# ARTIFICIAL INTELLIGENCE BASED FITNESS ASSISTANT SYSTEM

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**ABSTRACT—** This paper proposes a recommender system (RS) to support the fitness assistance system (FAS) with artificial intelligence. The RS is applied to make these suggestions for the beginners and existing users. The goal of the paper aims to develop an RS that has an ability to learn, analyze, predict, and make these suggestions as well as communicate to human through AI. Artificial Neural Network and Logistic Regression have been employed to predict the suitable workout for each beginner. In addition, the agent developed with reinforcement learning capability of Soar architecture help the members select their workout based on their condition.

*Index Terms*—Basic Training Layer, Trainer agent, Artificial Intelligence

## I. 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.

## II. LITERATURE SURVEY

**Toward the next generation of recommender systems: a survey of the state-of-the-art and possible extensions**

This paper presents an overview of the field of recommender systems and describes the current generation of recommendation methods that are usually classified into the following three main categories: content-based, collaborative, and hybrid recommendation approaches. This paper also describes various limitations of current recommendation methods and discusses possible extensions that can improve recommendation capabilities and make recommender systems applicable to an even broader range of applications

**The use of machine algorithms in recommender systems: A systematic review**

Recommender systems use algorithms to provide users product recommendations. Recently, these systems started using machine learning algorithms because of the progress and popularity of the artificial intelligence research field. However, choosing the suitable machine learning algorithm is difficult because of the sheer number of algorithms available in the literature. Researchers and practitioners are l

**Personalization of wellness recommendation using contextual interpretation**

A huge array of personalized healthcare and wellness systems are introduced into the portfolio of digital health and quantified-self movement in recent years. eft with little information about the best approaches

**The Runner—recommender system of workout and nutrition for Runners**

Recommender systems have been gaining popularity and appreciation over the past few years and they kept growing towards a semantic web. Internet users search for more and more facilities to get information and recommendations based on their preferences, experience and expectations.

**Prediction of one repetition maximum strength from multiple repetition maximum testing and anthropometry**

The purpose of this study was to quantify the decrease in the load lifted from 1 to 5, 10, and 20 repetitions to failure for the flat barbell bench press (chest press; CP) and plate-loaded leg press (LP). Furthermore, we developed prediction equations for 1 repetition maximum

(RM) strength from the multiple RM tests, including anthropometric data, gender, age, and resistance training volume. Seventy subjects (34 men, 36 women), 18-69 years of age, completed 1, 5, 10, and 20RM testing for each of the CPs and LPs.

**Adaptive e-Greedy Exploration in Reinforcement Learning Based on Value Differences**

This project presents "Value-Difference Based Exploration" (VDBE), a method for balancing the exploration/exploitation dilemma inherent to reinforcement learning. The proposed method adapts the exploration parameter of ε-greedy in dependence of the temporal-difference error observed from value-function backups.

## III. PROPOSED SYSTEM

The overview of our proposed system is shown in the below figure.

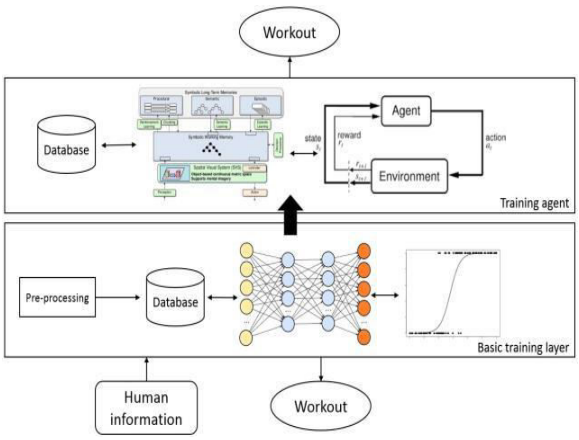


Fig. 1: System Overview

### *Implementation Modules*

**FAS**

- 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.
- In FAS, the proposed RS is added to predict appropriate suggestions for users and transfer a control command to embedded controller conducting the FAE.
- 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.

**User**

- 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.

- A fitness assistant framework is developed to smartly track and identify user's activity based on contextual interpretation.
- 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.

**Admin**

- The aim of admin is to approve the users. The entire data must be gathered to admin. Admin maintain the all-registered user information's and admin should maintain the user's daily status reports.
- 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

***Implementation Algorithms***

**K NN**

- K-Nearest Neighbour is one of the simplest Machine Learning algorithms based on Supervised Learning technique.
- K-NN algorithm assumes the similarity between the new case/data and available cases and put the new case into the category that is most similar to the available categories.
- K-NN algorithm stores all the available data and classifies a new data point based on the similarity. This means when new data appears then it can be easily classified into a well suite category by using K- NN algorithm.
- K-NN algorithm can be used for Regression as well as for Classification but mostly it is used for the Classification problems.

## IV. RESULTS

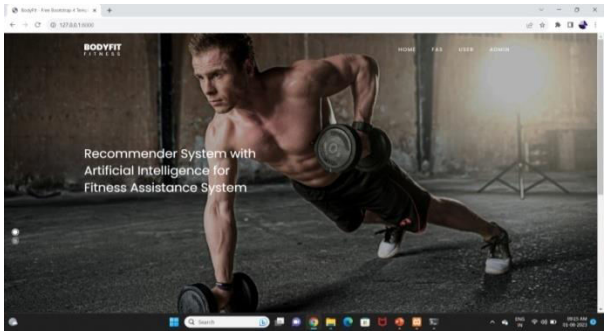


Fig. 2: Home Page

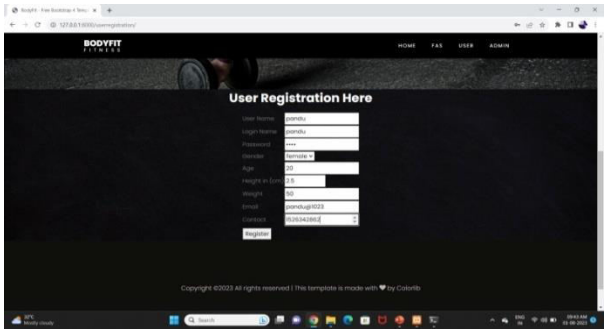


Fig. 3: User Registration

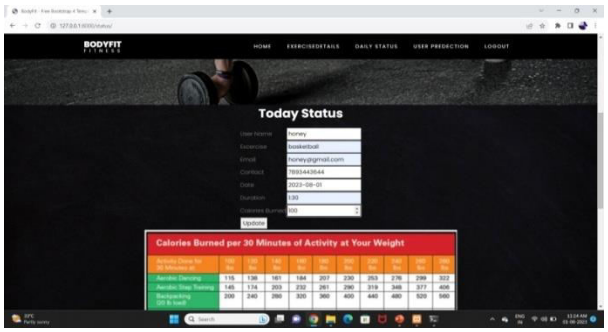


Fig. 4: Update Daily Status

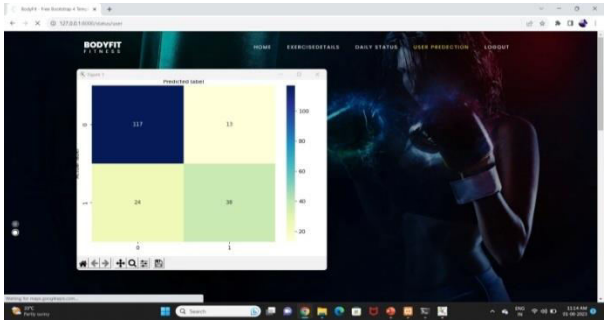


Fig. 5: Confusion Matrix

## V. CONCLUSION

In this study, we proposed RS for fitness assistance system and a novel method for fitness workout recommendation with artificial intelligence algorithms. We developed a system with several machine learning algorithms to predict and train data to give the suggestion for the fitness workout. The ANN with LR implements the prediction of workout parameters with the best accuracy. The proposed RS is expected to give better recommendation for user to do exercise. As future work of this study, we plan to focus on improving the TA module in the proposed RS with Soar agent by designing the RL algorithm to recommend several workouts for existing member's average selection. TA will be developed in future work for improving its features to calculate the epsilon value of epsilon-greedy method, and validate the suggested workout for approaching the suitable workout plan to the users. Consequently, the proposed RS will play a role of the professional trainer for user in future.

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