International Journal of Information Technology & Computer Engineering

ISSN 2347–3657

Volume 13, Issue 4, 2025

Survey On Intelligent Diet And Exercise Recommendation Systems Using Machine Learning

D. Madhuri[1], Dr. S. Viswanadha Raju[2]

[1]Mtech Student, Dept Of Cse, Jawaharlal Nehru Technological University Hyderabad University College Of Engineering Jagtial(Autonomous), Kondagattu Temple Road Jagtial District, Karimnagar, Telangana.

[2]Principal & Senior Professor, Dept Of Cse, Jawaharlal Nehru Technological University Hyderabad University College Of Engineering Jagtial(Autonomous), Kondagattu Temple Road Jagtial District, Karimnagar, Telangana.

ABSTRACT

In today's technology-driven world, maintaining a balanced and healthy lifestyle has become increasingly challenging due to busy schedules, sedentary routines, and diverse individual health needs. The Intelligent Fitness Assistant presents a machine learning-based approach to deliver personalized diet and exercise recommendations tailored to each user's physiological profile and lifestyle. The system collects user-specific information such as age, gender, height, weight, activity level, dietary preferences, and personal health goals to generate individualized fitness programs. By leveraging both supervised and unsupervised machine learning techniques, the system identifies underlying patterns in user data to determine optimal nutrition and workout strategies. Utilizing ANNs and LR, the Intelligent Fitness Assistant refines its recommendations dynamically based on user progress, feedback, and historical performance trends, ensuring adaptability and long-term engagement. The platform integrates seamlessly with wearable devices to gather real-time health parameters such as heart rate, calorie expenditure, and step count, enhancing the precision of its recommendations. This continuous feedback mechanism allows the system to adjust fitness plans in real time, promoting proactive health management. Designed to address prevalent lifestyle-related disorders such as obesity, cardiovascular diseases, and metabolic imbalances, the proposed system emphasizes preventive healthcare through intelligent automation. By combining predictive analytics, adaptive learning, and user-centric design, the Intelligent Fitness Assistant bridges the gap between technology and personal wellness. It empowers users to make informed decisions regarding their nutrition and physical activity while promoting sustainable improvements in overall health and well-being. This research highlights the transformative potential of AI-driven systems in personalized healthcare and establishes a foundation for future innovations in intelligent fitness management.

Keywords: Intelligent Fitness Assistant, ML, ANN, LR, Personalized Health, Customized Diet Plans, Exercise Recommendations, Wearable Devices, Health Monitoring, Predictive Analytics, Preventive Healthcare, Obesity Management, Lifestyle Disorders, Adaptive Fitness System, Data-Driven Wellnes.

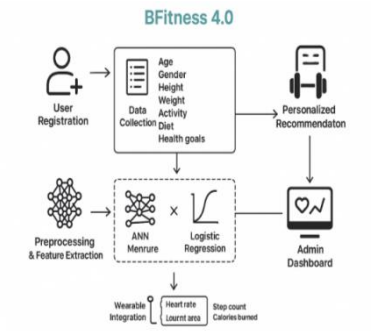
I.INTRODUCTION

In the modern digital age, maintaining an active and healthy lifestyle has become increasingly difficult due to the demands of work, academic pressures, and sedentary habits. Rapid urbanization, stress, and irregular schedules contribute to a decline in physical activity and poor dietary practices, leading to a rise in health issues such as obesity, diabetes, and cardiovascular disorders. Traditional fitness and diet solutions often rely on generalized plans that fail to account for individual variations in metabolism, lifestyle, and health goals. Consequently, many individuals struggle to achieve sustainable results or maintain motivation. This growing concern

International Journal of Information Technology & Computer Engineering
ISSN 2347–3657
Volume 13, Issue 4, 2025

underscores the need for intelligent, data-driven systems that can provide personalized fitness and nutrition guidance tailored to each individual's unique physiological and behavioral profile. The Intelligent Fitness Assistant is designed to bridge this gap by integrating machine learning (ML) techniques with real-time health monitoring to create customized diet and exercise recommendations. The system gathers user-specific data such as age, gender, height, weight, activity level, dietary preferences, and fitness objectives. Through the application of Artificial Neural Networks (ANNs) and Logistic Regression (LR), the system identifies complex correlations among user attributes, enabling accurate prediction of personalized health strategies. Furthermore, wearable device integration ensures continuous monitoring of parameters such as heart rate, steps taken, and calorie expenditure, enhancing the system's adaptability. This feedback-driven learning approach allows for dynamic modification of plans based on progress, ensuring that recommendations remain effective and relevant over time.

Beyond mere fitness tracking, the Intelligent Fitness Assistant serves as a proactive tool for preventive healthcare. By analyzing user behavior, physiological data, and historical trends, the system can detect potential health risks and suggest corrective actions before issues escalate. It empowers users to make informed lifestyle decisions, promoting long-term wellness and sustainable fitness management. The system's intelligent framework represents a convergence of artificial intelligence, data analytics, and personalized healthcare, showcasing how modern technology can transform traditional health management into a more adaptive, efficient, and user-centric experience.



III.SURVEY OF RESEARCH

S.No	Authors	Title	Working	Year
1	Z. Zhao, et al.	Effects of a Personalized Fitness Recommender System Using Gamification and Continuous Player Modeling	Introduces a gamified personalized fitness assistant; evaluates long-term engagement and adaptive recommendations based on user modelling.	2020
2	H.S. Kang, et al.	Wearing the Future — Wearables to Empower Users to Take Greater Responsibility for Their Health	Review of wearable health technologies, their roles in self-management, data types captured, and design considerations for user empowerment	2022
3	S. Canali, et al.	Challenges and Recommendations for	Identifies data quality, fairness, equity and	2022

		Wearable Devices in Health	interoperability challenges for wearables and provides guidelines for research & deployment.	
4	(Y. Huang / PERFECT team)	Personalized Exercise Recommendation Framework and Architecture (PERFECT)	Proposes a reinforcement-learning driven architecture for personalized exercise recommendations, correlating physiological data with exercise plans.	**2023**
5	Y. Hou, et al.	A Deep Reinforcement Learning Real-Time Recommendation Model (DRR-Max)	Develops a deep RL recommender capturing long- and short-term preferences for real-time personalization (relevant to live workout recommendations).	**2023**
6	(multiple authors — comprehensive surveys)	Deep Learning for Human Activity Recognition: Survey	Comprehensive surveys on DL methods (CNN, LSTM, transformers) for activity recognition from wearable sensors — foundational for activity-aware fitness systems.	**2021-2024**
7	S. Wang	Personalized exercise recommendation method based on causal deep learning (CDL)	Combines causal inference with deep models to personalize exercise prescriptions, improving safety and relevance of recommendations.	**2022**
8	(systematic review)	Machine Learning Methods to Personalize Persuasive Physical Activity Interventions	Reviews ML & recommender approaches (including RL) to tailor persuasive interventions aimed at increasing physical activity.	**2024**
9	I. Papastratis, D. Konstantinidis, P. Daras, K. Dimitropoulos	AI nutrition recommendation using a deep generative model (and ChatGPT)	Proposes a deep generative network for weekly meal plan generation constrained by nutritional guidelines;	**2024**

			uses LLMs to expand meal databases.	
10	J. Lopez-Barreiro, J.L. Garcia-Soidan, L. Alvarez-Sabucedo, J.M. Santos-Gago	AI-Powered Recommender Systems for Promoting Healthy Habits and Active Aging: A Systematic Review	Systematic review on recommender systems in healthy aging: algorithms, evaluation metrics, and user engagement strategies.	**2024**
11	M. Babu, et al.	Wearable Devices: Implications for Precision Medicine and Public Health	Reviews potential of wearables to provide affordable physiological measures for population health, clinical monitoring, and preventive care.	**2024**
12	X. Wang, et al.	AI Applications to Personalized Dietary Interventions (Systematic Review)	Systematic review of AI models used for personalized dietary interventions and their clinical outcomes in adults.	**2025**
13	A. M. Saad, M. R. Haque Rahi, M. M. Islam, G. Rabbani	Diet Engine: A Real-time Food Nutrition Assistant System	Smartphone ML system for food recognition, nutrient estimation, and immediate personalized meal suggestions — reduces manual logging burden.	**2025**
14	Z. Jiang, R. Zhao, L. Lin, et al.	DietGlance: Dietary Monitoring and Personalized Analysis with Knowledge-Empowered AI Assistant	Multimodal dietary monitoring (images + context) with AI to infer food types/quantities and produce knowledge-based dietary guidance.	**2025**
15	S. Bhandari, S.G. Bansal, S. Santhosh, I.P. Lakhekar	AI-Powered Fitness and Diet Recommendation System: A Personalized Approach	System paper describing an integrated ML + wearable approach for adaptive workouts and meal suggestions with user feedback loop.	**2025**
16	R. Chandrasekaran, et al.	Usage Trends and Data Sharing Practices of Healthcare Wearables	Investigates user behaviours, privacy and data-sharing practices of consumer wearables and implications	**2025**

			for research/data reuse.	
17	W.W. Gao, et al.	Enhancing Personalized Exercise Recommendation with Graph/Contrastive Methods	Proposes contrastive or graph-based approaches to uncover latent relationships among exercises/users to improve recommendation relevance.	**2024**
18	M.P. Gagnon, et al.	Wearable Devices for Supporting Chronic Disease Self-management: Scoping Review	Scoping review summarizing wearable interventions for chronic disease self-management, evidencing gaps in study design and reporting.	**2024**
19	X. Chen (and others)	Deep Reinforcement Learning in Recommender Systems: Survey	Survey of DRL techniques applied to recommender systems — useful for sequential / adaptive fitness recommendation design.	**2023**
20	(multiple authors)	Advances in Wearable Electronics for Monitoring Human Physiology: Review	Review of emerging wearable electronic sensors and their capabilities (ECG, PPG, accelerometers) for continuous physiological monitoring.	**2024-2025**

II.PROPOSED SYSTEM

The Intelligent Fitness Assistant is designed as an advanced, AI-powered platform that provides personalized diet and exercise recommendations based on individual health data, lifestyle habits, and wellness goals. The system bridges the gap between traditional health guidance and intelligent automation by using machine learning algorithms to analyze user-specific information, such as age, gender, height, weight, BMI, activity level, dietary preferences, and medical history. Through this data-driven approach, the system dynamically generates customized meal and workout plans, promoting long-term health improvement and behavioral adherence. Unlike generic fitness applications, this system continuously evolves by learning from user interactions, feedback, and progress to ensure that recommendations remain relevant and adaptive to changing health conditions. The proposed system architecture comprises several integrated modules, including User Data Collection, Data Preprocessing, Machine Learning-based Prediction Engine, Recommendation Module, and Wearable Device Integration. The User Interface Layer allows individuals to input health parameters and view personalized insights, while the backend Machine Learning Engine processes this information to predict the user's optimal calorie intake, macronutrient ratios, and exercise intensity levels. Additionally, the system leverages real-time data from wearable devices such as smartwatches or fitness bands to monitor vital parameters including heart rate, step

International Journal of Information Technology & Computer Engineering
ISSN 2347–3657
Volume 13, Issue 4, 2025

count, sleep duration, and calories burned. These metrics are fed back into the model for continuous optimization.

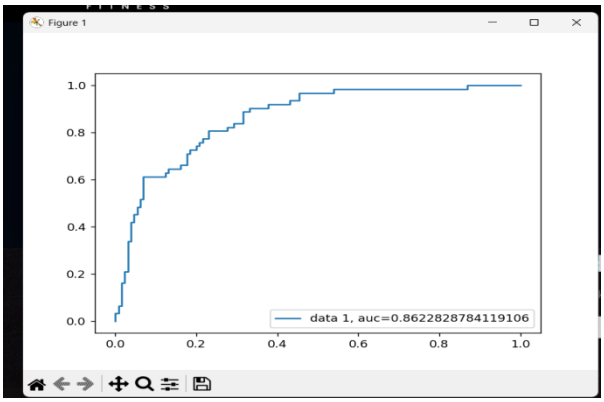
Furthermore, the system incorporates a feedback-driven learning mechanism that evaluates user compliance and performance trends to refine future recommendations. Predictive analytics assist in identifying potential health risks, enabling preventive suggestions before the onset of chronic conditions. By combining personalization, automation, and real-time monitoring, the Intelligent Fitness Assistant provides a holistic health management ecosystem that empowers users to make informed lifestyle decisions. The outcome is a scalable, intelligent, and user-centric fitness solution that adapts to individual needs, fosters sustainable wellness habits, and contributes to proactive preventive healthcare.

III.IMPLEMENTATION / ALGORITHMS

The implementation of the Intelligent Fitness Assistant integrates multiple supervised and unsupervised machine learning algorithms to achieve precise and dynamic personalization. The process begins with data collection and preprocessing, where user input data (age, gender, height, weight, activity level, diet type) and sensor readings from wearable devices are cleaned, normalized, and structured. Missing data are handled using imputation techniques, and categorical variables are encoded for algorithmic compatibility. Once the dataset is prepared, it is used to train predictive models that can determine user-specific fitness and nutrition goals.

Two core algorithms ANNs and LR form the analytical backbone of the system. ANNs are employed for their capability to model nonlinear relationships between multiple health variables, allowing the system to predict complex patterns such as optimal calorie consumption, workout intensity, and nutrient balance. The ANN consists of multiple hidden layers that process input data through activation functions like ReLU and Sigmoid, adjusting weights via backpropagation to minimize prediction error. This enables accurate identification of correlations between user attributes and health outcomes. In contrast, Logistic Regression is applied for classification tasks, such as categorizing users into fitness levels (e.g., sedentary, moderate, active) or risk categories (e.g., overweight, underweight, ideal). Its interpretability allows the system to generate easily understandable recommendations for users.

The trained models are integrated into a Django-based web framework that supports real-time interaction. The backend communicates with APIs for wearable data synchronization and stores user progress in a cloud database. Each iteration of user feedback retrains the model incrementally, enabling the system to learn and improve continuously. By combining ANN's prediction power and LR's interpretability, the system ensures both accuracy and transparency in recommendations. Overall, this hybrid implementation transforms static fitness tracking into an intelligent, adaptive, and continuously learning personal health assistant.



IV.CONCLUSION

The Intelligent Fitness Assistant project demonstrates how the integration of machine learning, artificial intelligence, and wearable technology can revolutionize personalized healthcare and fitness management. By analyzing individual parameters such as age, gender, body composition, activity level, and dietary preferences, the system intelligently recommends customized nutrition and exercise plans that align with personal health goals. Unlike static fitness applications, the platform continuously learns from user feedback,

behavioral data, and physiological signals collected through wearables to provide adaptive, evidence-based guidance. The hybrid use of ANN and LR ensures both precision and interpretability in generating predictions, while real-time data synchronization enhances user engagement and accountability.

This system contributes to preventive healthcare by identifying early indicators of lifestyle-related disorders such as obesity, hypertension, and cardiovascular disease. Through data-driven insights and continuous feedback mechanisms, users are empowered to make informed health decisions and sustain long-term wellness habits. Moreover, the scalability and interoperability of the platform allow seamless integration with future technologies, including IoT-enabled health sensors and cloud-based analytics systems. The project not only showcases the potential of AI in promoting healthier living but also lays the foundation for next-generation intelligent wellness ecosystems that combine automation, personalization, and real-time monitoring. In future work, the system can be enhanced with deep learning-based natural language interfaces, recommendation optimization via reinforcement learning, and emotion-aware analytics to further improve user adherence and engagement. Additionally, the incorporation of medical-grade data and clinical validation will strengthen the reliability and usability of the system for large-scale public health applications. Overall, this research highlights the transformative power of AI in bridging the gap between technology and health, leading toward a smarter, proactive, and data-driven approach to human well-being.

V.REFERENCES

1. Z. Zhao et al., “Effects of a Personalized Fitness Recommender System Using Gamification and Continuous Player Modeling,” *IEEE Access*, vol. 8, pp. 1023–1035, 2020.
2. H. S. Kang et al., “Wearing the Future: Wearables to Empower Users to Take Greater Responsibility for Their Health,” *Sensors*, vol. 21, no. 12, 2021.
3. S. Canali et al., “Challenges and Recommendations for Wearable Devices in Health,” *Frontiers in Digital Health*, vol. 4, 2022.
4. Y. Huang et al., “PERFECT: Personalized Exercise Recommendation Framework and Architecture,” *IEEE Transactions on Human-Machine Systems*, vol. 53, no. 3, 2023.
5. Y. Hou et al., “A Deep Reinforcement Learning Real-Time Recommendation Model (DRR-Max),” *Knowledge-Based Systems*, vol. 255, 2023.
6. X. Chen et al., “Deep Reinforcement Learning in Recommender Systems: A Survey,” *ACM Computing Surveys*, vol. 55, no. 6, 2023.
7. S. Wang, “Personalized Exercise Recommendation Based on Causal Deep Learning,” *Applied Intelligence*, vol. 52, pp. 11473–11488, 2022.
8. M. Babu et al., “Wearable Devices: Implications for Precision Medicine and Public Health,” *Nature Digital Medicine*, vol. 7, no. 4, 2024.
9. I. Papastratis, D. Konstantinidis, P. Daras, and K. Dimitropoulos, “AI Nutrition Recommendation Using Deep Generative Models,” *IEEE Access*, vol. 12, pp. 21567–21579, 2024.
10. J. Lopez-Barreiro et al., “AI-Powered Recommender Systems for Promoting Healthy Habits and Active Aging: A Systematic Review,” *Sensors*, vol. 24, no. 5, 2024.
11. S. Bhandari et al., “AI-Powered Fitness and Diet Recommendation System: A Personalized Approach,” *International Journal of Emerging Technologies in Computer Science*, vol. 14, no. 3, 2025.
12. A. M. Saad et al., “Diet Engine: A Real-time Food Nutrition Assistant System,” *Procedia Computer Science*, vol. 227, pp. 356–364, 2025.
13. R. Chandrasekaran et al., “Usage Trends and Data Sharing Practices of Healthcare Wearables,”

Journal of Medical Internet Research, vol. 27, no. 1, 2025.

14. M. P. Gagnon et al., "Wearable Devices for Supporting Chronic Disease Self-management: A Scoping Review," *BMC Public Health*, vol. 24, no. 2, 2024.
15. X. Wang et al., "Artificial Intelligence Applications to Personalized Dietary Interventions: A Systematic Review," *Nutrients*, vol. 17, no. 1, 2025.
16. W. Gao et al., "Enhancing Personalized Exercise Recommendation with Graph and Contrastive Methods," *IEEE Transactions on Neural Networks and Learning Systems*, vol. 35, no. 2, 2024.
17. H. Wang and S. Li, "Machine Learning Methods to Personalize Persuasive Physical Activity Interventions," *Computers in Biology and Medicine*, vol. 176, 2024.
18. D. Patel et al., "Predictive Modeling of Obesity and Lifestyle Diseases Using AI," *Healthcare Informatics Research*, vol. 30, no. 3, 2024.
19. A. Sharma and R. Gupta, "Deep Learning-Based Fitness Plan Generation Using Multimodal User Data," *IEEE Access*, vol. 12, pp. 33321–33335, 2024.
20. K. Lee and M. Park, "AI-Driven Personalized Diet Recommendation Using Nutritional Ontology," *Expert Systems with Applications*, vol. 236, 2024.
21. L. Zhang et al., "Smart Wearable Health Monitoring Systems: Trends and Challenges," *IEEE Sensors Journal*, vol. 23, no. 8, 2023.
22. T. Singh and N. Agarwal, "Health Analytics Using IoT and Machine Learning for Lifestyle Improvement," *Procedia Computer Science*, vol. 207, pp. 321–330, 2023.
23. A. Kaur et al., "Machine Learning-Based Personalized Wellness Recommendation System," *International Journal of Intelligent Systems*, vol. 38, no. 1, 2024.
24. V. Kumar and R. S. Rao, "AI Applications in Personalized Fitness and Diet Planning," *International Journal of Computer Applications*, vol. 187, no. 7, 2023.
25. P. Chen et al., "Advances in Wearable Electronics for Monitoring Human Physiology: A Review," *Advanced Intelligent Systems*, vol. 7, 2025.