SehatGuru : An AI-Powered Fitness, Nutrition and Recovery Companion for South Asian Markets

Kaavish Project Proposal

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1 Abstract

This project proposes a mobile application that combines gym training, personalized nutrition, and recovery guidance into a single, friendly digital mentor — a 3D avatar powered by a large language model (LLM) and supporting modules for workout planning, food recognition, and recovery tracking. The avatar functions as an accessible coach: it learns which equipment the user actually has and avoids suggesting unavailable machines, builds progressive workout plans (e.g., push/pull/legs or strength-hypertrophy splits) that adapt according to the user's pace, and nudges the user with motivational reminders when engagement drops. The nutrition component offers meal plans tailored to goals and budget, supports Indian/desi cuisines, and estimates calories and macronutrients from a user's food photo using computer-vision models trained on food datasets [1]. A recovery module complements training by offering evidence-based recovery routines and tracking markers such as sleep, soreness, and perceived exertion to adapt load and suggest restorative practices.

The concept builds on established commercial and research precedents. Several existing apps demonstrate parts of this vision: adaptive workout planning and equipment-aware sessions (e.g., Fitbod [3]) and AI-driven coach systems that tune based on user feedback (e.g., Freeletics [4]). Nutrition-first apps and photo-based food recognition tools show that meal-photo calorie estimation and regional-cuisine support are technically feasible (e.g., HealthifyMe [2]; Calorie Mama / SnapCalorie [5]). Separately, digital recovery programs have demonstrated clinical benefit in supervised trials, which supports including a recovery pathway in an app focused on safe, progressive training [6]. The avatar's notification and motivational system is informed by mobile health literature on how timely push notifications can increase engagement and adherence [7].

From a user perspective, the app emphasizes simplicity and personalization. Onboarding asks a few simple questions (goals, equipment, budget, dietary preferences) and the avatar creates a phased plan that balances training stimulus with recovery and daily life constraints. The system stores known constraints (e.g., "no leg press at home") so future recommendations are realistic. Meal plans are generated according to local food availability and budget considerations; when users upload a meal photo the app matches the meal to learned categories and returns estimated calories and macronutrients, explicitly flagging uncertainty for mixed/ambiguous dishes. The LLM-backed avatar provides conversational Q&A (form checks, exercise cues, diet clarifications) while a rules-and-ML hybrid engine governs safety checks: progression limits, contraindications, and recovery thresholds.

Technically, the project integrates (1) an LLM for conversational coaching and plan generation, (2) a workout planner that models progressive overload and equipment availability, (3) a food-recognition pipeline trained or fine-tuned on regional food datasets to improve desi-food accuracy [1], and (4) a recovery/adherence tracker that feeds back into plan adaptation [6]. Privacy and data security are prioritized: all health-related data are stored securely and users control sharing. In sum, this project aims to deliver an empathetic, context-aware digital mentor that helps users train smarter, eat more suitably for their culture and budget, and recover safely — combining commercial precedents [3, 4, 2, 5] and clinical evidence [6, 7] into a unified, locally-aware product.

2 Problem definition

Pakistan faces a severe health crisis with NCDs causing 58% of deaths and diabetes affecting 26.7% of adults—among the world's highest rates [8]. Despite this epidemic, available fitness technology

remains fundamentally incompatible with Pakistani needs, creating a dangerous gap in preventive healthcare access.

Global fitness apps fail catastrophically at recognizing South Asian cuisine, achieving less than 40% accuracy South Asian dishes [9]. Essential foods like biryani, karahi, and nihari are absent from databases or misrepresented, causing tracking errors of 200-400 calories per meal.

With per capita income at $1,588 and gym memberships costing PKR 3,000-10,000 monthly, only 2.3% of urban Pakistanis access gyms [10]. Premium fitness apps charging $15-30 monthly remain unaffordable for middle-class users earning PKR 50,000-100,000. Additionally, workout recommendations assume equipment availability that doesn't exist in Pakistani homes or local gyms, rendering most programs unusable.

Fitness apps globally retain only 8.48% of users after 30 days [11]. In Pakistan, this worsens due to language barriers (no Urdu support), and Western-centric motivational messaging. The absence of local context creates psychological distance between users and their fitness goals.

Pakistani users currently lack an integrated solution that understands local food, respects economic constraints, adapts to available equipment, and provides culturally relevant guidance. This fragmentation exacerbates the NCD crisis that already costs Pakistan's economy billions annually [8], particularly affecting 64 million urban youth who represent both the highest NCD risk and greatest technology adoption potential.

3 Social relevance

Pakistan's median age of 22 years presents both opportunity and crisis. The youth bulge of 64 million urban millennials exhibits alarming health trends: 40% are physically inactive, 33% consume fast food daily, and early-onset diabetes now appears in teenagers [12]. Without intervention, this generation will overwhelm hospitals by 2035, creating Pakistan's first lifestyle disease epidemic. SehatGuru targets this demographic with culturally relevant, affordable fitness technology before irreversible health damage occurs.

Cultural constraints prevent majority of Pakistani women from accessing public gyms or outdoor exercise. Social norms around mixed-gender facilities, family responsibilities, and safety concerns create insurmountable barriers to fitness. Home-based solutions become essential for 110 million Pakistani women who cannot access traditional fitness resources. Our avatar-based system provides private, culturally sensitive fitness guidance within homes, democratizing health access regardless of gender or social restrictions.

The fitness industry's premium pricing excludes majority of Pakistanis from professional health guidance. While affluent areas have international-standard gyms, middle and lower-income populations rely on unsafe practices: unqualified trainers, dangerous supplements, and medically unsound advice from social media. This creates a two-tier health system where wealth determines wellness. SehatGuru's affordable, AI-powered expertise breaks this inequality, providing evidence-based fitness guidance at local price points.

Young Pakistanis face identity conflict between traditional cuisine and Western fitness culture. International apps implicitly shame local food choices, pushing users toward expensive imported alternatives and creating cultural disconnection. This psychological tension reduces adherence and promotes unhealthy relationships with traditional food. By celebrating and accommodating Pakistani cuisine within fitness goals, SehatGuru preserves cultural identity while promoting health. With only $10 per capita healthcare spending annually, Pakistan cannot afford reactive medical

treatment [13]. Prevention through fitness and nutrition costs 20 times less than treating diabetes or heart disease.

4 Originality/Novelty

Existing fitness and nutrition apps such as HealthifyMe [2], Fitbod [3], Freeletics [4], and Calorie Mama [5] provide valuable tools for exercise tracking, meal logging, or AI-based coaching. However, these solutions focus on isolated aspects of health management: HealthifyMe emphasizes nutrition tracking but has limited adaptive workout guidance, Fitbod and Freeletics provide personalized workouts but lack culturally-aware nutrition or meal-photo analysis, and Calorie Mama offers food recognition but is mostly tuned for Western foods and does not support local South Asian cuisines. Consequently, users must rely on multiple apps or compromise on personalization, and there is little sense of a holistic, human-like coaching experience.

SehatGuru contrasts with these solutions by offering a fully integrated, AI-powered avatar coach that combines adaptive workout planning, personalized nutrition (including accurate analysis of Pakistani and South Asian dishes), and injury-aware recovery guidance in a single platform. Unlike existing apps, the avatar provides conversational guidance with personality and motivation, dynamically adjusting all plans according to user constraints, progress, and reported injuries. In the nutrition domain, SehatGuru allows users to input available ingredients and generates culturally-relevant meal plans with calorie and macronutrient estimation, addressing a gap that HealthifyMe and Calorie Mama cannot handle for Pakistani cuisine [1, 9]. By integrating these features, SehatGuru delivers a cohesive, culturally-aware, and immersive user experience, creating a digital alternative to a professional fitness coach that existing solutions do not offer.

5 CS contribution

SehatGuru brings together our computer science education to solve real-world problems. Based on our coursework, here's how we plan to apply these concepts to the project's core components, keeping in mind that our technical approach might evolve as we dive deeper into the build.

The AI coaching avatar builds on **Natural Language Processing** and **Introduction to Large Language Models** to create a conversational coach that understands South Asian cultural nuances. For food recognition, we're using **Introduction to Deep Learning** and **Computer Vision** to identify Pakistani dishes like biryani and pulao and estimate their nutritional content. The adaptive workout system applies algorithms from **Algorithms: Design and Analysis** and **Data Structures II** to personalize training based on user progress and available equipment.

Furthermore, using **Introduction to Human Computer Interaction** to ensure the app works well for everyone, from experienced users to first timers. **Software Engineering** principles and agile methodologies help us manage this year-long project effectively. The mobile app is built with **Web and Mobile Development** using React Native for cross-platform compatibility, while **Probability and Statistics** enables personalized plan adjustments based on user progress. All user data is securely managed through concepts learnt from **Database Systems** course.

6 Scope and Deliverables

SehatGuru aims to deliver an integrated AI-powered platform combining fitness, nutrition, and recovery guidance into a single, culturally-aware virtual avatar coach. The system will offer adaptive workout planning tailored to user fitness levels, available equipment, and recovery needs, following standard progressions that evolve over time. The nutrition module will generate personalized meal plans using local ingredients, provide calorie and macronutrient estimates for Pakistani and Indian dishes, and allow basic ingredient-based meal input. The injury-aware recovery tracker will let users report pain or injuries, receive simple rehab plans, and automatically adjust workout and nutrition plans to prevent strain or aggravation. An interactive avatar will provide conversational guidance, motivational nudges, and personalized real-time feedback throughout the user's fitness journey. To ensure feasibility within the year-long timeline and four-member team, advanced 3D avatar animations, integration with wearable devices, and social or community functionality are considered out of scope.

The project will be delivered in phases across two semesters. In Kaavish I, the mid-semester deliverable will document research, design, proposed workflows, and system architecture, while the final MVP will include basic avatar coaching, workout routines with standard progressions, nutrition plans from predefined templates with ingredient-based input, and an injury tracker supporting simple scenarios with basic adjustments. In Kaavish II, the mid-semester update will enhance functionality through adaptive workouts, personalized feedback, calorie estimation from food photos, and detailed injury or recovery management. The final deliverable will present the fully integrated SehatGuru application with adaptive planning, advanced nutrition analysis, improved avatar interaction, and comprehensive injury-aware plan adjustments. This phased approach ensures incremental development, testing, and refinement, maintaining a realistic and achievable roadmap for the team.

7 Feasibility

The proposed **AI-powered Virtual Fitness Coach**—covering gym training, nutrition, recovery, and motivation—is feasible through open-source datasets, mature AI frameworks, and efficient development tools.

Datasets: Open datasets such as *Free Exercise DB* [14] and *Kaggle Fitness Exercises* [15] provide exercise details for personalized workout plans. Nutritional data will be sourced from *Pakistan Food Composition Table (PFCT)* [16], *Indian Food Composition Table (IFCT)* [17], *Nutrition5k* [18], and *FoodData Central* [19] to ensure regional accuracy. For food image recognition, datasets like *Food-101* [20], *Indian Food Images (Kaggle)* [21], and *Indian Foods (Hugging Face)* [22] enable accurate recognition and calorie estimation for Indian and Pakistani dishes.

Compute and Hardware: Model training and fine-tuning (if needed) will leverage cloud GPUs such as *Google Colab* or *Kaggle*, while local development will be performed on a workstation with 16 GB RAM and a CUDA-compatible GPU. End-users will require smartphones with camera support for food recognition and avatar interaction.

Software Stack: The system will employ *Hugging Face Transformers* for LLMs and computer vision tasks, *FastAPI* or *Flask* with *PostgreSQL* or *Firebase* for backend services, and *Flutter* or *React Native* for cross-platform mobile development. Data visualization will be handled using *Pandas*, *NumPy*, and *Matplotlib*. A 3D avatar will be designed and animated in *Blender*, while *Firebase Cloud Messaging* or *OneSignal* will manage notifications and motivational nudges.

Utilization: All datasets will be indexed in a *vector database* (e.g., *FAISS*) to support RAG-based recommendations. Cloud and local compute resources will manage AI workflows. Behavioral feedback and motivational reminders will enhance user engagement and adherence throughout their fitness journey.

8 Team Dynamics

The team's combined expertise in AI, ML, software engineering, and mobile development ensures successful project execution.

Sameer Kamani specializes in LLM integration, RAG systems, and deep learning, with hands-on experience through internships at Systems Limited and 10 pearls. He has completed both basic and advanced Blender courses, strengthening his 3D modeling and visualization skills for the intelligent coach and avatar.

Ahtisham Uddin brings strong ML and backend expertise, with experience in model development using PyTorch/TensorFlow and API creation. His coursework in AI and Software Engineering supports data-driven workout and nutrition recommendations.

Hammad Malik excels in full-stack and DevOps, skilled in React Native, Docker, Kubernetes, and CI/CD pipelines. His experience ensures smooth app deployment, scalability, and cloud integration.

Arsal Jangda leads frontend development and UI/UX design, bringing specialized experience from Computer Vision where he worked with PyTorch and TensorFlow. His hands-on experience in React Native mobile app development ensures a responsive, engaging, and accessible user experience that enhances user interaction and motivation.

9 Tech Stack

The Virtual Fitness Coach app integrates AI-driven personalization, visual food recognition, and adaptive recovery guidance using a modern, efficient technology stack.

Frontend and Backend: The application is built using **React Native** for a smooth cross-platform experience on Android and iOS, ensuring a responsive and engaging UI. A **Node and Express** backend connects the app to AI models and databases via RESTful APIs. **Firebase** is used for authentication, real-time data storage, and cloud hosting, enabling secure and synchronized user data management.

Artificial Intelligence: The core intelligence of the app comes from **GPT-based models** integrated through the OpenAI API, enabling natural language interaction and personalized fitness guidance. A Retrieval-Augmented Generation (RAG) approach ensures responses are aligned with trusted, research-based health and fitness standards. For food recognition, image classification models like **ResNet50** or **Transformer models** are fine-tuned on culturally relevant datasets to identify meals and offer nutritional insights.

Visualization and Deployment: Blender is employed to create visual elements and posture guides for engagement and clarity. The app and backend are deployed via **Firebase Hosting** and managed through **GitHub** for version control and collaboration.

This stack ensures scalability, accuracy, and user engagement through intelligent personalization, cultural inclusivity, and adaptive fitness planning.

10 References

References

[1] Bossard, L., Guillaumin, M., & Van Gool, L. (2014). Food-101 – Mining discriminative components with random forests. In *Computer Vision – ECCV 2014* (pp. 446–461). Springer. https://doi.org/10.1007/978-3-319-10599-4_29

[2] HealthifyMe. (2024). *HealthifyMe: AI nutrition and fitness features*. Retrieved from https://www.healthifyme.com

[3] Fitbod. (2024). *Fitbod: Personalized strength training and workout planner*. Retrieved from https://fitbod.me

[4] Freeletics. (2024). *Freeletics: AI-powered personal training*. Retrieved from https://www.freeletics.com

[5] Calorie Mama. (2024). *Calorie Mama & SnapCalorie: AI food photo calorie counter*. Retrieved from https://www.caloriemama.ai

[6] Toelle, T. R., Utpadel, C., Schofer, M., & Appelbaum, S. (2019). App-based multidisciplinary back pain treatment versus combined physiotherapy plus online education: A randomized controlled trial. *npj Digital Medicine, 2*(1), 34. https://doi.org/10.1038/s41746-019-0109-x

[7] Laing, B. Y., Mangione, C. M., Tseng, C. H., Leng, M., Vaisberg, E., Mahida, M., Bholat, M., Glazier, E., Morisky, D. E., & Bell, D. S. (2014). Effectiveness of a smartphone application for weight loss compared with usual care in overweight primary care patients: A randomized, controlled trial. *Annals of Internal Medicine, 161*(10 Suppl), S5–S12. https://www.acpjournals.org/doi/10.7326/M13-3005

[8] World Health Organization. (2023). *Noncommunicable diseases country profiles: Pakistan*. Retrieved from https://www.who.int/nmh/countries/pak_en.pdf

[9] Pandey, S., et al. (2023). *IndianFoodNet: Detecting Indian Food Items Using Deep Learning*. International Journal of Engineering Technologies and Applications, 8(4), 234-248. Retrieved from https://www.researchgate.net/publication/376983744_IndianFoodNet_Detecting_Indian_Food_Items_Using_Deep_Learning

[10] Pakistan Bureau of Statistics. (2023). *Pakistan Social and Living Standards Measurement Survey*. Government of Pakistan. Retrieved from https://www.pbs.gov.pk/content/pakistan-social-and-living-standards-measurement

[11] Statista. (2023). *Health & Fitness Apps - Pakistan Market Forecast*. Retrieved from https://www.statista.com/outlook/dmo/app/health-fitness/pakistan

[12] The Lancet Regional Health Southeast Asia. (2023). *The burden of metabolic risk factors in Pakistan: A systematic analysis*. Retrieved from https://www.thelancet.com/journals/lansea/article/PIIS2772-3682(23)00024-0/fulltext

[13] World Bank. (2023). *Current health expenditure per capita - Pakistan*. Retrieved from https://data.worldbank.org/indicator/SH.XPD.CHEX.PC.CD?locations=PK

[14] Free Exercise DB. (2023). *Free Exercise Database: Comprehensive exercise dataset for fitness applications*. Retrieved from https://github.com/yuhonas/free-exercise-db

[15] Kaggle. (2023). *Fitness Exercises Dataset*. Retrieved from https://www.kaggle.com/datasets/omarxadel/fitness-exercises-dataset

[16] Government of Pakistan. (2021). *Pakistan Food Composition Table (PFCT)*. National Institute of Health, Islamabad. Retrieved from https://www.fao.org/fileadmin/templates/food_composition/documents/regional/Book_Food_Composition_Table_for_Pakistan_.pdf

[17] Indian Council of Medical Research (ICMR). (2017). *Indian Food Composition Tables (IFCT)*. National Institute of Nutrition, Hyderabad. Retrieved from https://github.com/lindsayjaacks/Indian-Nutrient-Databank-INDB-

[18] Bi, S., Wang, H., Li, C., et al. (2021). Nutrition5k: Towards Automatic Nutritional Understanding of Generic Food. *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 8903–8911. https://github.com/google-research-datasets/Nutrition5k

[19] U.S. Department of Agriculture. (2024). *FoodData Central*. Retrieved from https://fdc.nal.usda.gov

[20] Bossard, L., Guillaumin, M., & Van Gool, L. (2014). Food-101 – Mining discriminative components with random forests. In *Computer Vision – ECCV 2014* (pp. 446–461). Springer. https://doi.org/10.1007/978-3-319-10599-4_29

[21] Kaggle. (2023). *Indian Food Images Dataset*. Retrieved from https://www.kaggle.com/datasets/iamsouravbanerjee/indian-food-images-dataset

[22] Hugging Face. (2024). *Indian Foods Dataset*. Retrieved from https://www.kaggle.com/datasets/l33tc0d3r/indian-food-classification

Undertaking of Kaavish advisement as an External Supervisor

I hereby affirm that I have read the project details as described on the preceding pages and agree to undertake advisement of this Kaavish project as an External Supervisor. I understand that this role entails the following.

Meeting Meeting the project team regularly, at least once every two weeks, for the entire duration of the Kaavish. The meetings may be held remotely if required.

Advisement Providing supervision and advice to the team in order to ensure steady progress of the project toward its goals.

Liaison Liaising with the Internal Supervisor as required, e.g. to provide feedback or engage in grading.

Other Any other task, depending on availability and suitability, relevant to the Kaavish as communicated by the Internal Supervisor or Kaavish Working Group.

Name: _____

Email: _____

Phone: _____

Designation: _____

Affiliation: _____

Signature: _____