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DI RIPRESA E RESILIENZA



# Telemedicine network and patient classification

affiliated with the UdA's  
Spoke#4 | WP3 | Task 1-3

*Emanuele Lattanzi*



UniUrb team members:

Vincenzo Biancalana, Riccardo Izzo,  
Emanuele Lattanzi, Francesco Lucertini,  
Fabrizio Perroni, Davide Sisti

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1506  
UNIVERSITÀ  
DEGLI STUDI  
DI URBINO  
CARLO BO





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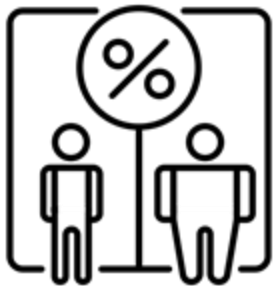


## One-Health: telemedicine and environment

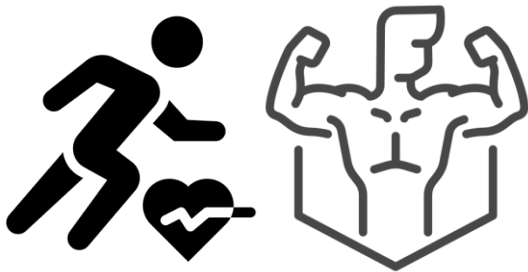
### WP3 – Telemedicine and Environment Health

- Task 3.2: Telemedicine network and patient classification

Body  
Composition



Fitness level  
CRF - MF



HRV  
(ANSI index)



CGM  
(in the blood)



PA  
Level



Food  
Diary

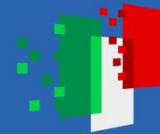




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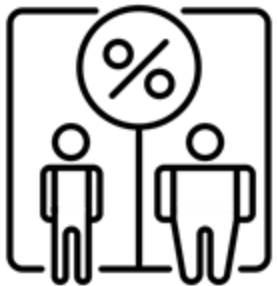


## One-Health: telemedicine and environment

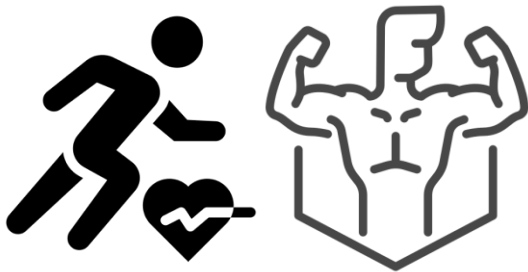
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PA  
Level



Gold Standard measuring  
device



Smartphone

#### RESEARCH ARTICLE

### Validation of a food frequency questionnaire for use in Italian adults living in Sicily

Silvio Buscemi<sup>1</sup>, Giuseppe Rosafio<sup>1</sup>, Sonya Vasto<sup>2</sup>, Fatima Maria Massenti<sup>3</sup>, Giuseppe Grosso<sup>4</sup>, Fabio Galvano<sup>4</sup>, Nadia Rini<sup>1</sup>, Anna Maria Barile<sup>1</sup>, Vincenza Maniaci<sup>1</sup>, Loretta Cosentino<sup>1</sup>, and Salvatore Verga<sup>1</sup>

<sup>1</sup>Dipartimento Biomedico di Medicina Interna e Specialistica (DIBIMIS) – Laboratorio di Nutrizione Clinica, <sup>2</sup>Dipartimento di Scienze e Tecnologie Biologiche, Chimiche e Farmaceutiche (DIBIMEF) and <sup>3</sup>Dipartimento di Scienze per la Promozione della Salute e Materno Infantile, University of Palermo, Palermo, Italy, and <sup>4</sup>Dipartimento di Scienze del Farmaco, University of Catania, Catania, Italy

Referenced food frequency  
questionnaire

Food  
Diary





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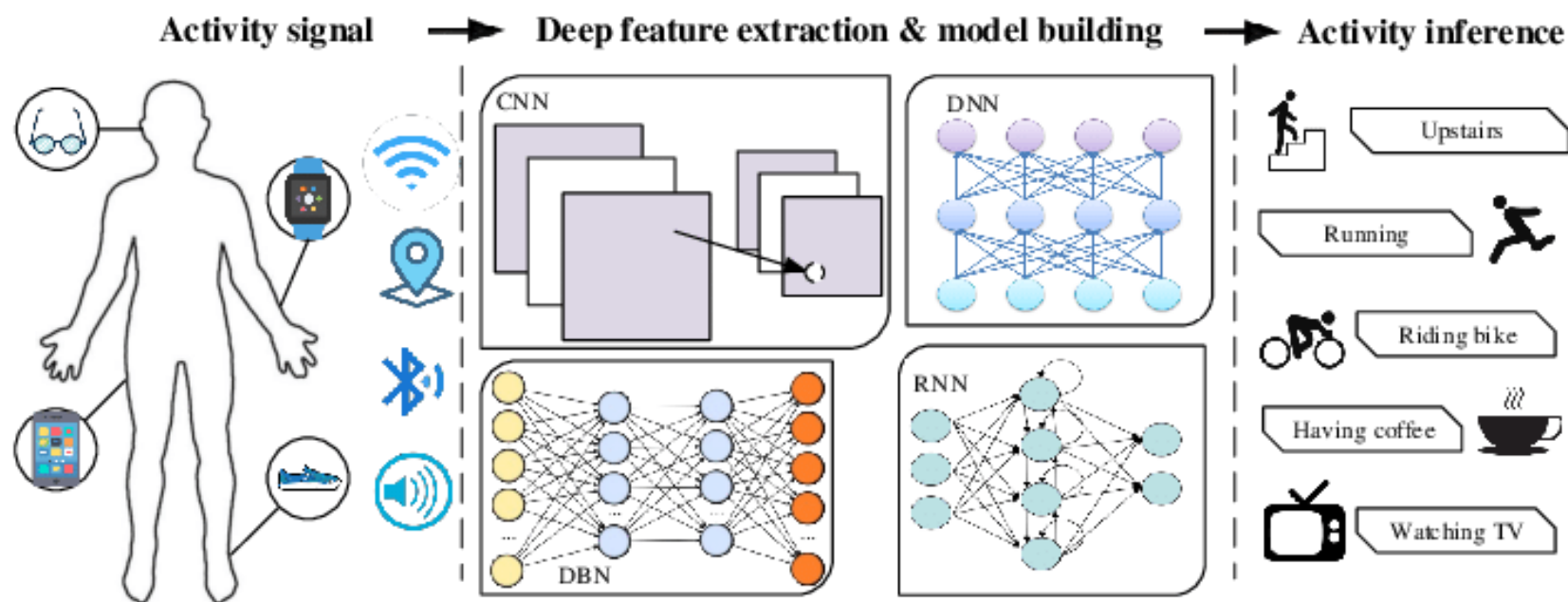


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## PA - Level: Sensor-based Human Activity Recognition







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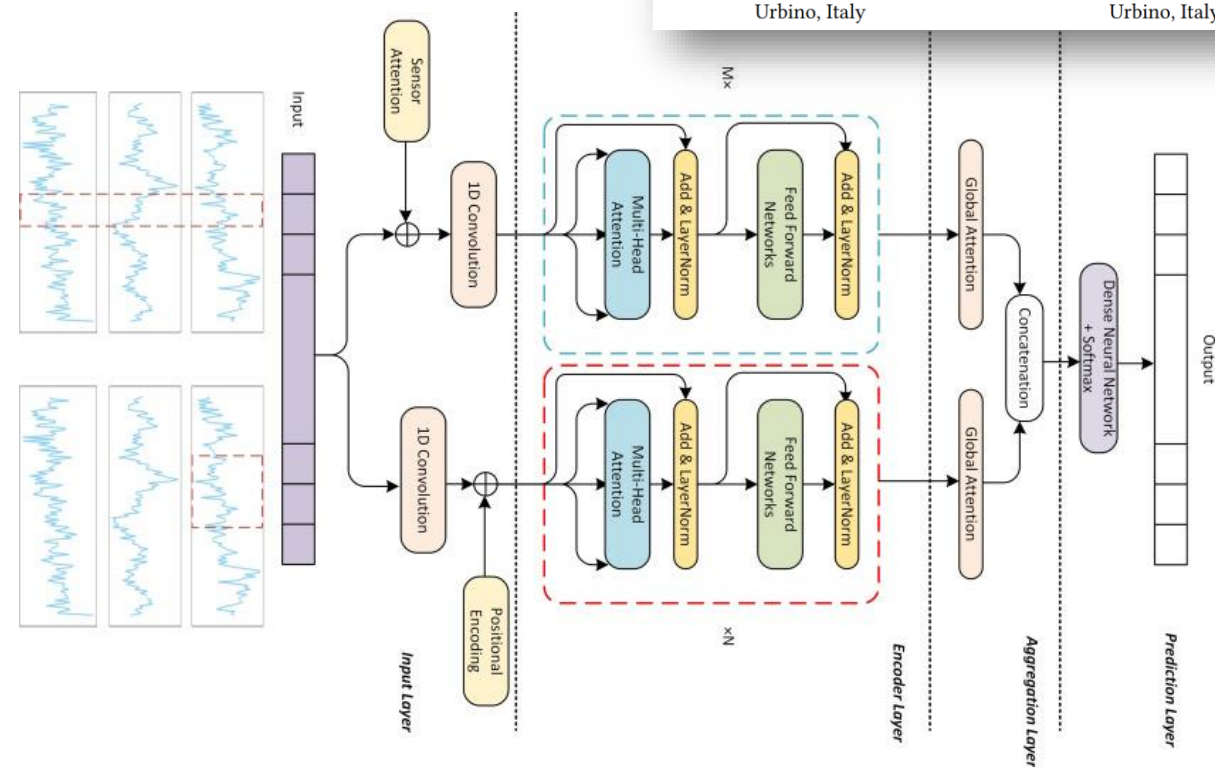
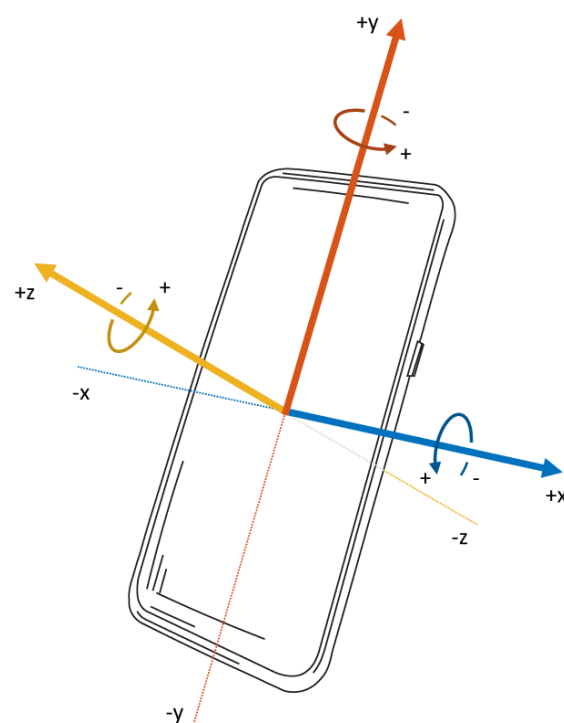


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# Smartphone sensors + Transformer App



## Are Transformers a Useful Tool for Tiny devices in Human Activity Recognition?

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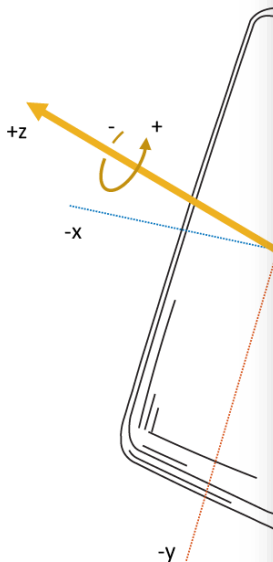


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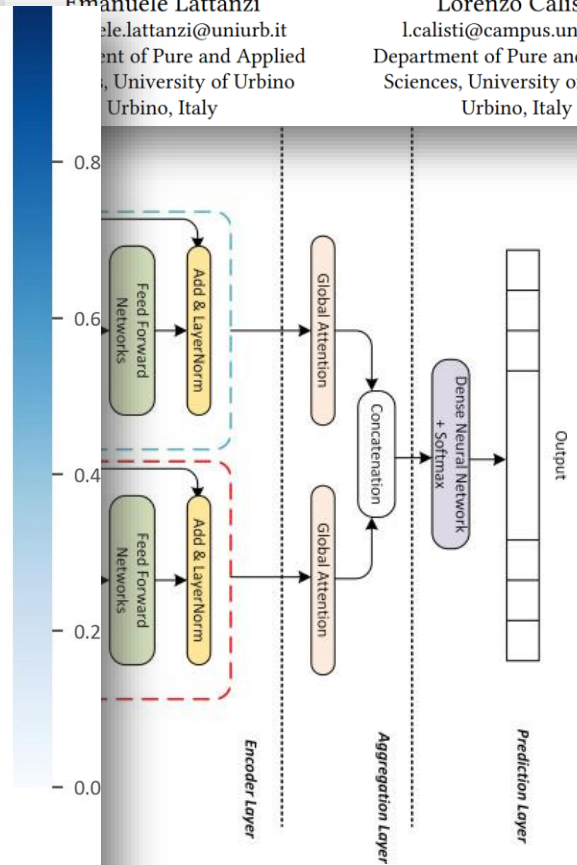
lying	0.994	0.001	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000
sitting	0.004	0.993	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
standing	0.000	0.004	0.996	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
walking	0.000	0.000	0.000	0.998	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000
running	0.000	0.000	0.000	0.003	0.995	0.002	0.000	0.000	0.000	0.000	0.000	0.000
cycling	0.000	0.000	0.000	0.000	0.000	0.997	0.003	0.000	0.000	0.000	0.000	0.000
Nordic walking	0.000	0.000	0.000	0.001	0.001	0.001	0.998	0.000	0.000	0.000	0.000	0.000
ascending stairs	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.990	0.006	0.004	0.000	0.000
descending stairs	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.972	0.018	0.000	0.000
vacuum cleaning	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.997	0.003	0.000
ironing	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.999	0.000
rope jumping	0.000	0.000	0.000	0.025	0.110	0.008	0.000	0.000	0.000	0.000	0.000	0.856

## Are Transformers a Useful Tool for Tiny devices in Human Activity Recognition?

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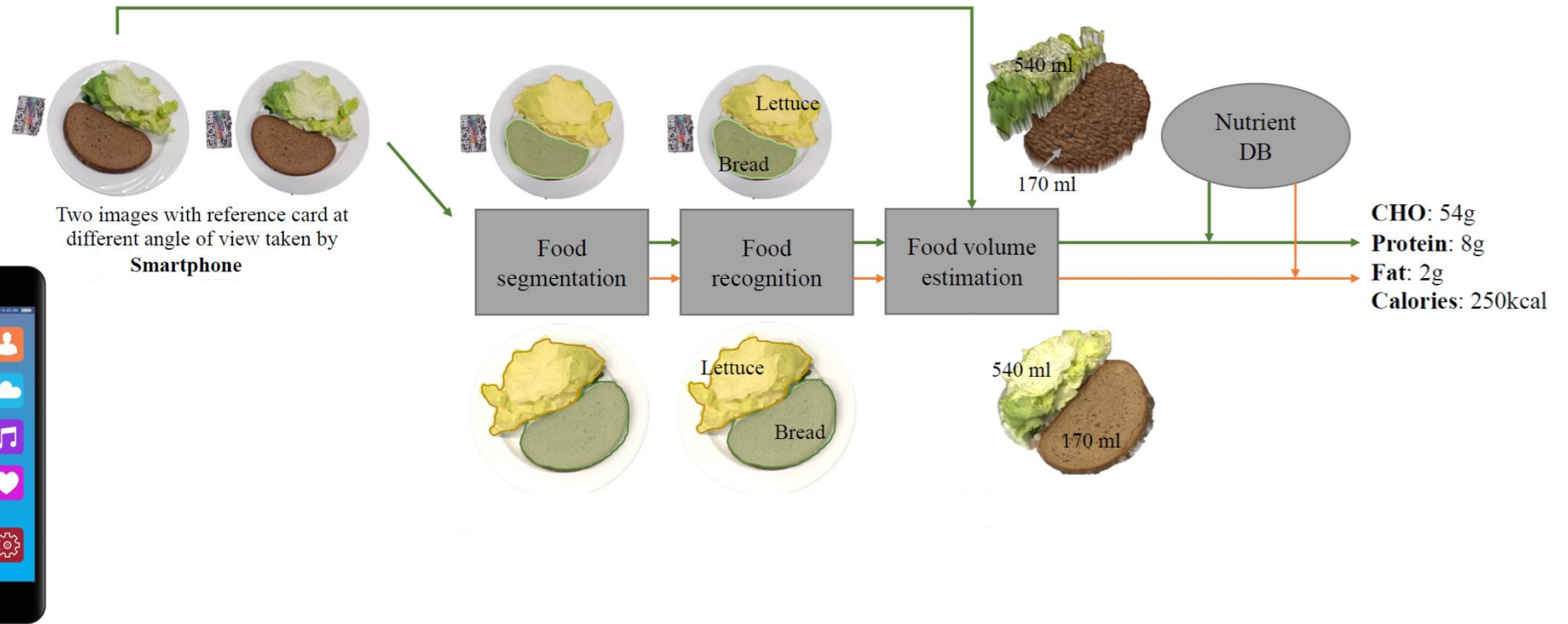


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# Food Diary: Artificial Intelligence System for Dietary Assessment

## Food Diary







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# Food Diary: Food Recognition

Food Diary



RESEARCH ARTICLE

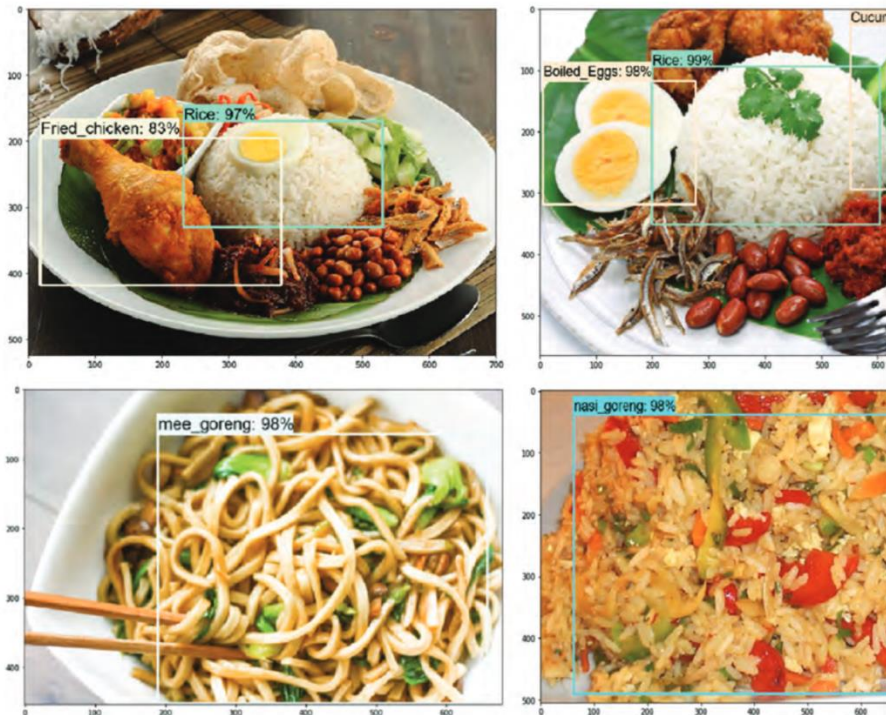


Fig. 5. Testing results of food detection and recognition.

Confusion Matrix

apple_pie	155	29	2	1	3	1	0	2	2	0	2	2	0	1
bread_pudding	44	141	1	1	0	0	2	2	7	0	1	0	1	0
breakfast_burrito	3	1	178	0	1	0	0	1	1	0	6	1	1	7
chicken_wings	2	2	0	186	0	4	1	1	0	1	2	1	0	0
eggs_benedict	5	0	0	0	191	0	0	1	1	1	1	0	0	0
fish_and_chips	0	0	0	3	0	192	3	0	0	0	1	0	0	1
french_fries	1	0	1	3	0	9	180	0	1	1	2	0	2	0
french_onion_soup	1	1	1	0	0	0	0	193	1	0	1	1	0	1
french_toast	4	11	0	1	0	0	1	1	168	0	14	0	0	0
fried_rice	5	0	0	1	1	1	0	0	1	189	0	0	1	1
grilled_cheese_sandwich	6	0	1	0	0	2	0	3	2	0	182	1	2	1
pizza	2	0	0	0	0	0	0	1	3	1	1	191	1	0
pulled_pork_sandwich	1	0	4	3	0	1	1	0	0	0	10	0	178	2
spring_rolls	2	3	4	1	0	2	1	1	0	1	1	0	0	184
apple_pie	bread_pudding	breakfast_burrito	chicken_wings	eggs_benedict	fish_and_chips	french_fries	french_onion_soup	french_toast	fried_rice	grilled_cheese_sandwich	pizza	pulled_pork_sandwich	spring_rolls	



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# Food Diary: Calorie Estimation

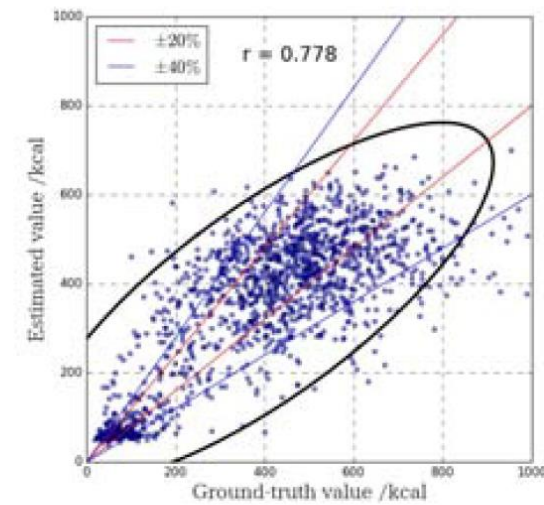
Food Diary



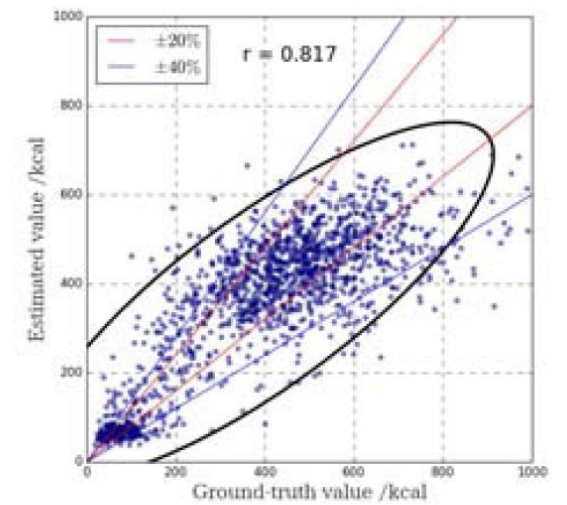
RESEARCH ARTICLE



Fig. 5. Testing results of food detection and recognition.



(a) Single-task CNNs. The correlation coefficient is 0.778.



(b) Multi-task CNNs. The correlation coefficient is 0.817.