A Survey on Food Computing

ACM Computing Surveys (CSUR)

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Introduction

- Food is very essential for human life, and it is fundamental to the human experience.
- Food-related studies may support multifarious applications and services, such as guiding human behavior, improving human health, and understanding the culinary culture.
- In this paper, the author formalizes food computing and presents a comprehensive overview of various emerging concepts, methods, and tasks. We summarize key challenges and future directions ahead for food computing.
- This is the first comprehensive survey that targets the study of computing technology for the food area and also offers a collection of research studies and technologies to benefit researchers and practitioners working in different food-related fields.

Overview of Food Computing

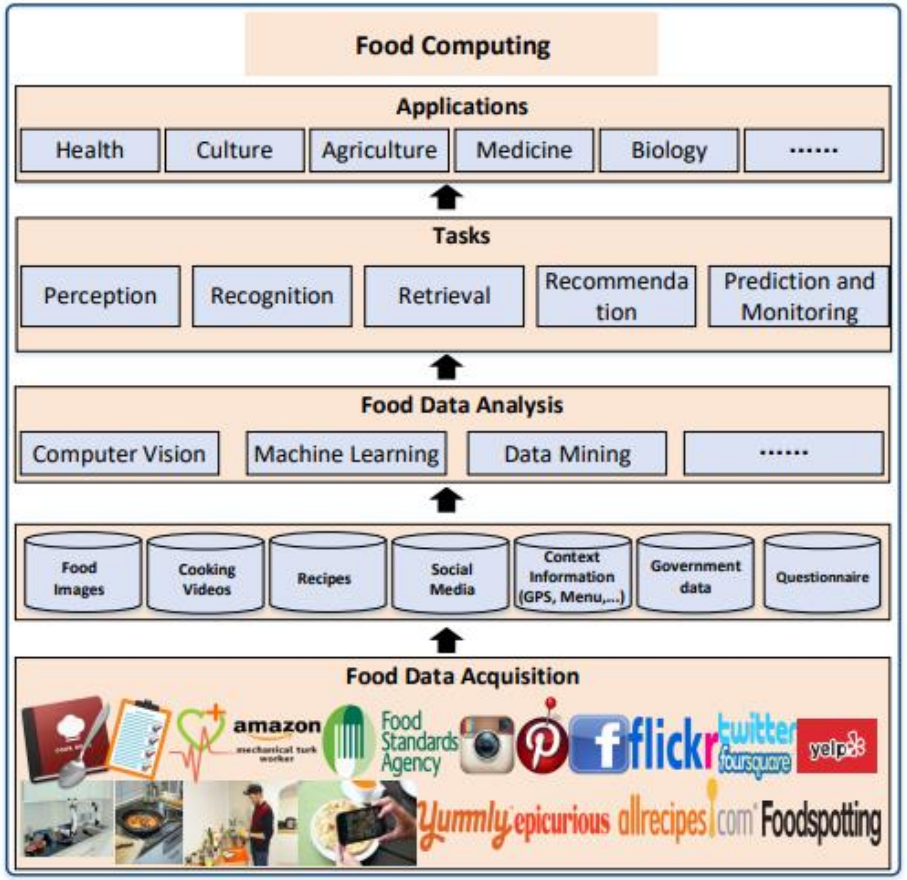

Fig. 1. An overview of food computing

Food Data Acquisition

- Food data acquisition refers to the process of gathering and collecting information about food, such as nutritional information, ingredients, and other relevant details.
- This data can be used for various purposes, such as creating food labels, analyzing food trends, and developing new food products.
- There are several methods for acquiring food data, including manual data entry, scanning barcodes, and using food databases.

Food type Data

- Food Images
- Food Text Data
- Recipes Video

Food Images Data

- **Food Image Datasets:** There are several publicly available datasets that contain images of food, such as the Food-101 dataset, the UEC-FOOD100 dataset, and the ETHZ Food-101 dataset.
- **Social media platforms:** Platforms such as Instagram, Pinterest, and Flickr can be used to collect food images data by searching for specific hashtags or keywords.
- **Food bloggers and websites:** Many food bloggers and websites have a large collection of food images that can be used for training and testing image recognition model.
- **Food manufacturers and retailers:** Companies may provide images of their products for use in food computing applications.

Recipes Video Data

- **Recipe websites:** Websites such as Allrecipes, Epicurious, and Food.com have a large collection of recipe videos that can be used for training and testing video recognition models.
- **Food bloggers and YouTube channels:** Many food bloggers and YouTube channels have a large collection of recipe videos that can be used for training and testing video recognition models.
- **Online recipe databases:** There are several online recipe databases, such as Recipe1M and YouCook2, that provide recipe videos for use in machine learning and computer vision applications.
- **Social media platforms:** Platforms such as Instagram and TikTok can be used to collect recipe video data by searching for specific hashtags or keywords.
- **Food television shows:** Many food television shows provide recipe videos that can be used for training and testing video recognition models.
- **Food manufacturers and retailers:** Some food companies also provide recipe videos on their website to promote their products.

Food Text Data

- **Food reviews:** Websites like Yelp, TripAdvisor, and Google reviews provide a large amount of food-related text data that can be used for various NLP applications such as sentiment analysis and understanding consumer preference.
- **Recipe websites:** Websites such as Yummly, Famous Recipes, and have a large collection of recipe texts that can be used for training and testing natural language processing models.
- **Cookbooks:** The Silver Spoon, The Joy of Cooking, The Complete Vegetarian Cookbook, etc.

Food Data Analysis

- Machine Learning
- Computer Vision
- Natural language Processing

TASK

- **Nutritional analysis:** Machine learning techniques are used to analyze food data, such as ingredient lists and nutritional information, to predict the nutritional content of different foods.
- **Food classification:** Machine learning algorithms are used to classify different types of food based on their ingredients and nutritional content. This can be useful for creating food recommendations or identifying potential food allergies.
- **Food image recognition:** Computer vision models to recognize and classify different types of food in images.

TASK

- **Recipe generation:** Generate new recipes based on a dataset of existing recipes and their ingredients.
- **Food trend analysis:** Analyze food data from social media platforms, recipe websites, and other sources to identify food trends and popular ingredients.
- **Food safety analysis:** Machine learning can be used to analyze food safety data, such as recall information, to predict potential food safety issues.

TASK

- **Sentiment analysis:** food-related text data, such as reviews, to identify consumer preferences and sentiment towards specific foods and restaurants.
- **Personalized food recommendations:** Analyze food data from an individual's eating habits and preferences to make personalized food recommendations.

Application

- Health
- Culture
- Agriculture

Health

- **Nutrition tracking:** track and analyze an individual's dietary intake, providing personalized nutrition recommendations based on their specific needs and goals.
- **Meal planning:** Using food computing to generate personalized meal plans based on an individual's dietary restrictions, preferences, and goals.
- **Food allergy detection:** identify potential food allergies and recommend alternative foods.
- **Weight management:** Using food computing to track and analyze an individual's food intake and activity levels to help them reach their weight management goals.

Culture

- **Food history:** Using food computing to analyze historical food data, such as cookbooks and recipes, to understand the evolution of food culture over time.
- **Food geography:** Using food computing to analyze food data, such as ingredient lists and recipes, to understand how food culture varies across different regions and countries.
- **Food and religion:** Using food computing to analyze data from religious texts, observations, and interviews to understand the role of food in religious practices and rituals.
- **Food and Language:** Using food computing to analyze data from texts and speech, to understand the language used to describe food and its relation to culture.

Agriculture

- **Crop monitoring and prediction:** Using food computing to analyze data from sensors, drones, and other sources to monitor crop growth and predict crop yields.
- **Climate-smart Agriculture:** Using food computing to analyze data on weather, climate, and soil conditions to develop strategies to adapt to climate change and improve crop resilience.

Challenges in Food Computing

- **Scalability:** Food data large and complex, so it is important to use scalable algorithms and data management techniques to handle the data.
- **Limited data availability:** Food data is often not publicly available, making it difficult to access and use for research and analysis.
- **Data integration:** Food data can be spread across multiple sources, making it difficult to integrate and analyze the data.
- **Data privacy:** Food data often contains sensitive information about individuals, such as their dietary habits and health status, which can make it difficult to protect privacy.

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Any Question?