TONI-AI: Tracking Of Nutrition Intake using Artificial Intelligence

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TONI-AI Partners

- **5M ICT (Industrial SME), Nis, Serbia**

- **Technische Universiteit Eindhoven (TU/e), Eindhoven, The Netherlands**

- **GGZ Oost-Brabant (Centre for Eating Disorders), Helmond, The Netherlands**

Motivation

- **Each year the amount of people who are overweight or obese increases**

- **Tracking nutrition intake is one of the key health parameters especially for people who are on a diet or suffer from obesity or anorexia**

- **Current methods for tracking nutrition intake are often inaccurate or cumbersome to use**

Goals

- **Recording nutrient intake using deep learning models to recognize food and determine the calorie intake**
- **Food recognition based on photos taken by the user's smartphone**
- **Extension of the existing 5M ICT FitSprite fitness service with a nutrition module to be used by personal trainers, medical doctors and their customers and patients**

Deep Learning For Food Recognition (1)

- **Problem: Calculating calories based on images of food**

- **Accurately classifying food**

- **Estimating volume**

Deep Learning For Food Recognition (2)

Current state-of-the-art:

- **Convolutional Neural Networks (CNN) for food classification and image segmentation [1][2][3]**
- **Volume estimation using reference object [1][2]**
- **Volume estimation using depth sensors [2][3]**
- **Calorie calculation using volume and food classification**

[1] Liang, Y., & Li, J. (2017). Deep learning-based food calorie estimation method in dietary assessment. *arXiv preprint arXiv:1706.04062*.

[2] P. Pouladzadeh, P. Kuhad, S. V. B. Peddi, A. Yassine and S. Shirmohammadi, "Food calorie measurement using deep learning neural network," *2016 IEEE International Instrumentation and Measurement Technology Conference Proceedings*, 2016, pp. 1-6, doi: 10.1109/I2MTC.2016.7520547.

[3] T. Ege, Y. Ando, R. Tanno, W. Shimoda, and K. Yanai, "Image-Based Estimation of Real Food Size for Accurate Food Calorie Estimation," *Proc. - 2nd Int. Conf. Multimed. Inf. Process. Retrieval, MIPR 2019*, pp. 274–279, 2019, doi: 10.1109/MIPR.2019.00056

Deep Learning For Food Recognition (3)

Proposed approach:

- **Estimating volume using image segmentation and depth estimation**
- **Training CNN for food recognition with food101 dataset [1]**
- **Calculate calories based on result**
- **Subtract calories in case user does not finish meal**

[1] https://www.tensorflow.org/datasets/catalog/food101

Deep Learning For Food Recognition (4)

Validation:

- **Demo of the app rolled out to users (members of the FitSprite service and patients of GGZ (the healthcare project partner)**
- **Users also log actual calories of food they eat**
- **Validates the performance of the app**
- **Useful to improve the dataset**

[1] https://www.tensorflow.org/datasets/catalog/food101

Market opportunity

Shortcomings of Competitors (MyDietCoach or MyFitnessPal)

- In the case of homemade meals, manual user input is cumbersome and inaccurate
- No direct contact with a nutrition specialist or a personal trainer, who can analyse nutritional habits and give recommendation

Advantages of TONI-AI

- Seamless automated food recognition for nutrition tracking and
- Possibility of getting a recommendation by specialist

Thank you for your attention

Any Questions

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