USING COMPUTATIONAL AND MACHINE LEARNING METHODS FOR DEVELOPMENT OF A PERSONALIZED FITNESS WEB APPLICATION

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The research focuses on the study of modern technological solutions in the field of fitness, with a special attention to modern methods of data collection, processing and analysis aimed at providing personalized recommendations on physical activity and nutrition. The result is the spread and popularization of a healthy lifestyle.

Personalized nutrition and training are based on key indicators such as body mass index (BMI), basal metabolic rate (BMR), calorie requirements based on fitness goals, physical parameters, and macronutrient balance. BMI is calculated using a standard formula, and BMR is determined by the Mifflin-St. George method [1]. The need for calories and macronutrients is adjusted according to individual parameters and fitness goals. These values are used in an algorithm that selects suitable exercises from the database, adjusting the duration and number of repetitions based on the user's characteristics and limitations. Each exercise includes a MET value (metabolic equivalent of the task) to estimate energy expenditure during the workout [2].

The project uses machine learning to recommend personalized workout types based on user data such as age, weight, height, body type, gender, activity level, and health status. Classification and clustering methods are used to analyze and group users with similar profiles. Random Forest and KNN are the best options for this task because they work well with small and medium-sized datasets and allow you to take into account many different user parameters. After comparing the models, it turned out that the Weighted K-Nearest Neighbors algorithm was the best solution to the problem, due to its simplicity and accuracy combined with proper data preparation. To reduce noise and improve model reliability, preprocessing steps include validation with logical constraints and Z-score, outlier removal with Local Outlier Factor (LOF), and Z-score normalization with StandardScaler from scikit-learn library to ensure correct distance calculations between users.

The result of this research is a solution to the problem of personalization of a fitness recommendation system that selects the appropriate types of workouts for each user based on their unique characteristics. This solution improves the relevance and accuracy of recommendations and addresses the lack of personalization in most fitness apps. This solution helps users stay motivated, achieve their fitness goals more effectively, and supports their physical and emotional well-being, which is especially valuable in situations with limited access to traditional training environments.

References:
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