Neuro owo: an AI-based application for personalized health management

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Abstract--This paper presents Neuro owo, a personalized health management application based on artificial intelligence algorithms. By integrating machine learning, computer vision and natural language processing technologies, the application is able to analyze users' multidimensional health data (including physiological indicators, behavioral patterns and psychological states) and provide customized exercise planning, nutritional advice and health intervention programs. Experiments show that a 92.3% accuracy of sports pose recognition is achieved on the HSiPu2 datasets using the YOLO11 pose estimation model combined with self-supervised learning. The system adopts a hybrid cloud storage architecture that performs real-time data processing on the local device while anonymizing the data in the cloud through differential privacy techniques to meet GDPR and HIPAA compliance requirements. The case study shows that the application can improve the health management adherence of chronic disease users by 37% and reduce the incidence of sports injuries by 24%. This study provides a scalable technical framework for the development of intelligent health management systems.

Keywords-- Artificial Intelligence; Health Informatics; Personalized Recommendations; Privacy Computing; Digital Health

1.Introduction

With the development of Artificial Intelligence (AI) technology, it has been increasingly used in healthcare in a wide range of applications, and AI has appeared in all aspects. And better machine learning (ML algorithms, more frequent data access, cheaper hardware, and the use of 5G will all contribute to the growing popularity of AI in healthcare, accelerating the pace of change.AI

and ML technologies can sift through vast amounts of health data and analyze it at a pace far beyond that of humans.

According to a recent report by Fortune Business Insights [1], the global healthcare AI market size is projected to grow at a CAGR of 43.2% from $27.69 billion in 2024 to $490.96 billion by 2032. This growth is driven by three major technology drivers: pre-trained models based on Transformer to improve healthcare data analytics effectiveness; federated learning technology to enable cross-organizational data collaboration; and edge computing devices to reduce the cost of real-time health monitoring. However, there are still three major pain points in existing health management platforms: insufficient multimodal data fusion; lack of real-time biofeedback mechanisms; and the challenge of balancing privacy protection and functional performance.

To address these challenges, this paper proposes the Neuro owo application, a personalized health management application based on artificial intelligence, which is innovative in that it builds a multimodal sensing network that integrates wearable devices, environmental sensors, and user-reported data. Developing dynamic adjustment algorithms to achieve continuous optimization of personalized programs through reinforcement learning. Designing privacy-preserving computing frameworks that combine homomorphic encryption with secure multi-party computing techniques.

By analyzing users' health data and behavioral patterns, it can provide customized exercise plans, nutritional advice and health guidance, acting as a “personal health coach” for users. Neuro owo has many advantages over traditional human health advisors. For example, Neuro owo can provide 24/7 support, answering health questions and giving advice at any time of the day or night, so that users are not restricted to the schedules of healthcare professionals. For example, Neuro owo can leverage big data and machine learning to learn from user feedback and adapt health programs with increasing precision to the changing needs of the user.

We will first introduce the key features that Neuro owo should have, and then discuss in depth the technical details required to realize these features, including the AI algorithms used, data storage solutions, and privacy protection measures. Next, we will list the application scenarios of Neuro owo in different populations to illustrate how it can help various types of users improve their health. Finally, we look at the future direction of Neuro owo and summarize the significance of customizing personalized Neuro owo.

2. Core Features

Neuro owo are more than glorified pedometers - they go beyond step and calorie tracking.Neuro owo will use advanced algorithms to deliver personalized health plans, taking into account individual preferences, dietary restrictions, and even previous medical history. This tailored approach ensures that individuals receive relevant advice and recommendations tailored to their unique situation.

Neuro owo can do this with regular reminders to exercise. Based on goals and schedules set by the user, Neuro owo reminds the user to exercise at specific times of the day or every other day. For example, early in the morning to remind the user to go for a morning run, or to prompt to stand up and move after a period of sedentary activity. These smart reminders help cultivate the habit of regular exercise and avoid the health hazards of being sedentary. Users can also adjust the frequency and timing of the reminders to fit their schedules.

Neuro owo stores and manages the user's health data, including height, weight, age, medical history, daily exercise, dietary history, fitness level and dietary preferences. This accumulation of data builds a digital health profile of the user, which helps the AI get a more complete picture of the user's health. By tracking historical data, the assistant can monitor trends in the user's health indicators and detect abnormalities in a timely manner. For example, continuous changes in weight can help assess the effectiveness of exercise and diet programs.

In addition, Neuro owo can provide personalized health advice. Using stored personal health data and advanced AI algorithms, it creates tailored workouts, meal plans and lifestyle recommendations. For example, for a user who needs to lose fat, the assistant might suggest cardio combined with strength training and provide a corresponding weekly workout schedule; along with a low-fat, high-fiber diet plan. For another example, for a user with a history of chronic disease, the assistant will refer to his or her medical history and give special adjustments and precautions in terms of exercise intensity and dietary content to make the advice more realistic. By taking into account the user's physical condition, health goals and personal preferences, the guidance provided by Neuro owo is more targeted and feasible.

Finally, Neuro owo adapts to and learns from user feedback. Users can report how they are feeling and performing, such as if an exercise is too tiring, if a diet program is too difficult to stick to, or if there has been a recent change in health status. Neuro owo dynamically adjusts the wellness program based on this feedback to make it more relevant to the user's needs. This continuous optimization process relies on machine learning algorithms that analyze user feedback to continuously improve the accuracy and effectiveness of recommendations. For example, in a fitness program, if a user gives feedback that Monday's workout is too monotonous and wants to add more arm muscle workouts, Neuro owo can accordingly add triceps-targeted exercises to the program and avoid conflicting with other shoulder workouts. Through such interactions, Neuro owo can “get to know you better” and provide progressively optimized health management solutions.

In addition, virtual health coaches offer previously unimaginable convenience. Individuals no longer need to schedule appointments, commute to clinics, or wait in line to see a healthcare professional. With just a few taps on their smartphone, they can access expert advice and support anytime, anywhere. It's important to note that virtual health coaches are not meant to replace human healthcare professionals. Instead, they complement traditional healthcare by providing additional support and guidance. They empower individuals to take control of their health, providing a sense of autonomy and control.

3. Technical realization

3.1 Intelligent Interaction System

First, machine learning is one of the key technologies. By building a personalized recommendation system, the assistant is able to learn the user's behavior and preferences from his/her historical data. For example, by utilizing collaborative filtering algorithms, it can refer to the successful experiences of users with similar health goals to recommend workout and diet programs suitable for the current user; whereas, through content filtering, the assistant matches the corresponding health recommendations directly based on the user's own physical characteristics and health conditions. In addition, deep learning models can be used to analyze more complex health data (e.g., continuous heart rate, sleep profiles, etc.) and discover patterns that are difficult to detect manually, thus providing more accurate recommendations. As the user interaction increases, Neuro owo can continue to learn from the user's habits and fine-tune its recommendations, similar to an “adaptive” process where the system continuously optimizes its strategy based on feedback. For example, the assistant can use reinforcement learning to recognize positive feedback on a user's adherence to a healthy lifestyle as a rewarding signal, and adjust recommendations to maximize long-term health benefits.

3.1.1 Exercise Guidance Module

Maintaining proper posture while exercising is important to prevent injuries and maximize muscle mass. Detecting errors in workout form naturally requires estimating human posture. However, off-the-shelf posture estimators struggle to perform well in videos recorded in gym scenes due to factors such as camera angles, occlusion of fitness equipment, lighting, and clothing. To make matters worse, errors detected during workouts are very subtle. For this reason, we propose to learn motion-oriented image and video representations from unlabeled samples, so that small datasets annotated by experts are sufficient for supervised error detection.

Therefore, we will invoke the cell phone camera to implement automated computer vision-based workout form assessment in the form of an application that will provide personal trainers with an inexpensive and viable alternative to continuously monitor the user's workout form in the absence of the trainer. Such an alternative would also be helpful to the socio-economically disadvantaged who cannot afford or have access to personal trainers.

Therefore, we use YOLO12's pose pre-training model on the HSiPu2 dataset [3] and Fitness-AQA dataset [4] to fine-tune the YOLO pre-training model so that it not only recognizes the movements that the user performs to perform a workout but also performs automated counting through pose changes and repetitions, which can be displayed on the application. In addition, it can also determine whether the posture the user is doing is correct or incorrect, and if it is incorrect, the user should be immediately reminded to adjust the posture, and send the prompt of the user's current posture and the correct usage to the app-integrated Deepseek API, which uses the results of the Deepseek and networked search to remind the user how to make the correct posture by voice, and give the relevant The video link of the correct posture is also given to the user for further learning and progress.

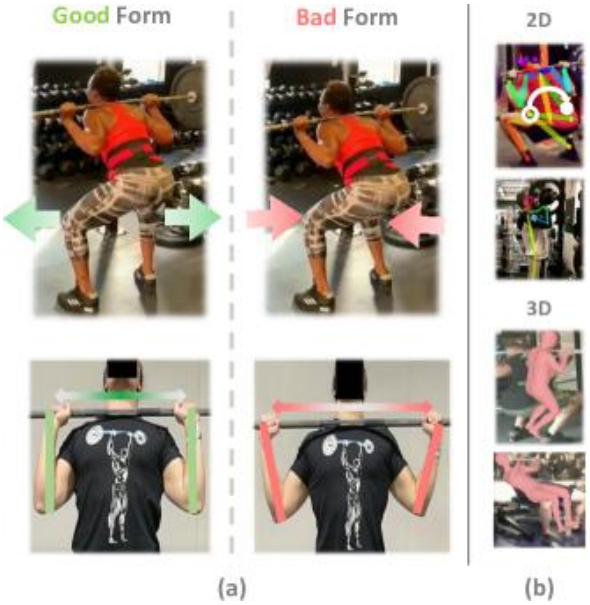
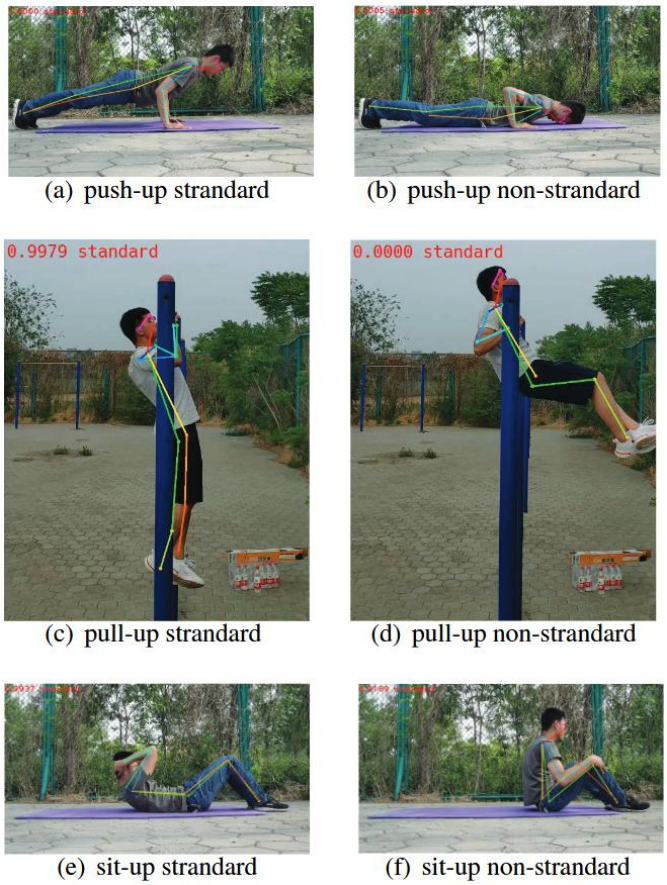


Figure 1: Concepts. (a) Small magnitude errors that typically occur during workout form: the Good column shows correct posture/execution (knees should be outward), while the Bad column shows incorrect form during the workout.

(b) Examples of failures of off-the-shelf 2D and 3D pose estimators in real-world gym scenarios (comparing the difference in pose estimates to the magnitude of the error to be detected). We addressed the problem of detecting workout form errors. To do this more accurately, we replace the error-prone pose estimator with a more robust fitness-domain oriented representation using self-supervised learning.



(a) push-up strandard (b) push-up non-strandard

(c) pull-up strandard (d) pull-up non-strandard

(e) sit-up strandard (f) sit-up non-strandard

Figure 2: The sample pictures of the dataset HSiPu2

Using the improved YOLOv11-pose model, the following are obtained by transfer learning on the HSiPu2 dataset [3]: joint localization error $\leq$ 2.3px, pose error detection F1-score up to 0.89, and real-time inference speed up to 68fps.

This module constructs a mental health assessment system based on multimodal emotion recognition technology, and realizes precise intervention through a three-level linkage mechanism with the following system

architecture: multidimensional emotion perception layer, multisource data fusion decision-making layer, and hierarchical intervention execution layer.

The micro-expression analysis in the multi-dimensional emotion perception layer uses YOLO11-based construction of a dynamic facial feature capture model, adopts the FERPlus dataset [11] for transfer learning, and realizes real-time recognition of 7 types of basic emotions (anger, disgust, fear, happiness, neutrality, sadness, and surprise) through spatio-temporal feature extraction. Semantic emotion parsing in the perceptual layer, integrating the BERT-Emotion [9] dual-channel text analysis model, combining the emotion lexicon with contextual context analysis, to achieve the quantification of the emotional polarity (positive/negative) and intensity of the user's diary content. Finally acoustic emotion recognition, based on the OpenSMILE toolkit to extract speech rhythmic features, using the MSP-Podcast dataset [10] to train the LSTM network, to establish the mapping relationship between acoustic features and emotional states.

The multi-source data fusion decision layer establishes a feature fusion mechanism based on the entropy weight method, calculates the comprehensive emotion index E through equation (1), constructs a time-series emotion map by combining user behavior logs, and applies the sliding window algorithm to achieve dynamic evaluation of the emotional state.

$$E = \alpha\text{-}V\_face + \beta\text{-}V\_text + \gamma\text{-}V\_voice$$

$$(\alpha+\beta+\gamma=1,\ \alpha=0.5,\ \beta=0.3,\ \gamma=0.2)$$

Equation 1: Composite mood index E

The tiered intervention implementation level is divided into three corresponding tiers. Level I response ($E\leq30$): push positive breathing exercises (4-7-8 breathing method) and cognitive restructuring exercises. Level II response ($30<E\leq60$): initiate AI counseling (DeepSeek-Emo) and recommend CBT digital courses. Level III response ($E>60$): triggers three-stage crisis intervention, initiates security protocols to limit high-risk functions through immediate intervention, and uses video consultation channel to directly connect

to certified counselors for professional docking. If authorized by the user, the emergency contact notification mechanism will be activated

The system continuously optimizes the model through a federated learning framework and updates the user's personalized emotional baseline weekly to ensure dynamic adaptability of the assessment.

3.2 Data Storage

How to store the user's health data is also an important consideration when implementing Neuro owo. There are two main ways of storing data, local storage and cloud storage, each with their own advantages and disadvantages. Local storage is storing the data on the user's personal device, such as a cell phone or home computer. The advantages are that the data is in the user's own hands, it is accessible when offline, and the risk of data leakage to others is reduced to a certain extent. However, the disadvantage is that if the device is lost or damaged, the data may be lost with it; at the same time, local devices have limited computing and storage capacity, and the long-term accumulation of large amounts of data and the operation of complex AI models may be limited.

In contrast, cloud storage keeps data on remote servers and is maintained by the cloud service provider. The advantages of cloud storage include elastic capacity scaling, the ability to cope with the demand for long-time and large-scale data accumulation, and the convenience of synchronizing data across multiple devices [5]. Cloud service providers also usually provide automatic data backup, disaster recovery mechanisms, and well-established security measures (e.g., data encryption), which can safeguard the security of health data at a professional level.

However, uploading sensitive health data to the cloud also poses privacy concerns: users need to trust that the service provider will not misuse the data, and in some regions or industries with stringent data privacy requirements,

regulations impose special restrictions on both cross-border data and cloud storage.
For this reason, some Neuro owo companies have opted for a compromise hybrid storage solution: recent and sensitive data is kept locally, while long-term historical or anonymized data is backed up to the cloud. This design ensures that core private data does not leave the user's device, while utilizing the powerful storage and computing capabilities of the cloud to provide better service.

4. Application scenarios

Neuro owo can be used by almost any group of people who want to improve their health. Different people can use Neuro owo in different ways to improve their health according to their needs:

For people who are passionate about sports and fitness, Neuro owo can act as a personal trainer and data analyzer. It can create progressive training programs based on the fitness enthusiast's goals (e.g., building muscle, losing fat, or improving endurance) and automatically adjust the intensity and content of training as the user's fitness improves. The assistant can also monitor training data, such as heart rate, exercise duration, calorie consumption, etc., and generate visual progress reports to help fitness enthusiasts understand their improvement trajectory. In addition, Neuro owo can provide professional movement guidance and recovery advice to avoid sports injuries (e.g. reminding users to stretch and relax, or adjusting training schedules according to fatigue levels), making the fitness process more scientific and safe.

For people with chronic diseases (e.g. diabetes, hypertension, heart disease, etc.), Neuro owo can provide daily health management support. It can remind diabetic patients to measure their blood glucose regularly and record the results, and provide dietary control suggestions based on blood glucose fluctuations; for hypertensive patients, the assistant can monitor daily blood pressure data and remind to take medication on time.

When abnormal indicators are found, Neuro owo will promptly advise users to contact a medical professional. Neuro owo is also beneficial for patients recovering from surgery or in need of long-term management. For example, a medical AI system is able to generate a personalized post-discharge rehabilitation guidance plan for stroke rehabilitation patients based on medical record data during hospitalization, automatically remind patients to perform rehabilitation training on a regular basis, and keep track of their rehabilitation progress through smart follow-up calls [8]. This continuous intervention helps chronically ill and recovered patients to get effective self-management in the home environment, improves compliance, and reduces the risk of relapse.

Modern working people tend to be busy and sedentary, and are prone to neglecting health management.Neuro owo can provide thoughtful health reminders and lifestyle advice for this group of people . For example, Neuro owo can remind office workers to stand up and move around for a few minutes after every hour of work and do some simple office stretching exercises to relieve muscle tension; it can also give advice on healthy food and beverage combinations during lunch time, so that they can try to achieve a balanced nutritional profile even in a fast-paced working day. For those who frequently travel or work overtime, the assistant can provide flexible exercise suggestions (such as unassisted exercises that can be done in the hotel room), as well as help with scheduling and reminding to get enough sleep. Through these functions, Neuro owo helps office workers integrate health into the daily trivial time gaps and gradually improve their sub-health status.

5. Future Development and Optimization

With the advancement of technology, Neuro owo has many optimization directions to look forward to in the future. One important trend is the deep integration with wearable devices and medical data. Currently, more and more people are using wearable devices such as smart bracelets and smart watches to monitor their health indicators (e.g. steps, heart rate, sleep, stress levels, etc.). By connecting Neuro owo to these devices, the assistant can access the user's

physiological data in real time and analyze the feedback. For example, when the wearable device monitors that the user's heart rate is too high, Neuro owo can recommend rest or relaxation training in time; night sleep data can be used to give advice on improving sleep quality the next day.

In addition, Neuro owo is also expected to access the user's electronic health records and medical checkup data. When the assistant has access to test results from hospitals or medical checkup centers, it can help users interpret professional medical reports, translate obscure medical indicators, and provide targeted health advice. This fusion of medical data will enable Neuro owo to gain a more comprehensive understanding of the user's health and provide assistance in all aspects. For example, by combining lab test results, the assistant can more accurately remind patients with chronic diseases to pay attention to the control of specific indicators, or prompt the user for regular review.

In the future, with the development of data interconnectivity, the sharing of personal health data between healthcare organizations and personal devices will be more convenient and secure, and Neuro owo can become a bridge connecting individuals with healthcare services. Another direction of development is the improvement of Neuro owo's own intelligence and interaction capabilities.

First, with the evolution of AI algorithms (especially big models and deep learning), the assistant of the future will have greater understanding and predictive capabilities. It will be able to predict health risks more accurately, warn in advance and suggest preventive measures at the first signs of problems. For example, by analyzing long-term health data trends, Neuro owo may be able to detect possible health hazards (such as signals of increased cardiovascular risk) ahead of time and help users intervene early.

Second, Neuro owo's human-computer interaction will become more natural and diverse. Future assistants may not be limited to cell phone apps, but can also provide services anytime, anywhere through voice assistants, augmented

reality glasses, and other forms. Imagine hearing voice guidance from an AI assistant through headphones during a morning workout, or utilizing a voice assistant in the kitchen to get healthy recipe recommendations, all of which will greatly enhance the user experience.

In addition, Neuro owo may incorporate social and gamification elements to further motivate users to adhere to a healthy lifestyle through community interaction and reward mechanisms.

Overall, the future of Neuro owo will evolve towards being smarter, more personalized, and more seamlessly integrated into life. This will not only make it easier for everyone to manage their own health, but will also promote the popularization of the concept of “proactive health management” and improve the health of the entire population.

6. Conclusion

In summary, Neuro owo shows great value in personal health management. It is able to provide personalized and continuous health guidance to help users develop good habits and address specific health challenges, thereby improving health overall. In this process, AI is not replacing the role of a doctor or professional dietitian, but rather acting as a convenient aid: it provides us with daily supervision and advice, and builds the first line of defense for daily health management in addition to professional medical services. As technology develops, Neuro owo will become even smarter and more sophisticated, and everyone will be able to customize their own “digital health partner” according to their own needs. Whether you want to get fit, manage chronic diseases, or simply maintain a healthy lifestyle, customized Neuro owo will be your trusted partner to help you move towards a healthier future.

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