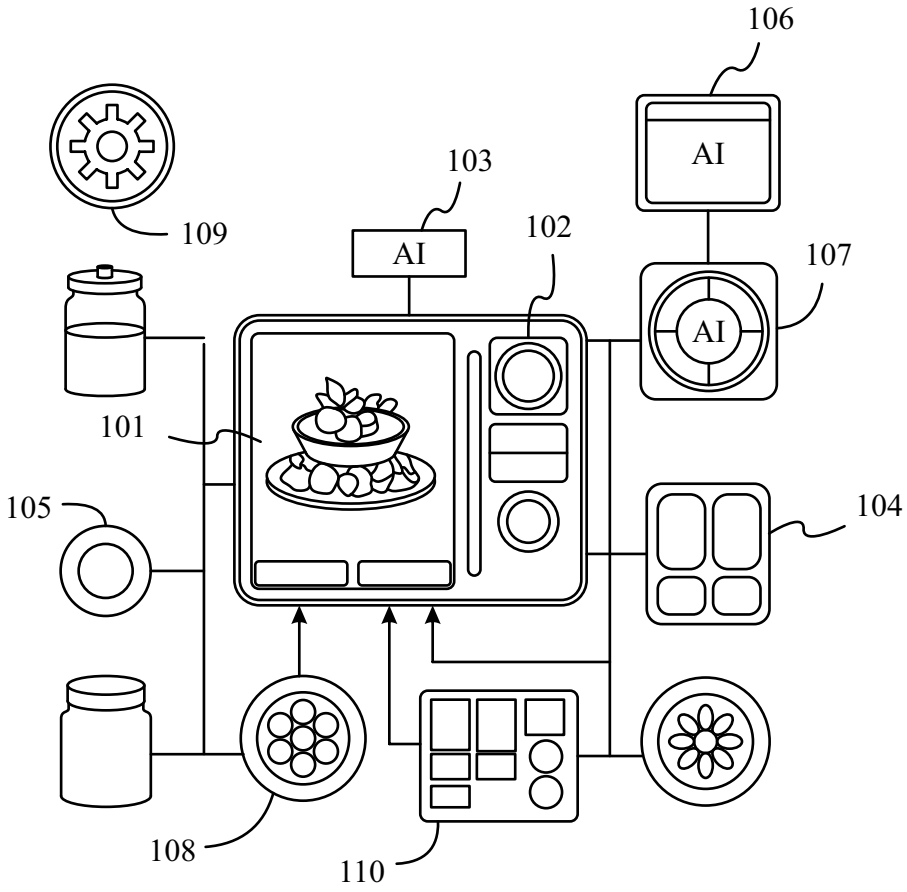
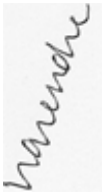


FIG. 1



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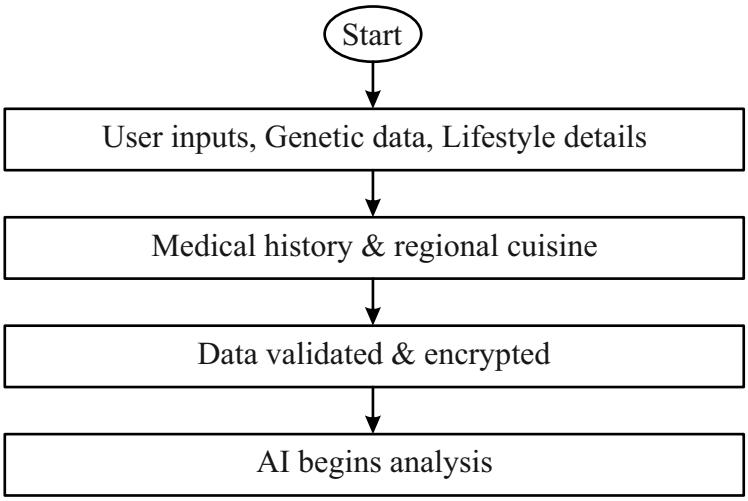
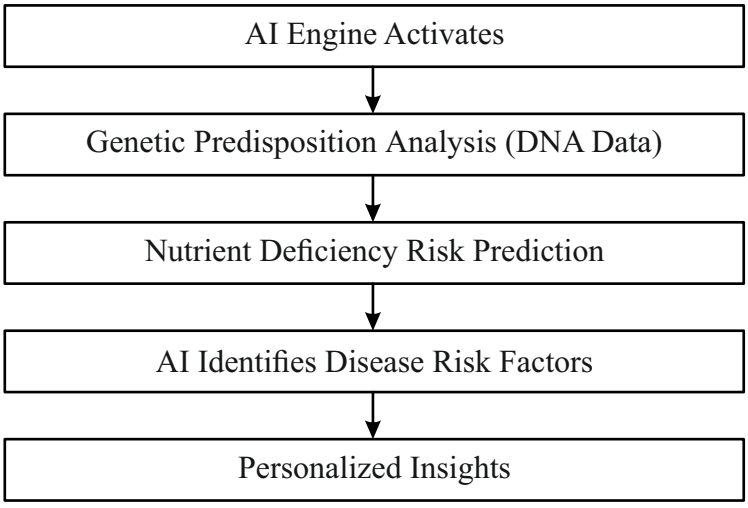


FIG. 2



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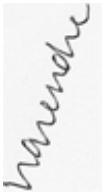

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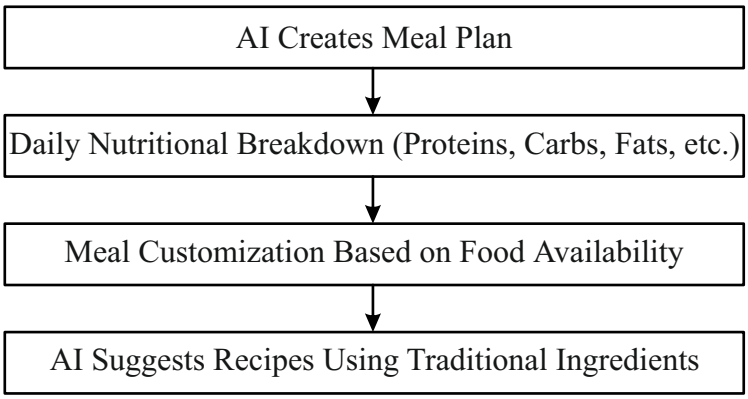


FIG. 4

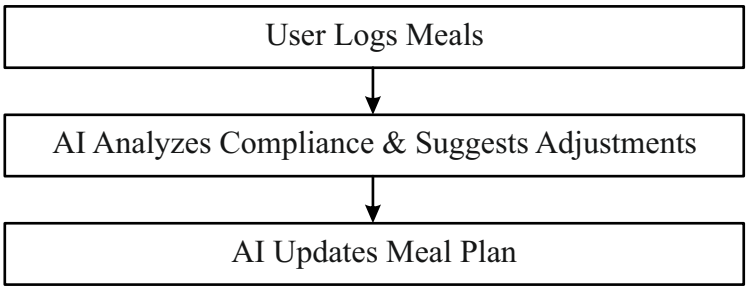


FIG. 5

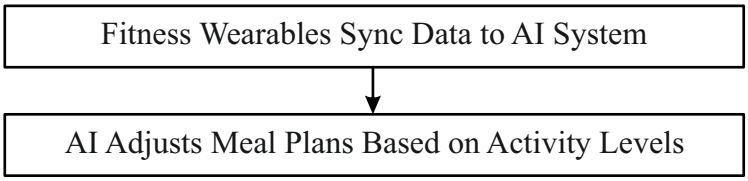
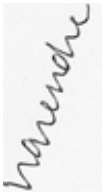


FIG. 6



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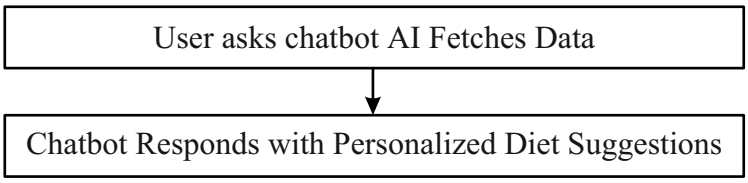


FIG. 7

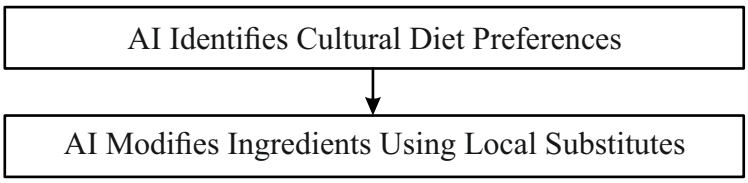


FIG. 8

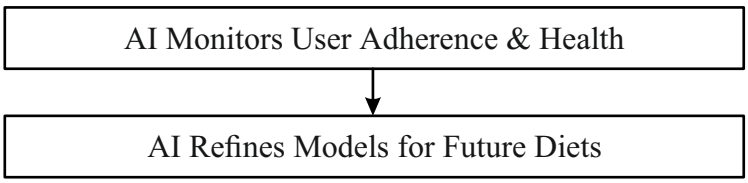
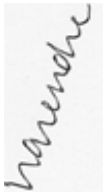


FIG. 9



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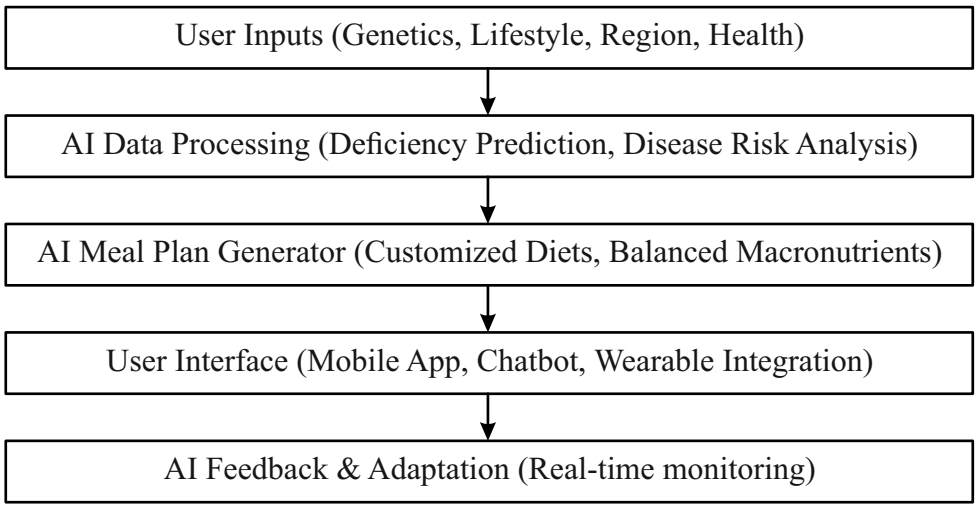
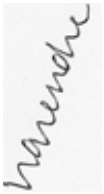


FIG. 10



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FORM 2

THE PATENTS ACT, 1970

(39 OF 1970)

&

THE PATENTS RULES, 2003

COMPLETE SPECIFICATION

(See section 10, rule 13)

SYSTEM AND METHOD FOR PERSONALIZED NUTRITION

APPLICANT(S)

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The following specification particularly describes the invention and the manner in which it is to be performed.

SYSTEM AND METHOD FOR PERSONALIZED NUTRITION

FIELD OF THE INVENTION

This present invention relates to an AI-driven personalized nutrition advisor platform that analyzes an individual's genetic makeup, lifestyle, and regional food preferences to create customized nutrition plans. The platform offers recommendations for diets aligned with modern health trends, aiming to enhance individual health outcomes through culturally relevant dietary guidance.

BACKGROUND OF THE INVENTION

The intersection of artificial intelligence and personalized healthcare has opened new avenues for tailored nutritional guidance. In India, dietary habits are deeply rooted in cultural and regional practices, making it essential for nutritional advice to align with these traditions for better acceptance and adherence. While advancements have been made in personalized nutrition, existing solutions often overlook the importance of cultural relevance, leading to generic recommendations that may not resonate with individuals

Existing nutritional guidance systems often provide generic recommendations that fail to account for individual genetic variations, lifestyle factors, and cultural food preferences. Several prior arts have attempted to address personalized nutrition:

The prior art **US8504385B2** discloses a method for providing personalized nutritional advice involves analyzing a subject’s medical condition and generating tailored dietary recommendations through a computer-based system. It begins with obtaining a definition of the subject's medical condition (Step A) and querying a comprehensive database (Step B) to assess the impact of specific foods and nutrients on that condition. The database consists of multiple interconnected tables. The Problem Table lists various health conditions unique to the subject, while the Item Table contains records for different food items and their nutritional content. The Content Table identifies the nutritional composition of each food item, including the presence and quantity of specific nutrients.

Another prior art **US20190244541A1** discloses a method assists users with their nutritional needs by collecting physiological and food consumption data from devices like mobile phones or personal computers. This data, which includes eating habits, health goals, and activity levels, is combined with a food ontology—a hierarchical database containing food items, their nutritional content, and relationships between them. The system generates personalized health, nutrient, and dietary constraints, applying these to an optimization algorithm. This algorithm creates a graphical visual object representing a "food space," where different points indicate possible diets. Users can interact with this visualization to receive optimal diet recommendations tailored to their unique constraints

and preferences. The system dynamically adjusts recommendations based on user feedback and changes in physiological inputs. It also supports multiple users by clustering them into groups with similar dietary needs, enabling a collaborative nutritional platform with shared insights and trends.

The prior arts have limitations such as consideration of cultural and regional dietary practices, which are important for user health and effectiveness. Countries with its diverse culinary, a one-size-fits-all approach is inadequate. There is a need for a system that not only considers individual genetic and lifestyle factors but also incorporates regional food preferences to provide personalized, culturally relevant nutrition advice.

The present invention overcome all the limitations of the prior arts by introducing an AI-driven platform that integrates personal health data with regional dietary preferences, offering customized nutrition plans that honor diets while aligning with modern health trends.

OBJECTS OF THE INVENTION

- The principal object of the present invention is to develop an AI-driven platform that provides personalized nutrition plans by analyzing an individual's genetic makeup, lifestyle, and regional food preferences.
- Another object of the present invention is to incorporate traditional Indian diets into personalized nutrition recommendations, ensuring cultural relevance and promoting better adherence.
- A further object of the present invention is to align personalized nutrition plans with modern health trends, addressing contemporary health concerns while respecting traditional dietary practices.
- Yet another object of the present invention is to enhance individual health outcomes through customized dietary guidance that considers genetic predispositions, lifestyle factors, and regional dietary habits.

SUMMARY OF THE INVENTION

The present invention discloses an AI-driven personalized nutrition advisor system designed to deliver individualized dietary recommendations by integrating genetic data, lifestyle factors, and regional food preferences. This advanced system utilizes multiple interconnected components and a structured methodology to provide scientifically accurate and culturally relevant nutritional guidance. By combining artificial intelligence with real-time feedback and secure data management, the system ensures personalized, adaptive, and privacy-compliant dietary support.

The User Interface Module serves as the primary interaction point where users input health and lifestyle data. This includes genetic information obtained through DNA sequencing, lifestyle attributes

like physical activity levels and sleep patterns, and regional dietary preferences influenced by cultural and historical food habits. The user-friendly interface simplifies data entry and facilitates accurate nutritional assessments based on user-specific needs.

The Data Acquisition System processes comprehensive datasets, including genetic markers, health conditions, and food habits. It collects data from diverse sources to provide a holistic health profile. This module identifies genetic predispositions, tracks medical conditions, and analyzes dietary behaviors, allowing for the creation of precise and personalized nutritional recommendations.

At the core of the system is the AI-Based Analytical Engine, which employs advanced machine learning algorithms to interpret user data. It performs several key functions: Genetic Predisposition Analysis evaluates how genetic markers affect nutrient metabolism, Deficiency Prediction identifies gaps in essential vitamins and minerals, Disease Risk Evaluation assesses the likelihood of chronic conditions like diabetes and cardiovascular diseases, and Regional Cuisine Mappingaligns dietary suggestions with local culinary traditions to improve user adherence.

The Personalized Meal Plan Generator converts analytical insights into actionable dietary plans. It creates comprehensive meal schedules through Meal Plan Generation providing daily, weekly, and monthly options tailored to individual goals. Nutrient Balance ensures optimal macronutrient and micronutrient distribution, while AI-Optimized Recipes adapt meal plans using locally available ingredients, accommodating dietary restrictions and allergies.

A Real-Time Feedback Mechanism dynamically adjusts dietary plans based on user behavior and biometric data. Adaptive Modifications update meal recommendations according to health metrics and compliance, while Wearable Integration synchronizes with fitness devices to enhance accuracy. This module also monitors diet adherence, sending reminders for hydration, meal timing, and nutrient intake while providing motivational support to promote better health outcomes.

User privacy is safeguarded by the Secure Data Management System, which employs Data Encryption to protect user information and ensure compliance with global data privacy standards. Role-Based Access controls data visibility, providing secure collaboration between healthcare professionals and dietitians while maintaining confidentiality.

The AI Chatbot Assistant enhances user engagement by offering real-time nutritional guidance. It provides Interactive Support for answering user queries regarding meal preparation, nutritional values, and food substitutions. Additionally, it includes Behavioral Coaching, which delivers personalized

motivation and habit-forming strategies to improve dietary adherence and overall health. This module supports secure access control, data encryption, and compliance with data protection laws.

The Regional Food Substitution Module enables cultural and regional adaptations to meal plans, ensuring accessibility and sustainability. It suggests Cultural Adaptations by offering alternative ingredients aligned with local customs, provides Dynamic Updates based on seasonal availability, and accommodates specific dietary needs such as vegetarian, vegan, and medical-specific diets. The system also leverages AI to propose local alternatives for unavailable foods.

A Cloud-Based Infrastructure ensures the system's scalability and interoperability. This infrastructure supports the integration of patient-specific meal plans with healthcare providers, food delivery services, and corporate wellness programs. The cloud-based architecture allows seamless data sharing and accommodates growing user bases without performance degradation.

The Continuous Learning Algorithm drives the system's ability to refine and evolve dietary recommendations over time. By analyzing user behavior, it improves the precision of future suggestions. This module incorporates the latest nutritional research to maintain evidence-based guidance and integrates advanced features like AI-powered voice assistance, augmented reality (AR) nutritional scanning, blockchain-based nutritional tracking, and AI-driven meal subscription services.

BRIEF DESCRIPTION OF THE DRAWINGS:

FIG.1 illustrates a personalized nutrition advisor System.
FIG.2 shows a flowchart for User Data Collection.
FIG.3 shows a flowchart for AI-Based Nutritional Analysis.
FIG.4 shows a flowchart for Personalized Meal Plan Generation.
FIG.5 shows a flowchart for Real-Time Feedback Mechanism.
FIG.6 shows a flowchart for Integration with Wearables.
FIG.7 shows a flowchart for AI Chatbot Assistance.
FIG.8 shows a flowchart for Regional Diet Adaptation
FIG.9 shows a flowchart for Continuous Learning and Adaptation.
FIG.10 shows a flowchart for working of nutrition advisor System.

DETAILED DESCRIPTION OF THE INVENTION

The present invention, discloses a personalized nutrition advisor which is an AI-powered nutrition planning system that integrates genetics, lifestyle, and regional food preferences to provide personalized dietary recommendations. The system consists of multiple components and follows a structured methodology to deliver culturally relevant and scientifically accurate nutritional guidance.

This system integrates various modules that work to deliver precise and adaptable nutrition plans developed as per genetic, lifestyle, and regional preferences.

Embodiments: -

User Interface Module (101)

The user interface module is the primary point of interaction where users input their health and lifestyle data. This includes genetic information derived from DNA sequencing, lifestyle attributes such as physical activity levels and sleep patterns, and regional dietary preferences influenced by cultural and historical food consumption. The interface is designed to be intuitive, allowing seamless data entry and facilitating personalized nutritional assessments.

Data Acquisition System (102)

The data acquisition system processes and analyzes complex datasets including genetic markers, health conditions, and dietary habits. This module collects data from multiple sources, ensuring a holistic understanding of the user's health profile. It identifies genetic predispositions, tracks existing medical conditions, and assesses food consumption patterns to deliver comprehensive nutritional insights.

AI-based analytical engine (103)

The AI-based analytical engine (103) is the core of the system, utilizing advanced machine learning algorithms to extract meaningful insights from collected data. It performs several functions, including Genetic Predisposition Analysis (103.1), which evaluates how genetic markers influence nutrient metabolism to provide personalized nutritional guidance. It also includes Deficiency Prediction (103.2) to identify potential gaps in essential vitamins and minerals, ensuring that dietary recommendations address these deficiencies. Additionally, the Disease Risk Evaluation (103.3) function assesses the likelihood of developing chronic conditions like diabetes, obesity, and cardiovascular diseases by analyzing genetic and lifestyle factors. Furthermore, the Regional Cuisine Mapping (103.4) feature aligns dietary recommendations with local culinary traditions to enhance user adherence and cultural relevance.

Personalized Meal Plan Generator (104)

The Personalized Meal Plan Generator (104) translates the analytical data into customized dietary plans. This module generates comprehensive meal plans developed to individual preferences and health goals through Meal Plan Generation (104.1), which creates daily, weekly, and monthly schedules. It ensures proper Nutrient Balance (104.2) by optimizing macronutrient and micronutrient distribution in each meal. The AI-Optimized Recipes (104.3) feature provides adaptable recipes that incorporate locally available ingredients while accommodating dietary restrictions and allergies.

Real-Time Feedback Mechanism (105)

The Real-Time Feedback Mechanism (105) dynamically refines dietary recommendations by responding to user behavior and biometric data. It includes Adaptive Modifications (105.1), which adjust meal plans based on user adherence and changing health metrics. Additionally, the Wearable Integration (105.2) component syncs with fitness trackers and other IoT devices to enhance data accuracy and update recommendations in real-time. This mechanism also offers Diet Adherence Monitoring, which tracks user compliance and provides reminders for hydration, meal timing, and nutrient intake while delivering motivational feedback.

Secure Data Management System (106)

Privacy and data security are safeguarded by Secure Data Management System (106). This system protects user information through Data Encryption (106.1), implementing advanced encryption protocols compliant with global privacy standards. It also uses Role-Based Access (106.2) to provide tiered access for healthcare professionals and dietitians, ensuring confidential and secure collaboration.

AI Chatbot Assistant (107)

The AI Chatbot Assistant (107) uses enhance user engagement and offers real-time nutritional guidance. Intelligent assistant provides Interactive Support by responding instantly to queries regarding meal preparation, nutritional values, and food substitutions. Compliance with Data Protection Laws: it offers Behavioral Coaching to deliver personalized motivation and habit-forming strategies, fostering, Secure Access Control: Only authorized users can access their personalized reports. better dietary adherence and improved health outcomes.

•107.1 End-to-End Encryption: All user data is encrypted during transmission and storage.

•107.2 Compliance with Data Protection Laws: The system adheres to India's Personal Data Protection Bill and GDPR standards.

•107.3 Secure Access Control: Only authorized users can access their personalized reports.

Regional Food Substitution Module (108)

The Regional Food Substitution Module (108) ensures cultural and regional adaptation of meal plans, promoting both sustainability and accessibility. This module suggests Cultural Adaptations by offering alternative ingredients and cooking methods aligned with local dietary customs. It also provides Dynamic Updates, adjusting recommendations according to seasonal food availability and price fluctuations.

•108.1 Vegetarian and Vegan Dietary Preferences: AI modifies recommendations for plant-based diets.

•108.2 Region-Specific Adaptations: Customized plans for North Indian, South Indian, Bengali, and other regional diets.

•108.3 Medical-Specific Diets: Specialized diets for diabetic, hypertensive, and cardiac patients.

•108.4 AI-Based Food Substitutions: The system suggests local alternatives to unavailable foods.

Cloud-Based Infrastructure (109)

A scalable Cloud-Based Infrastructure (109) supports seamless data processing and integration across the system. This infrastructure guarantees Scalability by accommodating growing user bases and increasing data volumes without compromising performance. It also ensures Interoperability, enabling integration with external platforms such as telemedicine and meal delivery services.

•109.1 Integration with Healthcare Providers: used by dietitians and hospitals for patient-specific meal planning.

•109.2 Partnership with Food Delivery Services: AI-generated meal plans can be integrated with meal delivery platforms.

•109.3 Corporate Wellness Programs: Companies can use the system for employee wellness programs.

Continuous Learning Algorithm (110)

The system's Continuous Learning Algorithm (110) powers its ability to evolve and refine recommendations over time. This algorithm provides behavioral insights to learn from user interactions, improving the precision of future suggestions. It also integrates the latest nutritional science through Research Integration, ensuring that dietary advice remains evidence-based and up-to-date.

•110.1 AI-Powered Voice Assistants for Meal Guidance.

•110.2 Augmented Reality (AR) Nutritional Label Scanning.

•110.3 Blockchain-Based Nutritional Tracking for Transparency.

•110.4 AI-Generated Meal Subscription Services Based on User Preferences.

Method of performing the invention:

The system is the AI-Based Adaptive Nutrition Optimization Method, which involves collecting and processing personalized health data from genetic and lifestyle inputs. It utilizes real-time biometric feedback from wearable devices to generate dynamic meal plans tailored to metabolic responses. The method also provides AI-generated recipes with real-time cooking instructions and predicts long-term health outcomes based on dietary adherence.

Step 1: User Data Acquisition

1.Genetic Data Input: Users upload genetic reports from DNA testing services such as 23andMe, AncestryDNA, or similar providers.

2.Lifestyle Data Input: Users provide information on daily routines, physical activity levels, dietary habits, and specific health goals.

3.Medical History Integration: The system allows integration with Electronic Health Records (EHR) for a holistic health assessment.

4.Regional Dietary Preference Selection: Users select their preferred cuisines (North Indian, South Indian, Bengali, Rajasthani, etc.), food allergies, and dietary restrictions.

Step 2: AI Processing & Analysis

1.Deep Learning Model Processing: AI analyzes genetic predispositions for nutrient metabolism, food intolerances, and disease risks.

2.Machine Learning-Based Pattern Recognition: The system predicts dietary deficiencies and macronutrient needs based on user input.

3.Regional Food Adaptation Algorithm: The AI maps scientifically recommended diets to culturally appropriate Indian meal options.

Step 3: Personalized Meal Plan Generation

1.AI-Generated Daily Meal Plans: The system produces customized meal plans based on nutrient needs, food preferences, and traditional recipes.

2.Dynamic Adaptation: AI modifies portion sizes, cooking methods, and ingredient substitutions to meet dietary goals.

3.Recipe Recommendations: The system suggests healthy versions of traditional Indian dishes, such as:

-Diabetes-friendly Poha with fiber-rich additions.

-Low-calorie Biryani with brown rice and lean protein.

-Iron-rich Palak Paneer optimized for anemia patients.

Step 4: Real-Time Monitoring and User Feedback

1.Meal Logging: Users track meal consumption through an intuitive mobile app interface.

2.Wearable Device Integration: The platform syncs with fitness bands (Fitbit, Apple Watch, etc.) to refine dietary suggestions.

3.AI-Based Adaptive Adjustments: The system modifies meal plans in real time based on user feedback and health metrics.

4.Voice-Activated AI Assistant: Users can interact with an AI chatbot for meal guidance and real-time dietary advice.

WE CLAIM:

1.An AI-driven personalized nutrition advisor system, comprising:

A user interface module (101) to receive user input including genetic data, lifestyle information, regional dietary preferences, and medical history;

A data acquisition system (102) configured to process genetic markers, health conditions, and food habits;

An AI-based analytical engine (103) that:

Analyzes genetic predispositions for nutrient metabolism;

Predicts deficiencies in essential vitamins and minerals;

Evaluates disease risks including diabetes, obesity, and cardiovascular conditions;

Maps dietary recommendations to region-specific traditional cuisines;

A personalized meal plan generator (104) that:

Generates daily, weekly, and monthly meal plans aligned with dietary patterns;

Balances macronutrients and micronutrients in meal recommendations;

Suggests AI-optimized recipes considering locally available ingredients;

A real-time feedback mechanism (105) to:

Monitor user adherence and suggest adaptive modifications;

Integrate with fitness wearables to refine dietary plans;

A secure data management system (106) to:

Encrypt user health records for privacy compliance;

Provide role-based access controls for healthcare professionals and dietitians;

An AI chatbot assistant (107) capable of providing real-time meal suggestions and answering user queries;

A regional food substitution module (108) for personalized adaptation of traditional diets;

A cloud-based infrastructure (109) to facilitate scalability and interoperability with external systems; and

A continuous learning algorithm (110) that refines dietary recommendations based on evolving research and user behavior.

2.An AI-based adaptive nutrition optimization method for the personalized nutrition advisor system as claimed in claim 1, wherein the method comprises:

Receiving personalized health data from genetic reports, lifestyle factors, and dietary habits;

Processing real-time biometric feedback using wearable devices and user meal logs;

Generating adaptive meal plans based on metabolic responses and dietary adherence;

Offering AI-generated regional recipes with real-time cooking instructions;

Predicting long-term health improvements based on adherence to AI-recommended diets;

Customizing meal plans for specific genetic markers and disease predispositions;
Ensuring caloric optimization for various lifestyle categories, including sedentary, active, and athlete-level users;
Using blockchain-based nutrition tracking for secure data recording and analysis;
Continuously learning user behavior patterns to enhance accuracy over time; and
Offering cross-platform API integration for healthcare institutions and meal delivery services.

3.The system as claimed in claim 1, wherein the user interface module **101** captures multi-modal inputs including:
Genetic predispositions identified through DNA sequencing data;
Lifestyle attributes such as physical activity, sleeping patterns, and work habits; and
Regional dietary choices based on historical and cultural food consumption.

4. The system as claimed in claim 1, wherein the AI-based analytical engine **103** predicts likelihood of dietary deficiencies and metabolic syndromes based on:
Enzymatic response to carbohydrates, proteins, and fats;
Gene-environment interaction affecting digestion and metabolism; and
Risk stratification for chronic illnesses such as diabetes and hypertension.

5. The system as claimed in claim 1, wherein the personalized meal plan generator **104** incorporates:
Nutrient-optimized meal recipes customized for vegetarian, vegan, and non-vegetarian diets;
Adaptive recipe modification using alternative ingredients based on user allergies and intolerances; and
AI-enhanced portion control guidelines for weight management.

6. The system as claimed in claim 1, wherein the real-time feedback mechanism **105** continuously adapts dietary recommendations by:
Tracking user compliance with recommended meals;
Providing AI-driven reminders for hydration, meal timing, and nutrient intake; and
Offering diet adherence scores with motivational feedback.

7. The system as claimed in claim 1, wherein the secure data management system **106** integrates with:
IoT-enabled health devices including blood glucose monitors and fitness trackers;
Electronic health records for personalized medical-nutritional therapy; and
AI-based telemedicine platforms for remote dietary consultation.

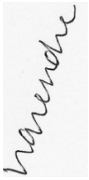
8. The system as claimed in claim 1, wherein the AI chatbot assistant is designed to:

Provide real-time nutritional guidance via text or voice interactions;
Answer queries related to meal preparation, nutrient values, and food substitutions; and
Offer personalized motivation and habit-forming strategies based on dietary goals.

9. The system as claimed in claim 1, wherein the regional food substitution module **108** ensures:
AI-driven cultural meal adaptations based on local ingredients and cooking methods;
Intelligent food replacement recommendations to accommodate dietary restrictions; and
Dynamic updates for seasonal food availability and price fluctuations.

10. The system as claimed in claim 1, wherein a blockchain-based nutritional tracking mechanism ensures:
•Immutable dietary compliance records for personalized healthcare;
•Secure data sharing between dietitians and healthcare providers; and
•AI-powered predictive modeling for future health risks.

Dated on 9th day of April 2025



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ABSTRACT

SYSTEM AND METHOD FOR PERSONALIZED NUTRITION

The present invention discloses an AI-driven personalized nutrition advisor system provides dietary recommendations by integrating genetic, lifestyle, and regional data. The system includes a user interface module to collect inputs such as genetic markers, health conditions, and dietary preferences. An AI-based analytical engine evaluates genetic predispositions for nutrient metabolism, predicts deficiencies, assesses disease risks, and aligns recommendations with regional cuisines. A personalized meal plan generator delivers adaptive meal plans, balances macronutrients, and suggests AI-optimized recipes. The real-time feedback mechanism monitors user adherence, adapts plans dynamically, and integrates with fitness devices. Data privacy is ensured through a secure data management system with encryption and role-based access. Additional components include an AI chatbot assistant for real-time guidance, a regional food substitution module, a scalable cloud-based infrastructure, and a continuous learning algorithm to refine recommendations over time.