International Journal of Engineering Research and Science & Technology

www.ijerst.org

ISSN : 2319-5991

Vol. 20 No. 2 (2024)

ijerst.editor@gmail.com

editor@ijerst.com

International Journal of Engineering Research and Science & Technology

ISSN 2319-5991 www.ijerst.com
Vol. 20, No. 2, 2024

Research Paper

SMARTFIT: AI-POWERED PERSONALIZED FITNESS RECOMMENDER SYSTEM

M. Jhansi Lakshmi[1], Avire Pravalika[2], Koshika Sonika[2], Podugu Srinadh[2], A. Sai Durga[2]
[1]Assistant Professor, [2]UG Student, [1,2] Department of Information Technology
[1,2]CMR Engineering College (UGC-Autonomous), Medchal Rd, Kandlakoya, Telangana 501401

Received: 07-3-2024 Accepted: 12-4-2024 Published: 22-4-2024

ABSTRACT

The growing emphasis on health and fitness has increased the demand for personalized fitness guidance. Traditional fitness assistance methods, such as generic workout plans and standard dietary guidelines, often fail to meet individual needs. While personal trainers provide tailored support, they can be costly and inaccessible to many. Generic fitness applications offer predefined routines but lack adaptability and real-time feedback, limiting their effectiveness. These conventional approaches do not consider personal preferences, fitness history, or changing health conditions, leading to suboptimal results. With advancements in artificial intelligence (AI), fitness assistance has transformed through the integration of machine learning algorithms that analyze user behavior and preferences. AI-powered recommender systems, like SmartFit, provide personalized workout routines, customized nutrition plans, and adaptive lifestyle recommendations. These intelligent systems continuously learn from user interactions, enabling real-time adjustments that enhance motivation, engagement, and adherence to fitness goals. The need for AI-driven fitness recommenders stems from the dynamic and diverse nature of individual health and wellness objectives. By leveraging AI, fitness guidance becomes more accurate, scalable, and user-centric, ultimately improving overall health outcomes. SmartFit bridges the gap between technology and fitness, offering a smarter, data-driven approach to achieving personal wellness goals.

KEYWORDS: AI-driven fitness, Personalized workout plans, Machine learning, Adaptive recommendations, User behavior analysis

1.INTRODUCTION

The RS is known as a part of information filtering system which helps the users seek the prediction of rating or preference that users would give to an item or service recommendations [1]. Currently, the RS has been upgraded with the several machine learning algorithms to provide users with the suggestion for their purposes in [2] or build the framework for RS as shown in [3]. In the fitness field, recent studies have focused on developing the RS to user with a wearable device and recording data in real-time. A fitness assistant framework is developed to smartly track and identify user's activity based on contextual interpretation in [4-5]. Moreover, RS has been approached for a runner, which is described in [6].

The purpose of this study is to design the RS that will suggest personalized workout to the users and predict the plan for doing exercise in future. In the proposed RS, we use machine learning algorithms on activity data to build a predictive module in the basic training layer (BTL) that classify the user's activity in their workout. In addition, we also build the trainer agent (TA) with Soar architecture and machine learning algorithm to reflect the prediction of BTL for suggesting the several workouts to

help users select the suitable workout fitting well with their exercise plan.

The FAS is the system designed to support users doing exercise with two motors (called fitness assistance equipment, FAE) used to support lifting the weight of exercise instead of the traditional method. The proposed RS used in FAS is a system combined with artificial intelligence (AI) packages, which plays a role as a professional trainer to give the training instructions of workout for users based on predictability and data analysis to provide the appropriate suggestions according to user's condition. Machine learning algorithms help RS improve the ability of learning, identifying and acquiring knowledge from the real workout data. Particularly, it supports FAS to perform the simulation of exercise for each user's requirements.

2. LITERATURE SURVEY

In the past few decades, lots of clinical data have been collected across different sites. With the growth of information technology, these data provided a high value of digital information to integrate into the healthcare recommendation system. These systems gave patients a personalized recommendation and improved understanding of their medical condition. Personalized diets, exercise routines, medications, disease diagnoses, and other healthcare services all belong to the domain of healthcare recommendation systems. In addition to health-related recommendation systems, various recommendation systems have been integrated into online retailers, streaming services, social networks, physical assistants, and e-commerce applications [7, 8].

The current AI-driven global health interventions cover four categories relevant to global health researchers: (1) diagnosis, (2) patient morbidity or mortality risk assessment, (3) disease outbreak prediction and surveillance, and (4) health policy and planning [9]. Focus on health policy and planning of previous healthcare recommendation systems, collaborative filtering, content-based, knowledge-based and hybrid approaches are the basic recommendation techniques in health recommender systems [10, 11]. The preventive programs for therapy optimization, adherence and risk factor management including exercise training, are now recommended for patients with CVD to reduce disease recurrence by the 2016 European guidelines for CVD prevention [5]. The European Association of Preventive Cardiology developed a digital training and decision support system for optimized exercise prescription in CVD patients based on the definition and diagnostic criteria for diseases and risk factor [12, 13].

On the other hand, up to 75% of the world's people are defined as belonging to the "sub-healthy group" according to the statistics from the World Health Organization. The health condition of this group is needed to be take care as well. In addition, high rest heart rate (rest HR) exists higher risk to suffer from CVD such as obesity, diabetes, dyslipidaemia and hypertension than low rest HR. Additionally, exercising with a period of time has been proved to decrease rest HR.

3. PROPOSED SYSTEM

The project consists of several modules, including the admin module, user module, and Fitness Assistance System (FAS) module, each serving distinct functionalities. The admin module is responsible for managing administrative tasks such as user registrations, viewing user data, and activating user accounts. The adminlogin function handles authentication for administrators, while adminhome provides access to the admin dashboard. Additionally, viewadminuserpage retrieves user data for administrative review, and activateusers allows the admin to activate user accounts. The uploadfile function facilitates file uploads, likely for data import or system configuration.

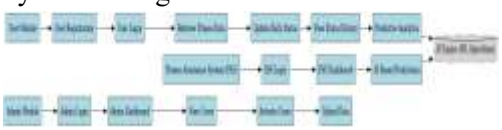

Fig 1 : Proposed Block Diagram

The user module focuses on registered users, managing key functionalities related to user engagement and fitness tracking. The userregistration function handles new user sign-ups, while userlogincheck validates login credentials and establishes session variables upon successful authentication. The userfitness function retrieves personalized exercise data based on the user's age and weight, ensuring customized fitness recommendations. Users can update their daily progress through the status function and review their fitness history using viewuserdailystatus. Additionally, UserPredections appears to offer predictive analytics or tailored fitness recommendations based on user data.

The FAS module, on the other hand, focuses on advanced fitness assistance, potentially catering to fitness professionals. The faslogin and fasloginaction functions handle authentication and access control for this module, while fashome provides a dedicated dashboard for advanced users. The faspredection function utilizes machine learning models, specifically artificial neural networks and logistic regression algorithms, to generate fitness predictions or personalized recommendations.

Overall, this project is designed to provide a comprehensive fitness assistance system, integrating user registration, personalized workout and health recommendations, daily status tracking, and administrative management. By leveraging machine learning algorithms, the system enhances fitness guidance through advanced analytics, offering users a more tailored and effective approach to their fitness journey.

4.RESULTS AND DISCUSSION

Figure 10.1 shows the home page of the system, where users can access different features and functionalities. Figure 10.2 allows new users to create accounts by providing necessary details such as name, email, age, weight, etc. Figure 10.3 provides a secure way for registered users to access their accounts by entering their login credentials. Figure 10.4 demonstrate admin login page is where administrators can log in to access the administrative functionalities of the system. Figure 10.5 displays the dashboard or main interface for administrators, where they can manage users, view reports, and perform other administrative tasks. Figure 10.6 shows the admin page for activating registered users allows administrators to activate or deactivate user accounts based on certain criteria. Figure 10.7 shows the interface for users after logging in, where they can access personalized recommendations, update their daily status, view progress, etc. Figure 10.8 is the daily status update interface allows users to input their daily fitness activities, dietary habits, mood, etc.

Figure 10.1: Home page of AI-based recommendation system for fitness assistance.

Figure 10.2: User registration page.

Figure 10.3: User login page.

Figure 10.4: Admin login page.

Figure 10.5: Admin page.

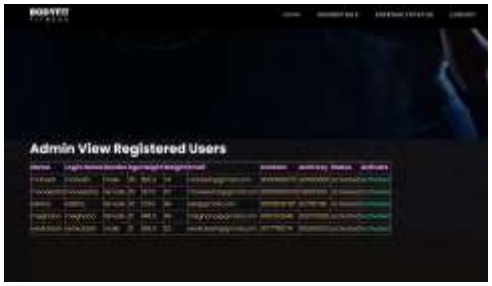

Figure 10.6: Admin page for activating the registered users.

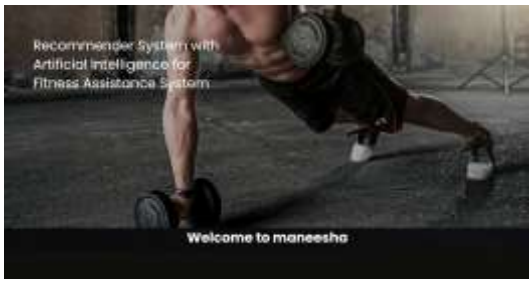

Figure 10.7: User page.

Figure 10.8: Daily status update.

Figure 10.9 demonstrate the recommendations based on user daily status update provide users with personalized fitness recommendations and suggestions based on their input. Figure 10.10 disclose the upload dataset interface enables administrators to upload datasets for model training and updating. Figure 10.11 is displaying confusion matrix of proposed ANN model visualizes the performance of the artificial neural network model used in the system, helping administrators and users understand its accuracy and effectiveness. Figure 10.12 is a view of user details with daily status provides administrators with insights into individual user profiles, including their daily fitness status updates, allowing for better monitoring and management.

Figure 10.9: Recommendations based on user daily status update.

Figure 10.10: Upload the dataset for model training.

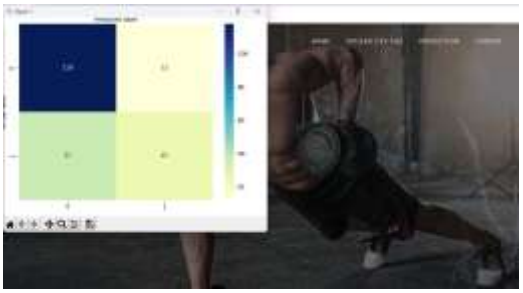

Figure 10.11: Displaying confusion matrix of proposed ANN model.

Figure 10.12: View of user details with daily status.

5. CONCLUSION

The AI-based recommender system for fitness assistance project is designed to revolutionize the fitness industry by offering personalized recommendations and guidance to users based on their unique profiles and goals. Leveraging machine learning algorithms like artificial neural networks and logistic regression, the system analyzes user data, including age, weight, exercise preferences, and dietary habits, to generate tailored exercise and diet plans. This personalized approach enhances the effectiveness and efficiency of fitness programs, providing users with targeted strategies to achieve their fitness objectives. In conclusion, the project showcases the potential of integrating AI technologies into fitness assistance, offering users a more personalized and effective means of reaching their fitness goals. However, there are opportunities for future enhancement and expansion. Refining recommendation algorithms, integrating wearable devices for real-time data tracking, and collaborating with healthcare professionals are just a few avenues to further improve the system's effectiveness and user experience. Overall, the project represents a significant step forward in leveraging technology to promote health and wellness.

REFERENCES

[1] G. Adomavicius, A. Tuzhilin, "Toward the next generation of recommender systems: a survey of the state-of-the-art and possible extensions", IEEE Trans. On Knowledge and Data Engineering, vol. 17, pp. 734-749, April 2005.

[2] I. Portugal, P. Alencar, and D. Cowan, "The use of machine algorithms in recommender systems: A systematic review", Expert Systems with Application, vol. 97, pp. 205-227, May 2018.

[3] J. Aguilar, P. Valdiviezo-Díaz, and G. Riofrio, "A general framework for intelligent recommender systems", Applied Computing and Informatics, vol. 13, pp. 147-160, July 2017.

[4] S. Dharia, V. Jain, J. Patel, J. Vora, S. Chawla, M. Eirinaki, "PRO-Fit: A personalized fitness assistant framework" in Proc. 28th International Conf. on Software engineering and knowledge engineering SEKE, Redwood City, CA, 2016.

[5] M. Afzal, S. I. Ali, R. Ali, M. Hussain, T. Ali, W. A. Khan, M. B. Amin, B. H. Kang, and S. Y. Lee, "Personalization of wellness recommendation using contextual interpertation", Expert Systems with Applications, vol. 98, pp. 506-521, April 2018.

[6] M. Donciu, M. Ionita, M. Dascalu, S. Trasusan-Matu, "The Runner—recommender system of workout and nutrition for Runners", in Proc. 13th International Symposium on Symbolic and Numeric Algorithms for Scientific (SYNASC), Romania, 2012.

[7] Sulikowski, P.; Zdziebko, T. Deep learning-enhanced framework for performance evaluation of a recommending interface with varied recommendation position and intensity based on eye-tracking equipment data processing. Electronics 2020, 9, 266.

[8] Sulikowski, P.; Zdziebko, T.; Turzyński, D.; Kańtoch, E. Human-website interaction monitoring in recommender systems. Procedia Comput. Sci. 2018, 126, 1587–1596.

[9] Schwalbe, N.; Wahl, B. Artificial intelligence and the future of global health. Lancet 2020, 395, 1579–1586.

[10] Loellgen, H.; Zupet, P.; Bachl, N.; Debruyne, A. Physical Activity, Exercise Prescription for Health and Home-Based Rehabilitation. Sustainability 2020, 12, 10230.

[11] Tran, T.N.T.; Felfernig, A.; Trattner, C.; Holzinger, A. Recommender systems in the healthcare domain: State-of-the-

art and research issues. J. Intell. Information Syst. 2020, 1–31.

[12] Hansen, D.; Dendale, P.; Coninx, K.; Vanhees, L.; Piepoli, M.F.; Niebauer, J.; Cornelissen, V.; Pedretti, R.; Geurts, E.; Ruiz, G.R. The European Association of Preventive Cardiology Exercise Prescription in Everyday Practice and Rehabilitative Training (EXPERT) tool: A Digital Training and Decision Support System for Optimized Exercise Prescription in Cardiovascular Disease. Concept, Definitions and Construction Methodology. Eur. J. Prev. Cardiol. 2017, 24, 1017–1031.

[13] Hansen, D.; Niebauer, J.; Cornelissen, V.; Barna, O.; Neunhäuserer, D.; Stettler, C.; Tonoli, C.; Greco, E.; Fagard, R.; Coninx, K. Exercise prescription in patients with different combinations of cardiovascular disease risk factors: A consensus statement from the EXPERT working group. Sports Med. 2018, 48, 1781–1797.

[14] T. T. Tran, J. W. Choi, C. Van Dang, G. SuPark, J. Y. Baek and J. W. Kim, "Recommender System with Artificial Intelligence for Fitness Assistance System," 2018 15th International Conference on Ubiquitous Robots (UR), Honolulu, HI, USA, 2018, pp. 489-492, doi: 10.1109/URAI.2018.8441895.

[15] Chen, H.-K.; Chen, F.-H.; Lin, S.-F. An AI-Based Exercise Prescription Recommendation System. Appl. Sci. 2021, 11, 2661. https://doi.org/10.3390/app11062661

[16] Zhang, Q., Lu, J. & Jin, Y. Artificial intelligence in recommender systems. Complex Intell. Syst. 7, 439–457 (2021). https://doi.org/10.1007/s40747-020-00212-w