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Food Recognition and Recommendation Systems: Revolutionizing Access and Delivery in Modern Nutrition

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Abstract: In the evolving field of artificial intelligence and computer vision, food recognition and recommendation systems have garnered significant attention due to their practical applications in dietary assessment, smart kitchens, and culinary exploration. This research presents a comprehensive approach to developing an image-based Indian recipe recommendation system that utilizes deep learning techniques, particularly the DenseNet201 convolutional neural network architecture. The primary objective is to enable users to upload images of Indian food dishes and receive accurate recipe suggestions, thereby enhancing user convenience and engagement.

The system employs a robust pipeline that begins with web scraping a large and diverse dataset of Indian recipes using Python's BeautifulSoup library. These recipes are categorized and paired with corresponding images to form a rich training and testing dataset. DenseNet201, a pre-trained model known for its efficiency in feature extraction and image classification, is fine-tuned to recognize a wide variety of Indian food categories with improved accuracy and reduced overfitting. The model's performance is validated using various evaluation metrics including accuracy, precision, recall, and F1-score, ensuring the system's reliability in real-world scenarios.

On the application side, the system is integrated into a user-friendly web interface developed using the Django framework. The frontend is designed with HTML, CSS, and JavaScript to provide an interactive user experience, while the backend manages image input, model inference, and result display. TensorFlow and NumPy are employed to handle the deep learning operations, and PIL (Python Imaging Library) is used for image preprocessing tasks.

The proposed system offers a unique blend of computer vision and culinary knowledge, making it a valuable tool for users seeking quick and personalized cooking recommendations. It holds potential for further development into mobile applications, integration with kitchen devices, and adaptation for other cuisines. This work not only demonstrates the capabilities of deep learning in food identification but also contributes to the growing body of research in intelligent food systems and recommendation technologies...

Keywords: Image Recognition, Indian Recipe Recommendation, DenseNet201, Deep Learning, Convolutional Neural Networks, Web Scraping, Django Framework, TensorFlow, Computer Vision, Smart Kitchen Applications

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