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THE FOOD RECOGNITION SYSTEM FOR DIABETIC PATIENTS BASED ON AN OPTIMIZED BAG-OF-FEATURES MODEL

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ABSTRACT

Proper dietary management is an important aspect of diabetes care, as food choices and portion sizes can affect blood glucose regulation. Identifying food items and understanding their nutritional values can help individuals make informed dietary decisions. This study proposes an image-based food recognition system for diabetic patients using an optimized Bag-of-Features (BoF) approach integrated with machine learning techniques.

The proposed approach processes food images through a sequence of image preprocessing, feature extraction, and classification stages. During preprocessing, the input image is prepared for further analysis. Visual characteristics, including texture, shape, and appearance, are subsequently extracted and represented using the Bag-of-Features model. These feature representations are provided to a machine learning classifier to determine the corresponding food category. Following food identification, the system is designed to present relevant nutritional details, including carbohydrate, calorie, protein, and fat content, based on the available nutritional data. The optimization of the BoF model aims to enhance the effectiveness of the food classification process.

The primary objective of this research is to develop a convenient and automated tool that supports dietary awareness among people with diabetes. By combining image processing, feature representation, and machine learning, the proposed system offers a practical method for recognizing food items and accessing nutritional information. This approach may assist users in making more informed food choices and supporting their dietary management.

KEYWORDS: Diabetes, Food Recognition, Machine Learning, Bag-of-Features Model, Image Processing, Feature Extraction, Food Classification, Nutritional Analysis.

INTRODUCTION

The Food Recognition System for Diabetic Patients Based on an Optimized Bag-of-Features Model is designed to recognize food items from digital images using image processing and machine learning techniques. The system analyzes the visual characteristics of food images and classifies them into appropriate food categories. The Bag-of-Features (BoF) model is a computer vision technique that represents an image using a collection of important visual features. These features can include texture, shape, and local image patterns that help distinguish one food item from another.

The proposed system involves several stages, including image acquisition, pre-processing, feature extraction, feature representation, and food classification. The optimized Bag-of-Features model extracts and represents relevant visual information, which is then used by a machine learning classifier to identify the food item. After classification, the system can provide associated nutritional information, such as carbohydrates, calories, proteins, and fats, using a suitable nutritional database.

The main objective of this project is to develop an efficient and user-friendly food recognition system that supports dietary awareness among diabetic patients. By automating food identification and providing nutritional information, the system can help users make informed dietary decisions. The proposed approach combines computer vision and machine learning to improve food recognition and contribute to better dietary management. The system is intended as a supportive tool and does not replace professional medical advice or individualized dietary recommendations.

Overall, this project demonstrates how an optimized Bag-of-Features model can be applied to food image classification to support nutritional awareness and diabetes management.

MODULES

Image Acquisition Module

This module collects food images from the user through a camera or by uploading an image. The collected image is used as input for the food recognition process. The system supports different food categories for identification and classification.

Image Pre-processing Module

The input food image is pre-processed to improve its quality and prepare it for analysis. This module performs operations such as image resizing, noise reduction, and colour normalization. Pre-processing helps maintain consistency in the images and supports effective feature extraction.

Feature Extraction Module

This module extracts important visual features from food images, including texture, shape, and local image patterns. These features help distinguish different food items. The extracted information is used as input for the Bag-of-Features model.

Optimized Bag-of-Features Module

The Bag-of-Features model represents food images using a collection of visual features. Local features are extracted and grouped into visual patterns using a visual vocabulary. The optimized model selects useful features and reduces unnecessary information, helping improve classification efficiency.

Food Classification Module

This module identifies the food item using the extracted feature representation and a trained machine learning classifier. The system compares the input image features with learned patterns and predicts the corresponding food category.

Nutritional Information Module

After recognizing the food item, the system retrieves its nutritional information from a predefined database. The information may include:

- Calories
- Carbohydrates
- Proteins
- Fats
- Other relevant nutritional values

This module helps diabetic patients understand the nutritional composition of recognized food items. The values depend on the food database and serving size.

Diet Recommendation and Result Display Module

This module displays the recognized food name and its associated nutritional information. Based on predefined dietary guidelines, it can provide general food-related suggestions suitable for diabetes management. The recommendations are intended for awareness and should not replace personalized advice from a healthcare professional.

CONCLUSION

The Food Recognition System for Diabetic Patients Based on an Optimized Bag-of-Features Model provides an automated approach to identifying food items using image processing and machine learning techniques. The system analyzes food images, extracts important visual features, and classifies food items using an optimized Bag-of-Features model. It also provides nutritional information, including calories, carbohydrates, proteins, and fats, to help users understand the composition of their food.

The proposed system aims to reduce the effort required for manual food identification and improve nutritional awareness among diabetic patients. By combining image preprocessing, feature extraction, and food classification, the system offers a convenient method for supporting informed dietary decisions. In the future, the system can be enhanced by integrating a larger food image dataset, improving classification accuracy, estimating portion sizes, and providing personalized dietary suggestions based on individual requirements.

Overall, this project demonstrates the potential of machine learning and computer vision in developing intelligent food recognition systems that support healthy eating habits and diabetes management. The system serves as a supportive tool for nutritional awareness and should be used alongside professional medical and dietary guidance.

REFERENCE

1. M. M. Anthimopoulos, L. Gianola, L. Scarnato, P. Diem, and S. G. Mougiakakou, “A food recognition system for diabetic patients based on an optimized bag-of-features model,” IEEE Journal of Biomedical and Health Informatics, vol. 18, no. 4, pp. 1261–1271, 2014. doi: 10.1109/JBHI.2014.2308928.
2. K. V. Dalakleidi, M. Papadelli, I. Kapolos, and K. Papadimitriou, “Applying image-based food-recognition systems on dietary assessment: A systematic review,” Advances in Nutrition, vol. 13, no. 6, pp. 2590–2619, 2022. doi: 10.1093/advances/nmac078.
3. F. S. Konstantakopoulos, E. I. Georga, and D. I. Fotiadis, “A review of image-based food recognition and volume estimation artificial intelligence systems,” IEEE Reviews in Biomedical Engineering, vol. 17, pp. 136–152, 2024. doi: 10.1109/RBME.2023.3283149
4. M. M. Anthimopoulos, L. Gianola, L. Scarnato, P. Diem, and S. G. Mougiakakou, “A food recognition system for diabetic patients based on an optimized bag-of-features model,” IEEE Journal of Biomedical and Health Informatics, vol. 18, no. 4, pp. 1261–1271, 2014. doi: 10.1109/JBHI.2014.2308928.

5. K. V. Dalakleidi, M. Papadelli, I. Kapolos, and K. Papadimitriou, “Applying image-based food-recognition systems on dietary assessment: A systematic review,” Advances in Nutrition, vol. 13, no. 6, pp. 2590–2619, 2022. doi: 10.1093/advances/nmac078.
6. F. S. Konstantakopoulos, E. I. Georga, and D. I. Fotiadis, “A review of image-based food recognition and volume estimation artificial intelligence systems,” IEEE Reviews in Biomedical Engineering, vol. 17, pp. 136–152, 2024. doi: 10.1109/RBME.2023.3283149
7. S. Mezgec and B. Koroušić Seljak, “NutriNet: A deep learning food and drink image recognition system for dietary assessment,” Nutrients, vol. 9, no. 7, article 657, 2017. doi: 10.3390/nu9070657.