

# NOVEL IMAGE-BASED DIETARY ASSESSMENT TOOLS: THE ROLE OF THE MACHINE LEARNING APPROACHES FOR FOOD RECOGNITION AND NUTRITIONAL EVALUATION IN EPIDEMIOLOGICAL STUDIES

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## BACKGROUND

Inadequate diet is considered one of the principal risk factors for morbidity and mortality in noncommunicable diseases. However, because of several limitations in data collection, such as people's subjectivity and memory and the need for time and trained interviewers, future challenges are focused to design more accurate and precise tools for diet assessment using an innovative approach.

The recent advances in artificial intelligence have led to the introduction of many new applications. Machine learning is a subfield of artificial intelligence that aims to enable computer to learn without being directly programmed, and it is often applied on big data rather than conventional statistical approaches.

A first perspective paper in 2021 (1) considered application of machine learning in nutritional epidemiology. In detail, deep learning can be used to automatically classify foods from pictures (2).

These techniques may facilitate less effortful and more regular diet records, improving precision and validity, and overcoming self-report biases.

## METHODS

a PhD project at University of Udine is dedicated to:

- Realization of a pilot dataset including Italian recipes and their related photos, volumes, weights, and nutritional values (3)
- Development of an algorithm based on a specific procedure including Convolutional Neural Network models
- Training of the machine learning algorithm on the Nutrition5k food dishes dataset (4)
- Development and validation of an innovative image-based dietary assessment tool

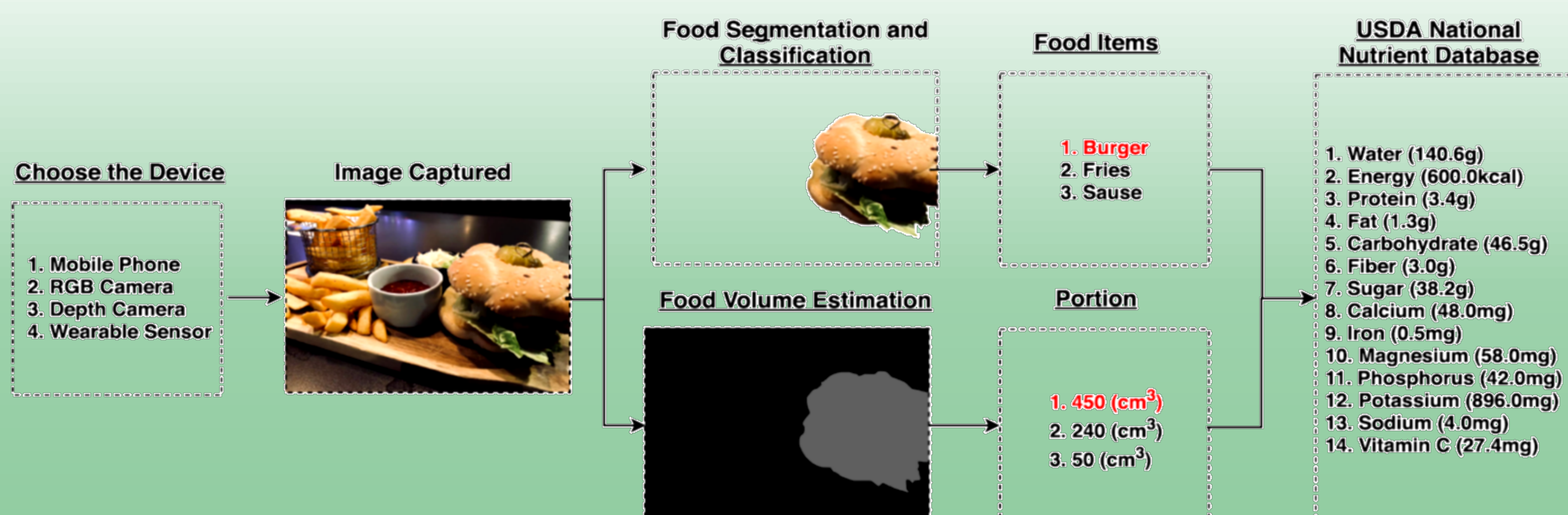


Figure: Lo et al., "Image-Based Food Classification and Volume Estimation for Dietary Assessment: A Review," 2020

## CONCLUSION

Despite of its excellent performance in image and text recognition, deep learning has never been applied to develop dietary assessment tools in Italy. The project will popularize the idea that a judicious application of machine learning and refined statistics could advance nutritional epidemiology.

Expected results include machine learning algorithms to assess weights from food images to support diet monitoring and open Italian atlas of food dishes with the related nutritional composition of recipes.

## References:

1. Morgenstern et al. *Adv Nutr.* 2021, 12:621.
2. Lo et al. *J Biomed Health Inform.* 2020, 24:1926.
3. Gnagnarella et al. *libreriauniversitaria.it edizioni, Padova*, 2022.
4. Thames et al. *Proceedings of the IEEE Computer Society Conference on CVPR.* 2021, 8899