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AI-Powered Nutrition: The Future of Food Calorie Tracking & Obesity Prevention

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Obesity is a pressing global public health concern closely associated with excess calorie consumption. This project focuses on enhancing food calorie intake estimation and body mass index (BMI) prediction, addressing the limitations of traditional unreliable self-reported methods. By leveraging advancements in computer vision and machine learning, the project aims to create a system that accurately estimates calorie content from food images and predicts BMI using demographic data. A convolutional neural network (CNN) will be trained on a dataset of food images, while a regression model will integrate user demographics for BMI predictions. The methods' accuracy will be assessed using metrics like mean absolute error and root mean square error, showcasing their feasibility for applications in nutrition and healthcare.

Key words: Food calorie, BMI, CNN, Machine learning.

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I. INTRODUCTION

The estimation of food calorie content and prediction of Body Mass Index (BMI) are vital for a healthy lifestyle. Various studies, including those by Wang et al. (2015) and Choi et al. (2017), have developed systems using Convolutional Neural Networks (CNNs) for accurate calorie estimation from food images, achieving accuracies of over 85%. Additionally, Gutiérrez et al. (2019) created a machine learning system to predict BMI with 82.9% accuracy. The project "Food Calorie Estimation and BMI Prediction Using Deep Learning and Machine Learning" aims to integrate these technologies to provide precise estimations of calorie content and BMI. By utilizing advanced image processing and machine learning techniques, the system will offer personalized recommendations to promote healthier lifestyles, enabling users to track dietary intakeeffectively.

II. REVIEW OF LITERATURE:

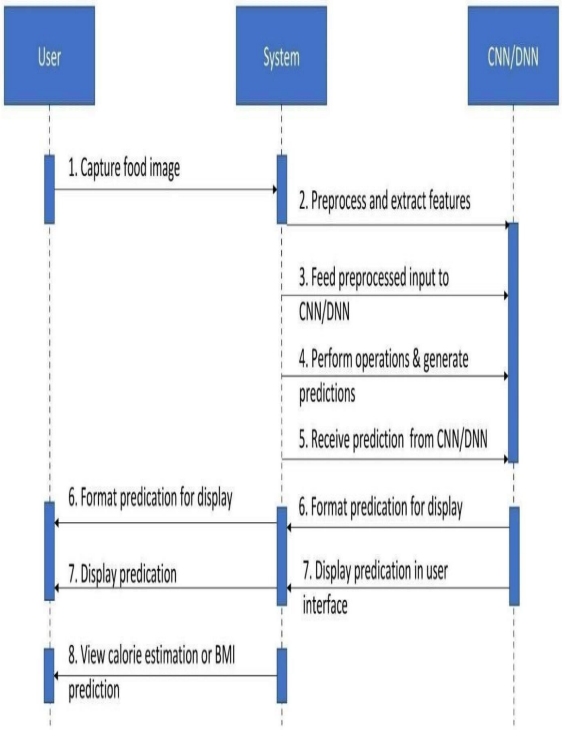
An improved food traceability system is proposed to enhance food quality assurance and consumer confidence amidst frequent safety incidents in China. This system allows for forward tracking and diverse tracing while also evaluating food quality at various supply chain stages using fuzzy classification and artificial neural networks. A case study on a pork

producer demonstrated its effectiveness in ensuring quality assurance. The paper also discusses implications and provides suggestions for future research. Recent food safety concerns necessitate effective traceability systems throughout the food supply chain—covering production, processing, and transportation. Traditional systems face challenges like data invisibility and tampering. Blockchain technology, with its smart contracts and consensus algorithms, presents a solution. This paper introduces a blockchain-based food safety traceability system utilizing EPC Information Services, while a prototype built on Ethereum demonstrates efficient data querying with a response time of 2 ms. Additionally, a new egg traceability system employing video capture and wireless networking is proposed, addressing existing gaps in standardization and timeliness. The review further highlights blockchain's potential to combat food falsification, ensuring authenticity and enabling better data management. Finally, a novel intelligent food traceability system integrating cyber-physical systems and fog computing is suggested to enhance safety and quality in the food supply chain.

System analysis:

In existing system, a deep learning model is trained on a large dataset of food images and their associated calorie information. The model is then integrated into a mobile app, which allows users to take a picture of their food and receive an estimate of its calorie content based on their BMI. The app uses the front- facing camera on the mobile device to capture an image of the food, which is then processed by the deep learning model. The model uses a combination of convolutional neural networks (CNNs) and recurrent neural networks (RNNs) to analyse the image and predict the calorie content of the food. This Project provides a convenient and accurate way for users to estimate the calorie content of their food based on their BMI, using state-of-the-art deep learning techniques. The disadvantage of this is accuracy, cost, limited scope, user engagement, and privacy concerns.

The proposed system for food calorie estimation and BMI prediction utilizes deep learning (CNNs) and machine learning (logistic regression, random forest) to enhance accuracy. It addresses existing system limitations by training on



a large dataset of food images and health data for a wide range of estimations. Designed for user-friendliness, it ensures quick data input and clear recommendations while prioritizing user privacy and data security. The system's cost-effectiveness comes from using open-source software and public datasets, promising to significantly aid in health management and obesity prevention through personalized recommendations. The main advantages are accuracy, scalability, user-friendly, cost effective and privacy preserving. These advantages make it a promising solution for improving the health and wellbeing of individuals and communities. Three key consideration involved in the feasibility are Economical, technical and operational feasibility.

System Architecture:

Below diagram depicts the whole system architecture of Food calorie estimation and BMI prediction using Machine Learning and Deep Learning.

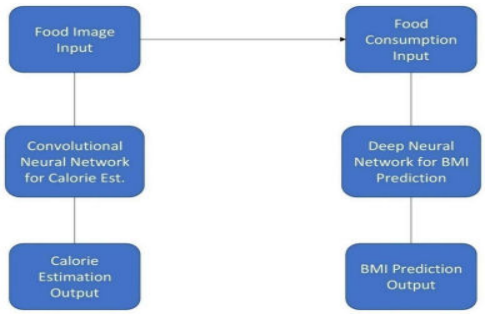


Fig. System Architecture

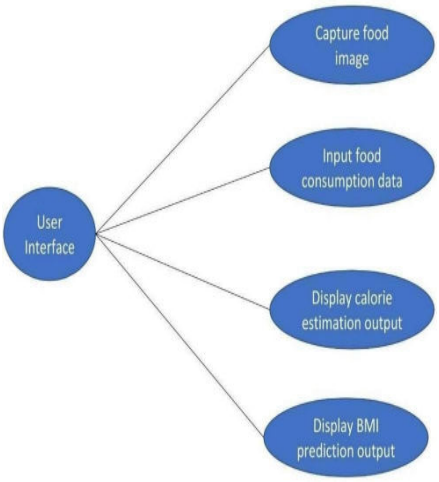


Fig. Sequence Diagram

Sequence Diagram

Sequence diagram is a construct of the Message Sequence Chart and conjointly it's a sort of interaction diagram that shows however processes operate with each other and in what order.

System implementation:

The following are the modules

1. Image Processing Module
2. Deep Learning Module
3. Logistic Regression Module
4. Random Forest Module
5. User Interface Module
6. Database Management Module

System requirements include hardware specifications with at least 4 GB RAM, Intel i3 processor or better, and a minimum 128 GB hard disk. Software requirements specify Windows 7 or higher OS, Python version 3.7.0, PyCharm IDE 2021.1.2, HTML and CSS for web authoring, Flask as the web development framework, and MySQL version 5.5 for the database.

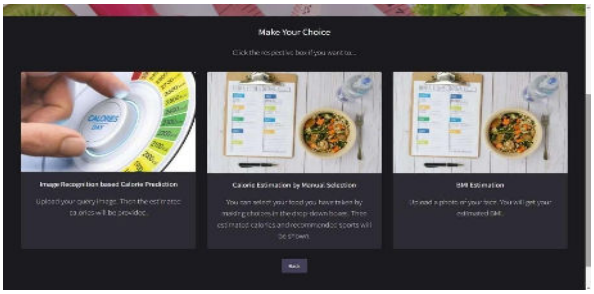
Testing:

The purpose of testing is to discover errors. **Testing** is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub-assemblies, assemblies and/or a finished product It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner.

There are various types of tests. Each test type addresses a specific testing requirement.

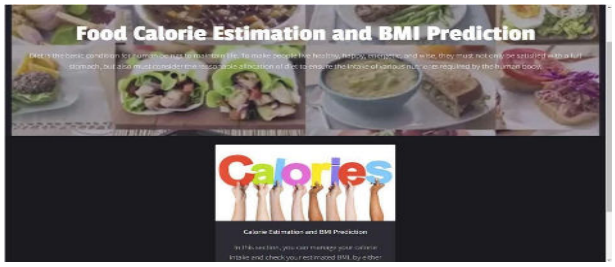
Unit testing checks if each part of the program

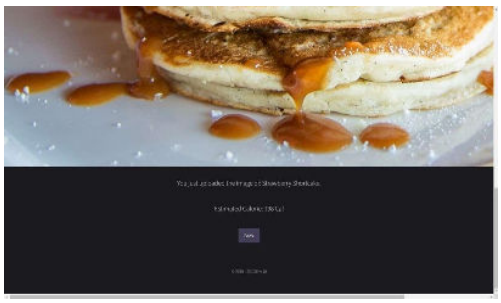
works correctly, validating program logic and outputs. The application has three units—Image processing, Logistic regression, and Random Forest—each tested individually. Functional testing ensures that the system functions meet the specified requirements, focusing on valid and invalid inputs and the outputs of calorie estimation and BMI prediction. System testing evaluates the complete software solution's functionality and performance, confirming it meets requirements. White box testing verifies



TEST CASE ID	S.NO	TEST CASE SCENARIO	TEST INPUT	EXPECTED OUTPUT	ACTUAL OUTPUT	TEST RESULT
T_01	1.	Web page is open	Hashtag name	Should enter user home page	Entered the home page	Pass
T_02	2.	Data Collection	Load Food Calorie Data	Positive/ Negative/ Neutra l values should be displayed	Positive values are displayed	Pass
T_03	3.	Data Preprocessing	If all previous steps are correct	Ensure that data is ready for analysis	Data is ready	Pass
T_04	4.	Model Development	If all previous steps are correct	CNN for food image recognition DNN for BMI prediction	Algorithms are ready to use	Pass
T_05	5.	Model Training and Evaluation	If all previous steps are correct	Trained models using CNN and DNN	Accurate models are provided	Pass

all conditional statements in the project. The goal was to find as many bugs as possible quickly, which was achieved. All fields must work





correctly, links should activate the right pages, and responses should be timely. Integration and acceptance testing showed all components functioned well without defects.

Results:

Fig. 1. Home page

Fig. 2 Modules in application dashboard

Fig. 3 First Module, Calorie estimation through the image

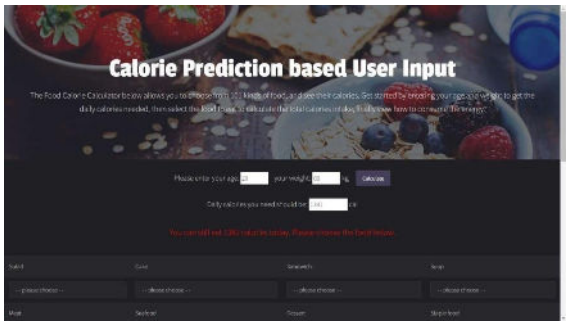


Fig. 4 Output of first module

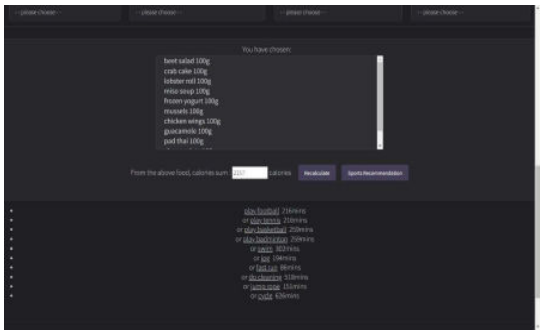


Fig. 5 Output of second module

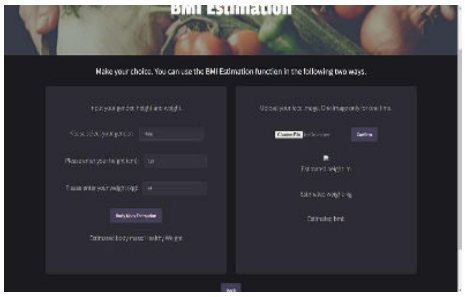
Fig. .8 Output of the third module

III. CONCLUSIONS

This initiative provides an estimation of the calorie content in food and forecasts BMI utilizing Machine Learning and Deep Learning techniques. Through our initial testing of a dataset containing food images analyzed with Mask R-CNN, we can conclude that creating an application to estimate calories from food images is indeed feasible. Such an application is likely to significantly influence people's views on their meals while also affecting the weight-loss and weight-management sectors. Given that images are captured using smartphones and the image processing techniques applied are mature, integrating this proposed solution into health applications is quite straightforward. Furthermore, we have successfully developed a system capable of predicting BMI from a limited set of participant images. This method could evolve into a public health assessment tool designed to support health initiatives in regions facing widespread obesity or malnutrition. Additionally, the incorporation of silhouettes in our methodology enhances user privacy.

IV.REFERENCES

1. Wang J. An Improved Traceability System for Food Quality Assurance and Evaluation Based on Fuzzy Classification and Neural Network[J]. Food Control, vol.79,pp.363–370, March2017.
2. Alfian, Ganjar. Improving Efficiency of RFID-Based Traceability System for Perishable Food by Utilizing IoT Sensors and Machine Learning Model[J].Food Control,vol.110,pp.16.January2020.
3. Liu, Feng. The Egg Traceability System Based on the Video Capture and Wireless Networking Technology[J]. International Journal of Sensor Networks, vol.17,no.4,pp.211–216,April2015.
4. Xiao, Xinqing. Development and Evaluation of



an Intelligent Traceability System for Frozen Tilapia Fillet Processing[J]. Journal of the Science of Food and Agriculture, vol. 95, no. 13, pp. 2693–2703, July 2015.
5. Aung, Myo Min, and Yoon Seok Chang. Traceability in a Food Supply Chain: Safety and Quality Perspectives[J]. Food Control, vol. 39, no. 39, pp.172–184, October2015.
6. Abad, E. RFID Smart Tag for Traceability and Cold Chain Monitoring of Foods: Demonstration in an Intercontinental Fresh Fish Logistic Chain[J]. Journal of Food Engineering, vol. 93, no. 4, pp. 394– 399, May 2009.
7. Tian, Feng. A Supply Chain Traceability System for Food Safety Based on HACCP, Blockchain & Internet of Things[J]. 2017 International Conference on Service Systems and Service Management, pp. 1–6, October 2017.
8. Galvez, Juan F. Future Challenges on the Use of Blockchain for Food Traceability Analysis[J]. Trends in Analytical Chemistry, vol. 107, pp. 222–232, April2018.
9. Thibaud, Montbel. Internet of Things (IoT) in High-Risk Environment, Health and Safety (EHS) Industries: A Comprehensive Review[J]. Decision SupportSystems,vol.108,pp.79–95,Janua

10. Lv, Man. Engineering Nanomaterials-Based Biosensors for Food Safety Detection[J]. Biosensors and Bioelectronics, vol. 106, pp. 122–128, March2018
11. Behnke, Kay, and M. F. W. H. A. Janssen. Boundary Conditions for Traceability in Food Supply Chains Using Blockchain Technology[J]. International Journal of Information Management, vol. 52, pp. 969, November2020.
12. Huang, Hui. Recent Developments in Hyperspectral Imaging for Assessment of Food Quality and Safety[J]. Sensors, vol. 14, no. 4, pp. 7248–7276, December2014.
13. Galanakis, Charis M. The Food Systems in the Era of the Coronavirus (COVID-19) Pandemic Crisis[J]. Foods, vol. 9, no. 4, pp. 523–523, January2020.
14. Chen, Rui-Yang. Autonomous Tracing System for Backward Design in Food Supply Chain[J]. Food Control, vol.51,pp.70–84,December.
15. An-Qi, Jin. Application of Traditional Chinese Medicine (TCM) Traceability System Based on TCM Quality Characteristics and HACCP System[J]. China Journal of Chinese Materia Medica, vol. 45, no. 21, pp. 5304–5308, August, 2020.

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