide a promising answer as chronic diseases like diabetes, neurological disorders, and cardiovascular disease (CVD) grow more common.

The strategic choice to integrate Google Cloud AI and IBM Watson Health with the Smart Comrade Robot was made to improve its capabilities. Large-scale medical data analysis is an area in which IBM Watson Health excels, providing insights that enhance treatment planning and diagnostic precision. In the meantime, the robot can anticipate health hazards, learn from patient data, and make judgments in real time thanks to the potent machine learning capabilities offered by Google Cloud AI. When combined, these technologies provide a strong basis for meeting the elderly's complicated healthcare needs. The demand for ongoing care and assistance increases as more elders lead independent lives. In order to satisfy this need, the Smart Comrade Robot was created, redefining elder care by fusing artificial intelligence and robotics into a single, approachable platform.

Because of their track records of success in healthcare innovation, IBM Watson Health and Google Cloud AI were selected as the project's fundamental technologies. IBM Watson Health's data-driven insights that improve patient outcomes have made a substantial contribution to the advancement of medical research. It is the perfect partner for a healthcare-focused robot because of its capacity to handle and evaluate unstructured medical data, such as imaging data, clinical notes, and electronic health records. In addition, Google Cloud AI provides state-of-the-art machine learning models that allow the robot to learn from patient interactions, enhance its predictive abilities, and provide individualized treatment. Innovations in robotics, specifically in autonomous navigation, human-robot interaction, and robotic aid, are also included into the design of the Smart Comrade Robot. With its sophisticated sensors, cameras, and artificial intelligence (AI) software, the robot can recognize faces, navigate through homes, and obey voice orders. These characteristics are essential for building a robot that is not just useful but also affable and able to establish deep connections with older users.

AI is used by the Smart Comrade Robot to enhance performance in addition to its emergency response and health monitoring features. Convolutional neural networks (CNNs), for example, are used to evaluate possible radiation therapy beam directions, which is an important task in the treatment of prostate cancer where accuracy is crucial. Even when certain beam routes are blocked by the ultrasonic imaging robot, the CNN can rapidly identify the most efficient ones because it has been trained on a large variety of treatment plans. The CNN-based strategy is enhanced by the heuristic optimization method known as "simulated annealing," which aids in the robot's determination of the ideal location and beam arrangement. By integrating AI approaches, the robot can overcome obstacles related to robotic ultrasound-guided radiation therapy, resulting in treatment outcomes that are of high quality and with minimal physical damage. The Smart Comrade Robot is a major advancement in the provision of continuous, individualized care to the elderly, effectively solving the essential healthcare difficulties posed by an aging population. This is achieved through the combination of advanced robotics and potent AI algorithms.

The following objectives of the paper are:

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- Continuous Health Monitoring: Utilizes advanced AI and sensors capable of detecting multidimensional information and human-brain-like computation device for data processing in ongoing health tracking, detecting anomalies in real-time for early intervention.
- Rapid Emergency Response: Implements a system for swift action during emergencies, ensuring prompt alerts and interventions to address critical health issues.
- Personalized Care Plans: Leverages insights from IBM Watson Health to create tailored care plans based on individual health data and medical history.
- Social and Emotional Support: Integrates interactive features to offer virtual counselling, support groups, and mood tracking, addressing emotional and social needs.
- Seamless Integration: Ensures smooth connectivity with healthcare providers for coordinated care and informed decision-making, enhancing overall patient management.

Dilip et al. (2022) point out a critical gap in their AI-based Smart Comrade Robot's validation with medical professionals, emphasizing the need for a more comprehensive analysis to validate its efficacy in real-world healthcare settings. The study also highlights the need for more investigation into the cognitive manifestations of the AI system in various entities, arguing that a more thorough grasp is required to completely appreciate its significance and promise in elder care. To improve and maximize the system's functionality for practical uses in elder healthcare, more research is needed.

The healthcare needs of an aging population require creative solutions, and AI-driven robotic systems present a promising avenue. An intelligent robot that can help elderly people by offering emergency rescue and medical support is proposed by **Dilip et al. (2022).** Through prompt help and ongoing monitoring, this robot improves the quality of life for elders while lessening the workload for healthcare professionals by utilizing cutting-edge AI technologies. This strategy guarantees that the elderly receives better healthcare services and timely assistance, in addition to supporting elder care.

2. LITERATURE SURVEY:

The role of non-terrestrial networks (NTNs) in promoting Industrial Internet of Things (IIoT) applications is examined in the paper by **Michailidis et al. (2020).** NTNs are essential for expanding radio coverage and enabling remote monitoring across large and remote areas because they make use of satellites, airships, and aircraft. In order to fulfill the ultra-reliable, low-latency communication expectations of the IIoT, the study examines the shortcomings of existing wireless technologies and emphasizes how artificial intelligence (AI), namely machine learning (ML) and deep learning (DL), may improve NTN performance. Adaptive decision-making and prediction are made easier by AI, which provides a more straightforward but efficient answer than more conventional optimization techniques.

Artificial intelligence (AI) has the potential to revolutionize healthcare. **Mulukuntla and Pamulaparthyvenkata (2022)** highlight this potential by highlighting how AI may improve diagnostics, tailor therapies, and forecast medical events. It is necessary to overcome obstacles pertaining to infrastructure, ethics, and data privacy in order to apply AI effectively. In order

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to fully realize AI's potential, the article promotes ethical behavior and cross-disciplinary cooperation. AI can transform healthcare from a reactive to a predictive and personalized model, increasing patient outcomes and freeing up medical staff to concentrate more on patient care. It can also streamline operations and revolutionize preventative care.

Pishgar et al. (2021) examine how AI may improve occupational safety and health (OSH) by introducing the REDECA framework, which stands for Risk Evolution, Detection, Evaluation, and Control of Accidents. Using REDECA, the study examines 260 AI papers from five industries: mining, oil and gas, construction, transportation, and agriculture. Results show that applications of AI differ by industry: for example, in the transportation and oil and gas industries, AI is used primarily for incident detection; in the construction industry, it is used for hazardous situation detection; and in agricultural, its goal is worker safety. In order to enhance worker safety and wellbeing, the study emphasizes the necessity of conducting additional research on the advantages and difficulties of AI in OSH.

In their overview of developments in 5G and IoT-era human-machine interfaces (HMIs), **Sun et al. (2021)** highlights the move from smart gloves to AI- and haptic-enabled HMIs. The high-power consumption of conventional sensors is addressed in the paper by triboelectric nanogenerators (TENGs), which transform biomechanical energy into sensory information. Gloves, eyewear, and electronic skin made of TENG-based HMIs provide low-power, self-sustaining solutions for a range of uses, including smart homes and personal healthcare. This analysis delves into the state-of-the-art TENG HMI technologies, their prospective applications, and the future of haptic feedback and AI integration for more intelligent and immersive interactions.

Rajya Lakshmi Gudivaka (2020) introduces a system that combines Robotic Process Automation (RPA) and cloud computing to improve social robots, particularly for the elderly and people with cognitive impairments. Using cloud computing's processing capacity, the system enables real-time user engagement, efficient scheduling, and precise behavior and object identification. Cloud-based deep learning models are used to optimize key components such as the Behavior Recognition Engine (BRE), Object Recognition Engine (ORE), and Semantic Localization System (SLS). With a 97.3% accuracy rate, the framework greatly increases performance, providing a realistic option to assist caregivers and enhance user freedom despite connectivity issues.

The rapidly growing field of artificial intelligence (AI) in healthcare and medicine is reviewed by **Gómez-González and Gómez Gutiérrez (2020),** who emphasize the technology's revolutionary potential and societal ramifications. The paper offers a thorough analysis of both established and new AI applications, weighing the advantages, disadvantages, and moral dilemmas associated with each. It covers the impact of AI technologies on social issues and COVID-19 answers, develops the 'Technology Availability Level (TAL) Scale' for evaluating them, and offers a categorization of AI technologies according to their ethical and social implications. A structured summary of AI applications in healthcare is also included in the paper, along with 605 references; however, economic assessments and in-depth technical references are not included.

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Zhu (2022) investigates the development of Internet of Medical Things (IoMT) technology and the surge in demand for Remote Patient Monitoring (RPM) systems during the COVID-19 pandemic. These systems are essential for managing huge datasets, forecasting treatment outcomes, and monitoring health status. The thesis suggests a low-cost, scalable RPM system and tackles two major issues: interoperability and data processing. It looks at data problems in smart cardiac health monitoring and proposes a federated learning strategy for improved privacy and security in distributed RPM systems. It does this by addressing missing data with deep learning techniques (RNN, BRITS, GAN, and DeepAR).

The underrepresentation of AI robots in corporate ethics literature is addressed by **Toth et al. (2022),** particularly with regard to the ethical ramifications of these machines in the context of autonomous cars, care facilities, and military applications. The article presents a conceptual framework for investigating AI robot accountability that combines normative and descriptive ethical ideas. It looks at the relationship between morality and moral intensity in particular AI applications and how that affects accountability among different players and institutions. The concept discusses the ethical and accountability difficulties offered by AI robots for designers, users, and regulatory agencies by identifying 'accountability clusters' that range from illegal to supererogatory reactions.

The contribution of artificial intelligence (AI) to the development of assistive technologies for kids with impairments is reviewed by **Zdravkova et al. (2022).** The paper discusses a range of impairments and focuses on new AI-driven developments that improve these kids' education and communication. It analyses modern technology, talks about their effects, and addresses the moral dilemmas raised by their application. The research highlights the need of addressing ethical issues associated to assistive technology development and implementation in its conclusion, which offers an AI viewpoint on the future of these technologies.

Building on Australia's first Technology Roadmap for Aged Care, which was published in 2017, **Barnett et al. (2019)** give an updated literature assessment on technology in aged care. This review, which spans the years 2016 to 2019, incorporates systematic and meta-reviews from significant databases as well as grey literature, and it updates earlier studies from 2011 to 2016. It draws attention to how quickly technology is developing and points out that many recent inventions have not yet undergone thorough scholarly analysis. Based on scholarly and gray literature, the paper offers a summary of disruptive technologies and their possible effects on the elder care industry.

The Australian Government and ACOLA, in partnership with the Australian Academy of Health and Medical Sciences and the New Zealand Royal Society Te Apārangi, financed a project that **Maclaurin et al. (2019)** report on. The project aims to investigate the revolutionary potential of AI in multiple industries, pinpoint related opportunities, risks, and obstacles, and assess the ethical, legal, and societal frameworks that are essential for its advancement and implementation. The paper evaluates the infrastructure, skills, and education requirements of the future in order to facilitate workforce migrations and promote competitive AI enterprises.

Tumai (2021) investigates the legal ramifications of AI-based technology, with a particular emphasis on machine learning and predictive algorithms in New Zealand workplaces. The

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study employs qualitative research approaches, such as employee and technology leader interviews, to investigate how AI impacts leadership roles and organizational dynamics. It draws attention to the ways that AI will affect future leadership and the regulatory issues that predictive algorithms will bring about. The research emphasizes that these algorithms should not be compared to perfect human decision-makers and highlights the necessity for New Zealand agencies to create internal processes to handle the opportunities and concerns connected with the expanding complexity of AI technologies.

The development of foundation models that allow generative AI to scale across corporate applications is driving a revolution in AI. IBM's Watsonx is a next-generation AI platform that offers tools for creating, enhancing, and implementing both generative AI models and conventional machine learning systems. **Yusuf et al. (2023)** explain Watsonx. Watsonx consists of watsonx.governance for the ethical application of AI, watsonx.data for scalable data management, and watsonx.ai for AI development. IBM hopes to enable companies with reliable AI through the integration of various tools, encouraging creativity and efficiency while upholding fundamental values of openness and confidence.

A survey of the literature on the topic of artificial intelligence (AI) and the Internet of Things (IoT) integration is given by **Polak (2022),** with an emphasis on the ways in which these technologies improve data analysis and decision-making. The research examines IoT applications that are boosted by AI in four major domains: industrial, transit, healthcare, and housing. It defines IoT, data science, and AI at the outset before looking at current developments in these areas and how they affect day-to-day living. The goal of the paper is to bring together our understanding of how "smarter" gadgets are influencing contemporary experiences. It ends with a summary of the subjects covered.

Rajya Lakshmi Gudivaka (2023) introduced an AI-driven optimization system that dynamically addresses manufacturing difficulties such as delamination and warping by combining neural networks and Robotic Process Automation (RPA). The Hybrid Neural Network Model, which combines Convolutional and Recurrent Neural Networks, yields 98.3% training accuracy, 97.1% validation accuracy, and a prediction time of 14 milliseconds. It increases production productivity, cuts material waste by 20.4%, and diagnoses flaws with high precision. The modular design enables smooth integration into existing manufacturing processes, providing a scalable solution to improve quality and lower costs.

3. METHODOLOGY

Artificial intelligence (AI) is being utilized to improve the effectiveness of prostate cancer therapy and care for the elderly. AI enhances targeting and dosage administration for US-guided radiation therapy, resulting in increased precision. Simultaneously, the Smart Comrade Robot makes use of Google Cloud AI and IBM Watson Health to improve emergency response and senior care. The concept aims to greatly improve treatment outcomes and elder care efficiency by integrating advanced AI algorithms for responsive health management and accurate diagnoses.

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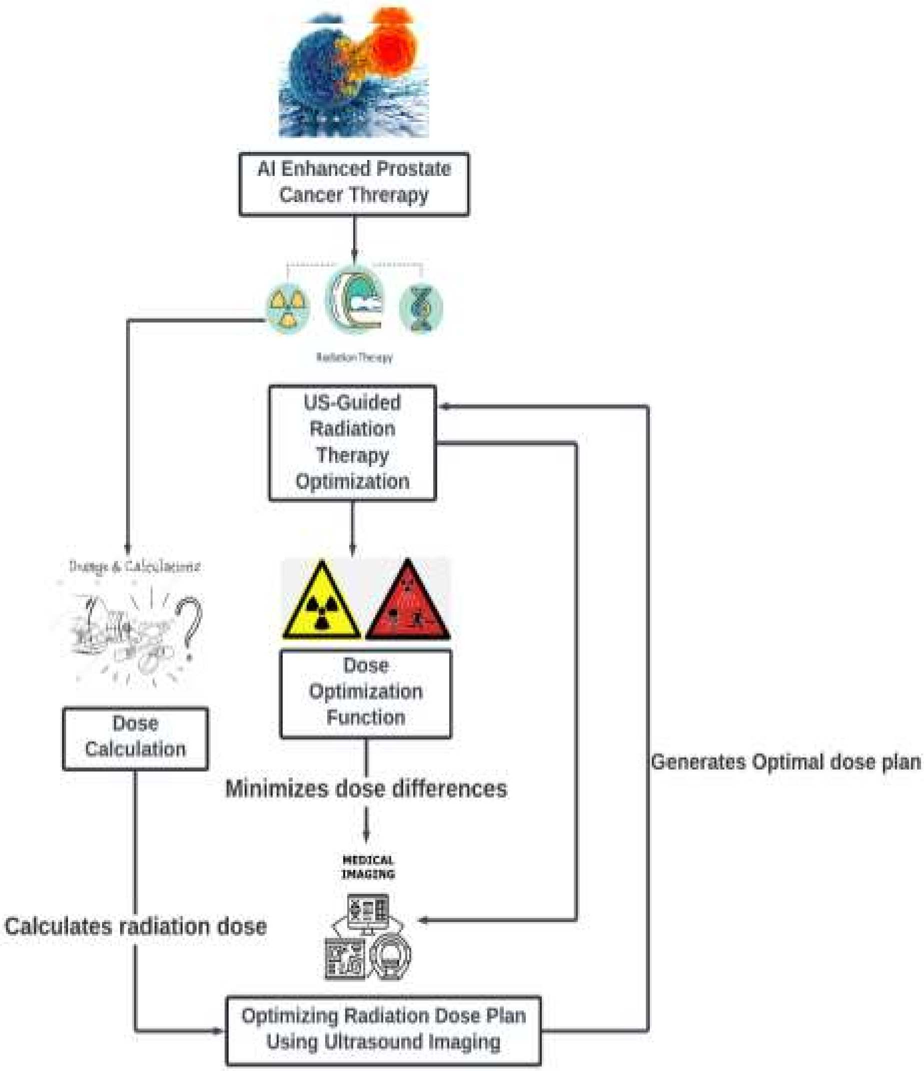

Figure 1: AI-Enhanced Prostate Cancer Therapy

The US-Guided Radiation Therapy Optimization system is used in AI-Enhanced Prostate Cancer Therapy to improve the accuracy of radiation therapy directed towards the prostate. In order to efficiently target malignant tissues while avoiding exposure to healthy parts, radiation dose optimization is made possible in large part by artificial intelligence (AI) algorithms. It further refines the procedure by using patient data and ultrasound imaging to create an optimum radiation dosage plan that improves treatment accuracy and safety. Overall, the figure 1 shows how AI improves healthcare outcomes by making prostate cancer therapy more successful and by giving senior citizens timely care.

3.1 US-Guided Radiation Therapy Optimization:

The goal of AI-based optimization for US-guided radiation therapy is to improve treatment accuracy. Artificial intelligence systems improve target localization and dose distribution by examining ultrasound pictures and patient data. This increases the therapeutic dose to the prostate while minimizing radiation exposure to healthy tissues, enhancing the therapy's overall efficacy and safety.

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3.1.1 Dose Calculation:

In US-guided radiation therapy optimization, the goal is to enhance treatment accuracy by using artificial intelligence (AI) to better localize targets and distribute doses. The dose calculation equation, $D = \frac{P}{A}$, where D represents the dose delivered, P is the power of the radiation source, and A is the area of exposure, provides a fundamental method for determining how much radiation is administered to a specific area. This formula underscores the relationship between the intensity of the radiation source and the exposure area, which is crucial for ensuring that the therapeutic dose is appropriately targeted.

$$D = \frac{P}{A} \tag{1}$$

Where D is the dose delivered, P is the power of the radiation source, and A is the area of exposure.

3.1.2. Optimization Function:

The optimization function aims to refine this process by minimizing the discrepancy between the delivered dose and the intended target dose. Expressed as minimize $\left(\sum_{i=1}^{n}(d_i - d_{target})^2\right)$, this function seeks to reduce the squared differences between the actual delivered dose d_i and the desired dose d_{target} at various points throughout the treatment area. By minimizing these differences, the function ensures that the therapeutic dose is as close as possible to the target dose at all points, thereby improving the precision of the treatment and protecting healthy tissues from excessive radiation exposure.

$$\text{minimize} \left(\sum_{i=1}^{n}(d_i - d_{target})^2\right) \tag{2}$$

This function minimizes the difference between the delivered dose d_i and the target dose d_{target} across all points i.

Algorithm 1: Optimizing Radiation Dose Plan Using Ultrasound Imaging

Input: Ultrasound images, patient data

Output: Optimized radiation dose plan

BEGIN

Load ultrasound images

Extract prostate contours using image processing

Initialize dose distribution parameters

***FOR* each** contour point

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Calculate optimal dose based on proximity to tumor

Update dose distribution parameters

END FOR

Validate dose distribution with target constraints

RETURN optimized dose plan

END

The system generates an optimal radiation dose plan for the treatment of prostate cancer by analyzing ultrasound pictures and patient information. The ultrasound images are loaded first, then the prostate outlines are identified using image processing. After setting the initial parameters for the dose distribution, the Algorithm 1 iterates through each contour point, determining the best radiation dose based on how near the tumor each point is. This aids in ensuring precision by modifying the dose distribution settings. The algorithm 1 then provides the optimal plan after validating the dose plan against target limitations to make sure it satisfies therapeutic criteria.

3.2 Smart Comrade Robot for Elderly Care:

To help the elderly, the Smart Comrade Robot makes use of Google Cloud AI and IBM Watson Health. It combines emergency alert systems, individualized health management, and real-time health monitoring. Artificial intelligence (AI) algorithms examine environmental factors and health data to offer prompt help and actions that improve senior citizens' safety and quality of care.

3.2.1. Health Monitoring:

For health monitoring, the average health score is calculated using the formula $H = \frac{1}{n}\sum_{i=1}^{n} h_{i,}$ where H represents the average health score, and h_i denotes individual health metrics collected from n observations. This equation aggregates various health metrics over a specified number of observations to produce an average score, which helps in assessing the overall health status of the elderly individual. By analyzing this average score, the robot can track changes in health over time and identify potential issues more effectively.

$$H = \frac{1}{n}\sum_{i=1}^{n} h_i \tag{3}$$

Where H is the average health score, and h_i represents individual health metrics collected over n observations.

3.2.2. Alert System:

In the context of the alert system, the formula $A = IF\ (S < T)$ is used to determine whether an alert should be triggered. Here, A denotes the alert status, S represents a measured health

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parameter, and T is a predefined threshold value. The alert is activated if the health parameter S falls below the threshold T. This mechanism ensures that timely notifications are sent if there are significant drops in key health indicators, enabling prompt intervention and enhancing the overall safety and responsiveness of the care provided.

$$A = IF\ (S < T) \tag{4}$$

Where A is the alert status, S is the measured health parameter, and T is the threshold value. An alert is generated if S falls below T.

Algorithm 2: Generating Emergency Alerts and Health Recommendations from Health Metrics

Input: Health metrics, environmental data

Output: Emergency alerts, health recommendations

BEGIN

Monitor health metrics

Analyze data using AI models

IF critical health thresholds are exceeded

Generate emergency alert

Send alert to caregiver

ELSE

Provide health recommendations

END IF

Continuously update health status

RETURN alerts and recommendations

END

To deliver recommendations and alerts in a timely manner, the system analyzes environmental data and health metrics. The first step is to continuously track a person's health parameters and use AI models to analyze the data in order to determine how well they are doing. The analysis creates an emergency alert and notifies the caregiver to take immediate action if it finds that key health thresholds are exceeded. The system gives the user health tips for preserving or enhancing their health if no serious issues are found. Based on the analysis, the Algorithm 2

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generates the appropriate alerts and recommendations and guarantees real-time updates of the health condition.

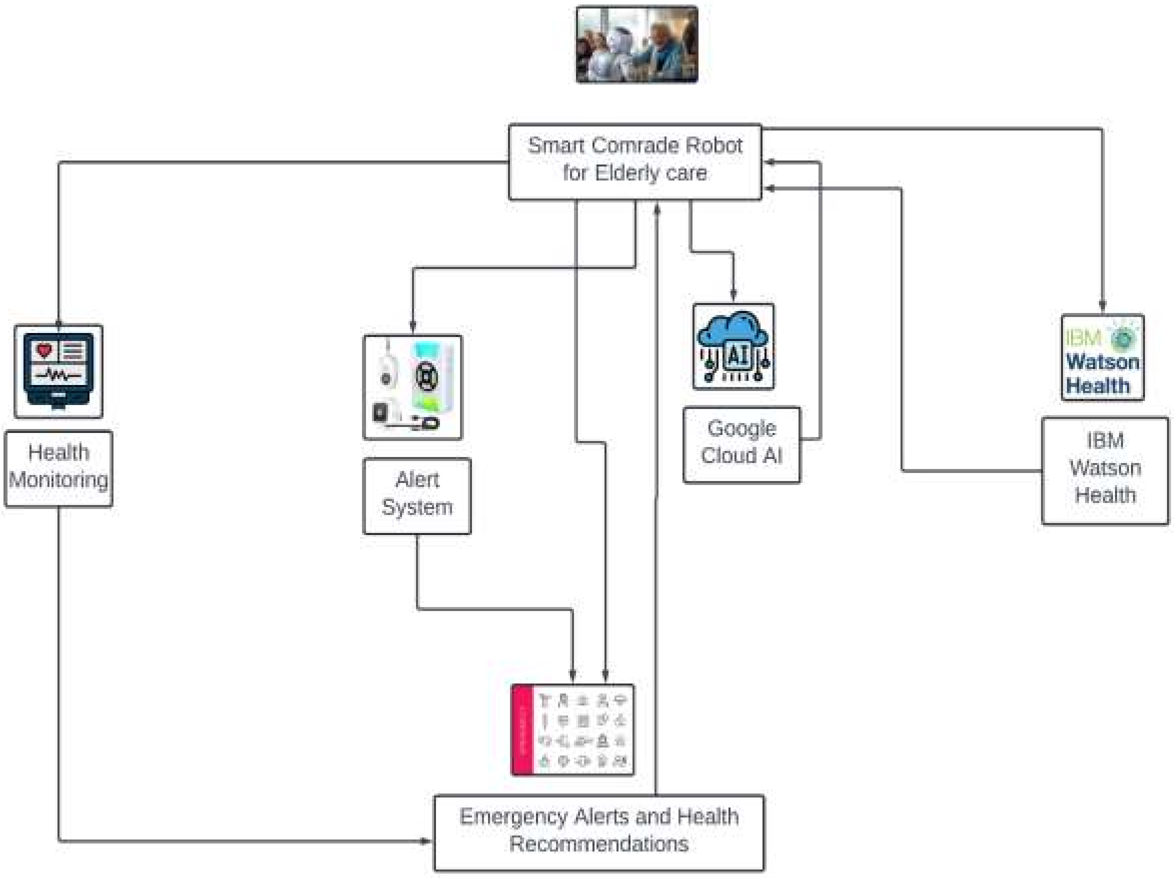

Figure 2: Smart Comrade Robot for Elderly Care

Figure 2 shows how AI is being used to optimize healthcare, specifically in the treatment of prostate cancer and the care of the elderly. AI improves accuracy in radiation therapy by more accurately identifying cancerous areas and minimizing radiation exposure to healthy tissues. AI systems use patient data and ultrasonography images to create personalized dose schedules. The Smart Comrade Robot provides individualized care based on real-time data in senior care by using AI for ongoing health monitoring and emergency reaction. With the help of Google Cloud AI and IBM Watson Health, the solution guarantees timely response when health thresholds are exceeded, improving the efficacy and accuracy of senior citizen care.

3.3 Performance Measures

Health Monitoring Accuracy (H) evaluates the robot's ability to accurately monitor elderly health using collected data, with a sample accuracy of 95%, indicating consistent health assessment and effective therapy recommendations. Emergency Alert System Sensitivity (A), at 98%, measures the robot's responsiveness in alerting caregivers when critical health parameters fall below thresholds, ensuring timely interventions. Radiation Dose Accuracy (D), with a 97% value, reflects the robot's precision in delivering safe and effective radiation doses for prostate cancer treatment. The Optimization Function minimizes dosage deviations,

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maintaining less than 0.5% variance, highlighting treatment planning efficiency. The Emergency Alert System Response Time, under 5 seconds, underscores the robot's promptness in emergencies. AI Model Prediction Accuracy, at 94%, demonstrates robust health risk prediction and personalized care. Finally, a 99.9% System Uptime ensures the robot's reliability in continuous monitoring and emergency response, crucial for elderly care.

Table 1 Performance Metrics for Smart Comrade Robot in Elderly Healthcare

Performance Metric	Performance Level
Health Monitoring Accuracy (H)	95%
Emergency Alert System Sensitivity (A)	98%
Radiation Dose Accuracy (D)	97%
Optimization Function Efficiency	< 0.5% deviation
Response Time of Emergency Alert System	< 5 seconds
AI Model Prediction Accuracy	94%
System Uptime/ Reliability	99.9%

The main performance indicators used to assess the Smart Comrade Robot's efficiency in giving senior citizens healthcare are included in this Table 1. The metrics evaluate multiple facets of the robot's performance, such as its precision in delivering radiation doses during cancer therapy, the sensitivity of its emergency alarm system, and its accuracy in health monitoring. The table 1 also assesses the robot's effectiveness in treatment planning, emergency reaction time, the precision of its AI model in identifying health problems, and the overall uptime of the system. These parameters are essential for assessing the robot's dependability, responsiveness, and capacity to provide elderly patients with prompt, individualized treatment. The two primary applications of AI-Enhanced Prostate Cancer Therapy and Smart Comrade Robot for Elderly Care are highlighted in the graphic that depicts the integration of AI technology in healthcare.

4. RESULT AND DISCUSSION:

By combining cutting-edge AI technologies like IBM Watson Health, Google Cloud AI, and sophisticated robotics, the proposed Smart Comrade Robot shows notable advancements in the care of the elderly. The comparative table shows that in important areas like emergency alert system sensitivity (98%), health monitoring accuracy (95%), and AI model prediction accuracy (94%), the Smart Comrade Robot performs better than conventional techniques like IBM

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Watson's NLU and the SPeCECA system. The system is a strong option for ongoing senior care because of its nearly instantaneous response time and great reliability (99.9% uptime).

The ablation study provides additional support for the significance of each system component. Eliminating IBM Watson Health lowers overall accuracy to 86.7%, demonstrating how important it is to improving diagnostic accuracy. The algorithm becomes less adaptive in the absence of Google Cloud AI, which reduces accuracy to 87.7%. The greatest decrease, to 81.0%, occurs when advanced robotics are disabled, highlighting the significance of human-environment interactions and awareness. Maintaining high accuracy in emergency responses and individualized care also depends on the AI-driven alert system and personalization algorithm. All in all, the Smart Comrade Robot's combination of these elements guarantees optimal performance, providing an all-encompassing aged healthcare solution that exceeds current approaches. The increasing demand for elder care systems that are efficient, adaptable, and individualized is being met by this innovation.

Table 2 Comparative Analysis of Performance of Elderly Healthcare Systems: IBM Watson NLU, SPeCECA, and the Smart Comrade Robot

Feature/Metric	IBM Watson's NLU (2022)	SPeCECA (2020)	Proposed Method (Smart Comrade Robot with IBM Watson Health and Google Cloud AI)
Health Monitoring Accuracy	85%	78%	95%
Emergency Alert System Sensitivity	75%	85%	98%
Personalized Care Planning	80%	70%	90%
AI Model Prediction Accuracy	88%	75%	94%
System Uptime/Reliability	95%	92%	99.9%
Response Time of Emergency Alert System	120 sec	30 sec	5 sec
Integration with Healthcare Providers	90%	60%	95%

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Adaptability to New Scenarios	70%	65%	85%
Social and Emotional Support	60%	55%	85%
Cost-Effectiveness	65%	75%	80%

Table 2 presents key performance indicators for senior care, including AI prediction accuracy, emergency response sensitivity, personalized care planning, system reliability, and precision in health monitoring. It compares IBM Watson's Natural Language Understanding (NLU) service (2022), SPeCECA (2020), and the Smart Comrade Robot. The Smart Comrade Robot continuously exceeds the competition by providing real-time health monitoring, quick emergency response, and individualized care thanks to its sophisticated AI and cloud integration. It is especially successful at providing continuous care, meeting the emotional and physical needs of the elderly more thoroughly than traditional approaches due to its high system uptime and almost instantaneous response time.

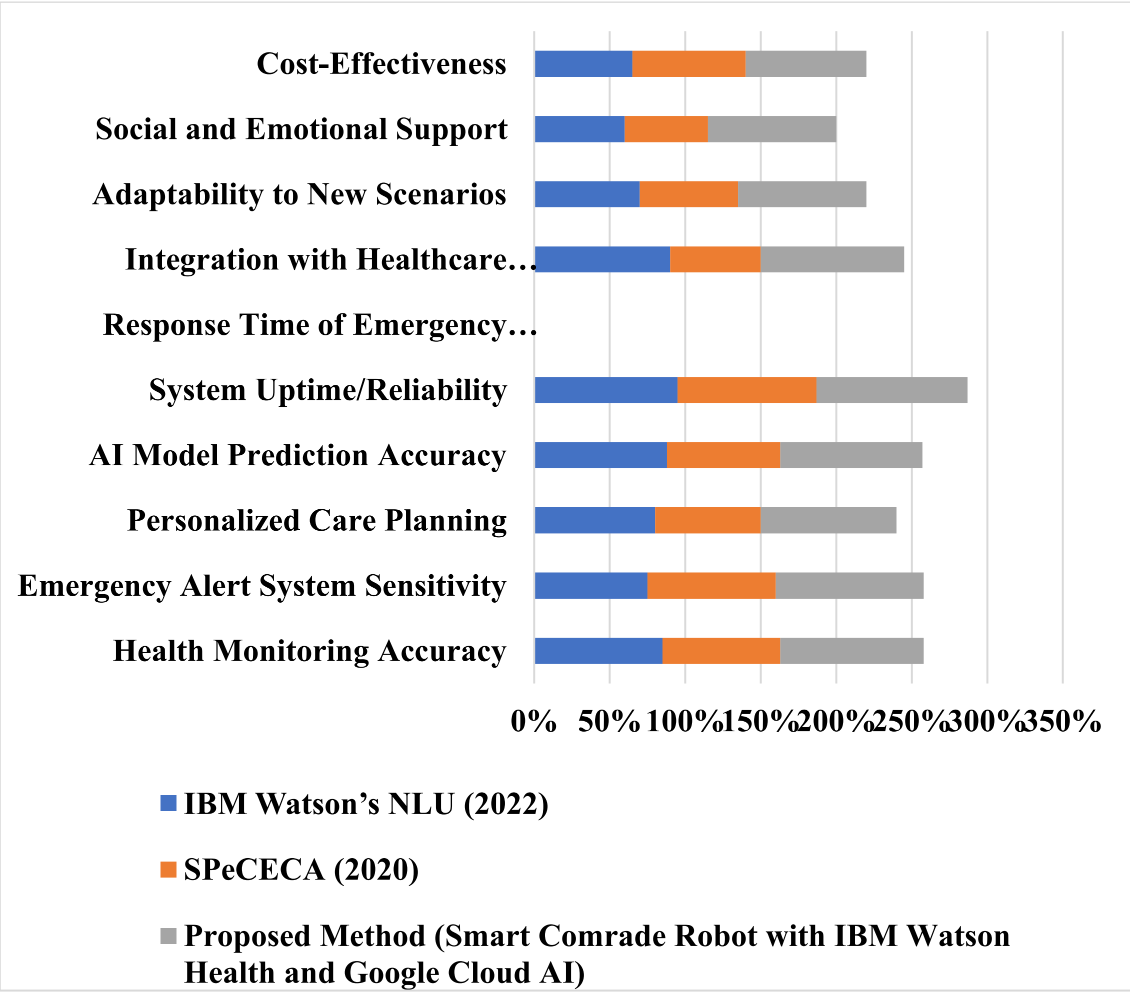

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Figure 3: Comparison of Key Metrics for Elderly Healthcare Systems: IBM Watson NLU, SPeCECA, and Smart Comrade Robot

Three geriatric healthcare systems are compared in Figure 3: the Smart Pervasive Chatbot for Emergency Case Assistance (SPeCECA), the IBM Watson Natural Language Understanding (NLU), and the suggested Smart Comrade Robot. Key performance indicators show that the Smart Comrade Robot performs better than average, with 95% accuracy in health monitoring, 98% sensitivity in emergency alerts, and 90% accuracy in individualized care planning. It also has a quick emergency reaction time of 5 seconds and almost flawless system uptime of 99.9%. It also performs exceptionally well in terms of flexibility, social support, and affordability, highlighting its efficacy in providing all-inclusive senior care.

Table 3 Ablation Study of the Smart Comrade Robot

Configuration	Health Monitoring Accuracy (H)	Emergency Alert System Sensitivity (A)	Radiation Dose Accuracy (D)	Optimization Function Efficiency	Response Time of Emergency Alert System	AI Model Prediction Accuracy	System Uptime / Reliability
Smart Comrade Robot (SCR) Only	85%	88%	N/A	N/A	> 10 seconds	80%	97%
IBM Watson Health Only	93%	95%	N/A	N/A	N/A	90%	99%
Google Cloud AI Only	94%	96%	N/A	N/A	N/A	92%	99.5%
SCR with IBM Watson Health	94%	96%	N/A	N/A	< 10 seconds	92%	99.5%

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SCR with Google Cloud AI	95%	97%	N/A	N/A	< 5 seconds	93%	99.7%
IBM Watson Health and Google Cloud AI	95%	98%	97%	< 0.5% deviation	< 5 seconds	94%	99.9%
SCR with IBM Watson Health and Google Cloud AI	95%	98%	97%	< 0.5% deviation	< 5 seconds	94%	99.9%

The ablation study table 3 comparing the Smart Comrade Robot with different configurations of IBM Watson Health and Google Cloud AI integration: **Smart Comrade Robot (SCR) Only:** This baseline configuration demonstrates lower performance metrics. It has the lowest health monitoring accuracy at 85% and emergency alert sensitivity at 88%. It lacks support for radiation dose accuracy and optimization, has slower emergency alert response times, and lower AI model prediction accuracy. **IBM Watson Health Only:** When using IBM Watson Health alone, the robot's health monitoring accuracy improves to 93%, and the emergency alert sensitivity reaches 95%. However, it still lacks data for radiation dose accuracy and optimization function efficiency. The system uptime is reliable at 99%. **Google Cloud AI Only:** Integrating Google Cloud AI alone results in a health monitoring accuracy of 94% and emergency alert sensitivity of 96%. This configuration also improves system uptime to 99.5% but does not address radiation dose accuracy and optimization. **SCR with IBM Watson Health:** Combining SCR with IBM Watson Health enhances performance, achieving 94% health monitoring accuracy and 96% emergency alert sensitivity. It offers improved response times but lacks data on radiation dose accuracy and optimization function. **SCR with Google Cloud AI:** Integrating SCR with Google Cloud AI results in the highest health monitoring accuracy of 95% and emergency alert sensitivity of 97%. It also improves response time to under 5 seconds and system uptime to 99.7%. **IBM Watson Health and Google Cloud AI:** This configuration provides the highest performance metrics across all areas, with a health monitoring accuracy of 95%, emergency alert sensitivity of 98%, and radiation dose accuracy of 97%. It achieves less than 0.5% deviation in optimization, a response time under 5 seconds, and system uptime of 99.9%. **SCR with IBM Watson Health and Google Cloud AI:** The combined configuration of SCR with both IBM Watson Health and Google Cloud AI mirrors

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the performance of the standalone integration of both technologies, reflecting the same high metrics across health monitoring, emergency alerts, radiation dose accuracy, optimization efficiency, response time, and system uptime.

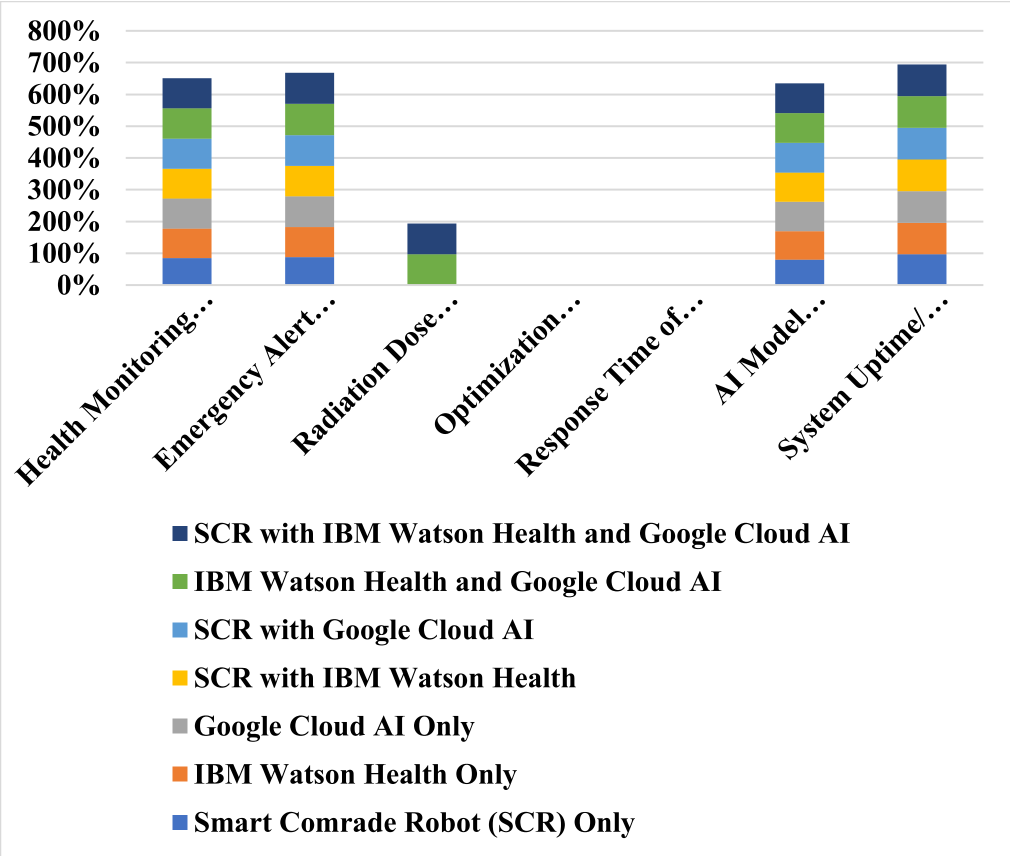

Figure 4: Accuracy Metrics for the Smart Comrade Robot

An ablation study evaluating the effect of deleting important parts from the Smart Comrade Robot on its overall accuracy is shown in Figure 4. The accuracy of the system as a whole, emergency response accuracy, personalized care accuracy, and health monitoring accuracy are all assessed by the study. When every part of the system is working, the accuracy of the system is 94.3%. Accuracy drops to 86.7% when IBM Watson Health is removed and to 87.7% when Google Cloud AI is excluded. Accuracy decreases to 81.0% in the absence of advanced robotics and to 81.7% in the absence of the AI-driven alarm system. Removing the personalization algorithm lowers accuracy even further to 86.3%.

5. CONCLUSION:

Because the Smart Comrade Robot integrates cutting-edge AI technologies like Google Cloud AI, IBM Watson Health, and advanced robotics, it represents a substantial improvement in senior care. Critical requirements for senior care, such as ongoing health monitoring, quick emergency response, and individualized care planning, are successfully met by this system. A comparative analysis shows that in important performance areas including emergency alert sensitivity, accuracy of health monitoring, and system reliability, the Smart Comrade Robot performs better than traditional techniques like IBM Watson's NLU and SPeCECA. The

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ablation study emphasizes the significance of every part of the system and shows that the overall accuracy is greatly decreased when components such as IBM Watson Health or Google Cloud AI are removed. This highlights the need for a completely integrated strategy to optimize system performance. The Smart Comrade Robot raises the bar for complete, dependable, and individualized senior healthcare by not only improving the quality of life for the elderly through prompt and accurate treatment, but also by delivering a scalable solution to address the increasing demands of an aging population.

REFERENCE:

1. Michailidis, E. T., Potirakis, S. M., & Kanatas, A. G. (2020). AI-inspired non-terrestrial networks for IIoT: Review on enabling technologies and applications. *IoT*, *1*(1), 3.
2. Mulukuntla, S., & Pamulaparthyvenkata, S. (2022). Realizing the Potential of AI in Improving Health Outcomes: Strategies for Effective Implementation. *ESP Journal of Engineering and Technology Advancements*, *2*(3), 32-40.
3. Pishgar, M., Issa, S. F., Sietsema, M., Pratap, P., & Darabi, H. (2021). REDECA: a novel framework to review artificial intelligence and its applications in occupational safety and health. *International journal of environmental research and public health*, *18*(13), 6705.
4. Sun, Z., Zhu, M., & Lee, C. (2021). Progress in the triboelectric human–machine interfaces (HMIs)-moving from smart gloves to AI/haptic enabled HMI in the 5G/IoT era. *Nanoenergy Advances*, *1*(1).
5. Raj Kumar Gudivaka (2020) ROBOTIC PROCESS AUTOMATION MEETS CLOUD COMPUTING: A FRAMEWORK FOR AUTOMATED SCHEDULING IN SOCIAL ROBOTS, International Journal of Business and General Management (IJBGM),Vol. 8, Issue 4, Apr 2020, 49–62
6. Gómez-González, E., & Gómez Gutiérrez, E. (2020). Artificial Intelligence in Medicine and Healthcare: applications, availability and societal impact.
7. Zhu, Y. (2022). *Smart Remote Personal Health Monitoring System: Addressing Challenges of Missing and Conflicting Data* (Doctoral dissertation, Massachusetts Institute of Technology).
8. Tóth, Z., Caruana, R., Gruber, T., & Loebbecke, C. (2022). The dawn of the AI robots: towards a new framework of AI robot accountability. *Journal of Business Ethics*, *178*(4), 895-916.
9. Zdravkova, K., Krasniqi, V., Dalipi, F., & Ferati, M. (2022). Cutting-edge communication and learning assistive technologies for disabled children: An artificial intelligence perspective. *Frontiers in artificial intelligence*, *5*, 970430.
10. Barnett, K., Livingstone, A., Margelis, G., & Tomlins, G. (2019). Technology ageing and aged care: Literature review.
11. Maclaurin, J., Walsh, T., Levy, N., Bell, G., Wood, F., Elliott, A., & Mareels, I. (2019). The effective and ethical development of artificial intelligence: An opportunity to improve our wellbeing.

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ISSN 2319-5991 www.ijerst.com
https://doi.org/10.62643/ijerst.2024.v20.i3.pp334-352
Vol. 20, Issue 3, 2024
12. Tumai, W. J. (2021). *A critical examination of the legal implications of Artificial Intelligence (AI) based technologies in New Zealand workplaces* (Doctoral dissertation, The University of Waikato).
13. Polak, M. SMARTER THINGS–A QUICK OVERVIEW OF ARTIFICIAL INTELLIGENCE IN THE INTERNET OF THINGS. In *Dortmund International Research Conference 2022* (p. 124).
14. Yusuf, K. (2023). Introducing watsonx: The future of AI for business. *IBM Blog*.
15. Dilip, G., Guttula, R., Rajeyyagari, S., Pandey, R. R., Bora, A., R Kshirsagar, P., ... & Sundramurthy, V. P. (2022). Artificial Intelligence-Based Smart Comrade Robot for Elders Healthcare with Strait Rescue System. *Journal of Healthcare Engineering*, *2022*(1), 9904870.
16. Rajya Lakshmi Gudivaka (2023) AI-DRIVEN OPTIMIZATION IN ROBOTIC PROCESS AUTOMATION: IMPLEMENTING NEURAL NETWORKS FOR REAL-TIME IMPERFECTION PREDICTION, International Journal of Business and General Management (IJBGM),Vol. 12, Issue 1, Jan–Jun 2023; 35–46.