Final Project. - Proposal

School name : University Greenwich

Topic : FitAI – AI-powered Fitness & Nutrition Assistant

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**Abstract.**

This project proposal presents FitAI – an AI-powered fitness and nutrition assistant platform developed in a microservices architecture. FitAI is designed to help users track their health progress, manage their workout and diet plans, and provide personalized recommendations based on their up-to-date data.

The system combines a scientifically designed database with an interactive AI chatbot, allowing users to easily ask questions, receive intelligent feedback, and adjust their workout plans accordingly. FitAI caters not only to beginners but also to professional exercisers through features such as nutrition management, progress tracking, workout plan building, and comprehensive workout plan suggestions.

This project focuses on addressing the limitations of current applications by integrating AI into the experience personalization process. The proposal will clearly present: practical problems and needs, research objectives, implementation methods, system design, expected results and implementation plan.

**Introduction.**

1. **Background and trends**

In recent years, personal health care and fitness have become increasingly important, while modern lifestyles have caused many people to suffer from overweight, stress and lack of exercise. At the same time, the trend of healthy living and the strong development of AI in HealthTech have opened up new opportunities, from tracking body indexes to suggesting personalized diets and exercises.

Current applications such as MyFitnessPal, Fitbit, Samsung Health, Apple Health support basic recording and calculations but mainly stop at the monitoring level, not fully exploiting the personalization capabilities. Along with that, digital transformation and microservices architecture are becoming inevitable trends, allowing the development of more integrated, scalable and intelligent systems.

In that context, the development of the FitAI platform – AI-powered Fitness & Nutrition Assistant is necessary and appropriate, both meeting practical needs and keeping up with technological trends, while bringing application value in both academia and commerce.

1. **The urgency of the topic**

Although there are many health and fitness tracking applications, most of them only focus on individual aspects and have limitations: lack of personalization, fragmented processes, and low interoperability. Users often have to use many different tools and interpret data themselves, leading to low efficiency.

In that context, the emergence of FitAI - an AI-integrated fitness and nutrition assistant is necessary. The system not only stores and tracks data (weight, BMI, calories, training history) but also analyzes trends, makes automatic recommendations, and supports via AI chatbot as a virtual coach.

**The topic has a double meaning:**

* Academic: is an opportunity to research and apply conversational AI, microservices, Docker, and relational databases to a real project.
* Practical: provides a comprehensive solution for both beginners and professionals with personalized suggestions.

Thus, FitAI not only meets the urgent need in personal health management, but also has wide application value and contributes to research in the fields of AI and HealthTech.

**C.The significance of the topic**

The topic FitAI – AI-powered Fitness & Nutrition Assistant has both academic and practical significance.

**Academic significance:**

This is an opportunity for me to apply and combine many of the knowledge I have learned such as: web programming, database, microservices architecture, system deployment using Docker, as well as integrating conversational AI.

The project contributes to researching the applicability of AI in the field of HealthTech, thereby enriching academic approaches in personal health management.

Students practice analytical skills, system design, process management, and develop personal working capacity

**Practical significance:**

* FitAI provides a comprehensive solution, integrating health monitoring, nutrition management, exercise and progress functions on a single platform.
* The application supports both beginners (with simple, easy-to-apply suggestions) and professional users (with detailed and in-depth plans).
* With interactive AI chatbots, users have a close experience like working with a personal trainer, helping to save time and improve training efficiency.
* In the long term, the system can be expanded to become a startup product in the healthcare field, meeting the needs of the market and the community.

In short, FitAI is not only valuable in applying technology to personal health management, but also has great significance in training, research, as well as commercialization potential in the future.

1. **Backgroud and Literature Review**
2. **Health and Fitness Apications**

Previous research on fitness apps has focused on user loyalty and engagement.

Emerald (2021)[1] found that gender influences how users maintain loyalty: males are more interested in the competitive element, while females are more interested in the social-community element. This suggests that there is a need for tailored design for each demographic group.

Sampat et al. (2023)[2] highlighted the role of gamification (badges, challenges, leaderboards) and AI-based personalization, helping users achieve a state of “flow” → increasing satisfaction and likelihood of recommending the app.

Taken together, both studies confirm that demographic factors and personalized experiences + gamification are key to the success and sustainability of fitness apps.

1. **AI in HealthTech**

Kalaiarasi et al. (2025)[3] introduced SAHAYAK AI, a next-generation healthcare management system that applies artificial intelligence to improve diagnosis and hospital efficiency. The study demonstrated how AI can be embedded into healthcare services to enhance operational workflows and patient support.

Wang et al. (2024)[4] explored accountability in the use of AI within healthcare. The findings highlighted that transparency, fairness, and responsibility are essential factors for professionals to trust and adopt AI-driven systems in medical contexts.

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1. **System Architecture Approaches**

Tsegaye et al. (2025)[6] proposed a cloud–edge microservices architecture using SDN for hospital asset management and anomaly detection. The system employed AI analytics at the edge, achieving over 94% detection accuracy with low latency, showing the scalability of microservices in healthcare.

Osei-Tutu (2021)[7] developed a microservices-based enterprise architecture to improve health information exchange in developing countries. The study emphasised interoperability, scalability, and modularity as key advantages of microservices for sustainable digital health systems.

Guo & Gao (2023)[8] designed a distributed healthcare system based on high-concurrency microservices. Their model improved handling of large-scale medical data, reduced single points of failure, and ensured high throughput with low latency, demonstrating efficiency for big data healthcare applications.

1. **Research Gap & Contribution**

**Research Gap:**

* Studies on fitness apps (Emerald, 2021; Sampat et al., 2023) have emphasized gamification, personalization, and gender differences in design, but have not yet integrated conversational AI to analyze health data and directly support users.
* Studies on AI in healthcare (Kalaiarasi et al., 2025; Wang et al., 2024) focus on hospital management, diagnosis, and accountability issues, but have not yet applied them to daily personal fitness & nutrition.
* Studies on microservices in healthcare (Tsegaye et al., 2025; Osei-Tutu, 2021; Guo & Gao, 2023) mainly serve large-scale medical infrastructure, and no studies have combined microservices with AI chatbots for personal fitness tracking.

**Contribution:**

* FitAI is the first system that combines conversational AI, recommendation system and microservices architecture in the field of fitness & nutrition.
* On the academic side, the project contributes by testing microservices + AI architecture in a personalized health application.
* On the practical side, FitAI provides users with an integrated platform: tracking meals, workouts, progress and receiving smart suggestions via AI chatbot.
* This is a gap that previous studies have not addressed, and FitAI will fill by providing a practical, feasible and easy-to-deploy system.

1. **Problem Statement**

In recent years, digital health and fitness applications have become widely available, offering users a variety of tools to track nutrition, monitor physical activity, and evaluate overall progress. Applications such as MyFitnessPal, Fitbit, Samsung Health, and Apple Health have achieved global popularity by providing basic logging functions, calorie counting, and integration with wearable devices. While these platforms represent important advancements, they still fail to address several critical limitations in delivering truly personalized health support.

First, most existing applications lack deep personalization. Research has shown that factors such as gender differences, gamification, and user engagement play significant roles in app adoption and loyalty (Emerald, 2021; Sampat et al., 2023). However, current systems typically rely on generic recommendations, requiring users to interpret raw data themselves rather than receiving tailored guidance based on their individual progress, body metrics, and long-term goals.

Second, fitness management remains fragmented across multiple platforms. Users often need one application to log meals, another to track workouts, and yet another to evaluate health metrics. This fragmentation not only creates inefficiency but also discourages long-term adherence, as users are required to maintain data across separate systems without a unified view of their health.

Third, there is a notable absence of conversational artificial intelligence in most fitness applications. Although AI is increasingly applied in healthcare to improve hospital efficiency, diagnostic support, and anomaly detection (Kalaiarasi et al., 2025; Suthaharan et al., 2024), fitness and nutrition applications have not yet integrated AI-driven conversational agents capable of providing real-time feedback, coaching, and adaptive recommendations. This absence limits user interaction and reduces the potential for continuous engagement.

Finally, while the adoption of microservices architecture has shown promising results in large-scale healthcare information systems (Tsegaye et al., 2025; Osei-Tutu, 2021; Guo & Gao, 2023), little research has focused on applying such distributed and scalable architectures to personal fitness platforms. Most fitness apps remain monolithic, which restricts scalability, integration with AI services, and efficient handling of complex user data.

* These limitations highlight a clear gap: the lack of an integrated, AI-powered system that combines nutrition tracking, workout management, progress monitoring, and conversational interaction within a scalable architecture. To address this gap, the proposed project FitAI seeks to develop an AI-powered fitness and nutrition assistant built on microservices, supported by a structured database, and enhanced by a chatbot for personalized and interactive health coaching.

1. **Methodology** 
   1. **Research and Development Approach**

This project adopts a practical research and development approach, combining academic investigation of fitness applications, AI in healthcare, and microservices architecture (as discussed in Section 4) with the implementation of a fully functional system prototype. The methodology focuses on incremental development, ensuring that each module (or service) is designed, tested, and integrated progressively.

The project will follow the Agile Scrum model, with development carried out in short sprints of 1–2 weeks. Each sprint will deliver a working increment of the system, followed by testing and refinement. Weekly evaluations will ensure progress tracking, allow for adjustments, and reduce risks related to delays or technical barriers.

* 1. **Development Process**

The development process consists of six phases:

**1.Requirement Analysis**

* Identify functional requirements: user registration, nutrition tracking, workout management, progress monitoring, AI-based recommendation, chatbot.
* Define non-functional requirements: scalability, security, usability, performance.

**2.System Design**

* Architecture: design a **microservices architecture** to separate services for User, Foods, Workout, Progress, Recommendation, and Chat.
* Database: design an **ERD** for relational storage of user profiles, meals, workouts, and progress data.
* Data Flow: map how user queries travel from frontend → Chat Service → Intent Detection → appropriate backend service.

**3.Implementation**

* Backend: implement each service in **Python Flask**.
* Database: create **MySQL schema** with stored procedures (e.g., sp\_add\_meal, sp\_add\_workout) and functions (e.g., fn\_bmi, fn\_bmr).
* AI Integration: connect **Ollama + LLaMA3** for intent detection and personalized recommendations.
* Frontend: develop a **web interface** for user interaction using HTML, CSS, JS (with dashboard and chatbot integration).

1. **Intergration**

* Deploy all services using **Docker Compose**.
* Establish inter-service communication via RESTful APIs.
* Ensure scalability and modularity of each container.

1. **Testing**

* Unit testing: validate functions within each microservice.
* Integration testing: check communication between services.
* System testing: evaluate the platform as a whole in terms of usability, accuracy of recommendations, and chatbot responses.

1. **Deployment and Evaluation**

* Deploy the system locally and potentially on a cloud environment for demonstration.
* Evaluate based on:

**Accuracy**: correctness of recommendations (calories, workouts).

**Usability**: ease of navigation on the website.

**Performance**: latency of API responses, chatbot interaction speed.

**3.3 Tools and Technologies**

**Programming Language & Framework:** Python Flask (for microservices backend).

**Database:** MySQL with stored procedures, views, and functions.

**AI Framework:** Ollama + LLaMA3 for natural language understanding and personalized recommendation.

**Frontend:** HTML, CSS, JavaScript (web-based dashboard and chatbot).

**Deployment:** Docker & Docker Compose for containerized services.

**Collaboration & Version Control:** GitHub repository (with code, documentation, and issue tracking).

**Testing Tools:** Postman for API testing; pytest/unittest for backend services

**3.4 Justification of Methodology**

The choice of Agile Scrum ensures flexibility and incremental development, which is well-suited for a student project with evolving requirements. The microservices architecture provides modularity and scalability, aligning with modern best practices in health informatics systems. Docker containerization supports reproducibility and portability across environments. Finally, the use of AI-powered conversational agents addresses the research gap identified in Section 4, offering a novel contribution in the context of fitness and nutrition applications.

**Reference**

[1]Emerald Publishing. (2021). Does gender really matter? Exploring determinants of loyalty in fitness apps. International Journal of Research in Marketing, 33(1), 280–298. Available at: [https://www.emerald.com/intr/article-abstract/33/1/280/185829](https://www.emerald.com/intr/article-abstract/33/1/280/185829" \t "_new)

[2]Sampat, B., Behl, A., & Raj, S. (2023). Understanding fitness app users’ loyalty and word of mouth through gameful experience and flow theory. AIS Transactions on Human-Computer Interaction, 15(2), 193–223. <https://doi.org/10.17705/1thci.00188>

[3]Kalaiarasi, P., Reddy, M.P., Kousik, K. & Neeraj, M. (2025). SAHAYAK AI: A Next-Gen AI-Powered Intelligent Healthcare Management System for Enhanced Diagnosis and Hospital Efficiency. 2025 International Conference on Computational Robotics, Testing and Engineering Evaluation (ICCRTEE). IEEE. doi:10.1109/ICCRTEE64519.2025.11053067.

[4]Wang, W., Wang, Y., Chen, L., Ma, R. & Zhang, M. (2024). Justice at the Forefront: Cultivating felt accountability towards Artificial Intelligence among healthcare professionals. Social Science & Medicine, 347, 116717. doi:10.1016/j.socscimed.2024.116717.

[5]Suthaharan, S. et al. (2024). AI-Enabled Anomaly Detection with Privacy Preservation in Wireless Sensor Healthcare IoT Environment. Journal/Conference name. [PDF].

[6]Tsegaye, H.B., Tshakwanda, P.M., Devetsikiotis, M. & Spachos, P. (2025). A Cloud-Edge Microservices Architecture for Smart Healthcare: SDN-Based Medical Asset Management. IEEE Medical Measurements & Applications (MeMeA). doi:10.1109/MEMEA65319.2025.11067988.

[7]Osei-Tutu, K. (2021). A Microservices Enterprise Architecture for Healthcare Information Exchange (HIE) in Developing Countries. 2021 10th International Congress on Advanced Applied Informatics (IIAI-AAI). doi:10.1109/IIAI-AAI53430.2021.00134.

[8]Guo, K. & Gao, R. (2023). Distributed Healthcare Information System Based on High-Concurrency Microservice Architecture. 2023 4th International Conference on Information Science, Parallel and Distributed Systems (ISPDS). doi:10.1109/ISPDS58840.2023.10235584.