Supplementing Omitted Named Entities in Cooking Procedural Text with Attached Images

Yixin Zhang[1], Yoko Yamakata[2] and Keishi Tajima[1]
[1]Kyoto University [2]The University of Tokyo

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Research Background

- In recent years, user-submitted recipe sites have become popular.
- Recipes with one-to-one correspondence between **images and texts**
- Recipe website: Haodou

Target Data

source: https://www.haodou.com/recipe/1190778

Research Problem

Example:

- when people interacting with smart speakers...

Cut into slices.

onion

We could extract food information from images

Food entity is omitted in the text.

  - **Foodstuffs are omitted** in some instructional text.
    - This can make the recipe or a particular procedure difficult to understand.
  - However, those entities omitted in text are sometimes shown in the **instructional images**.

- If we want to **supplement food in text**, we need to **recognize food** in instructional images.

Research Problem

Depending on the situation, **the appearance** of the **same ingredients (in the images)** may **differ**.

Prepare two potatoes.

Beginning Phase

Cut them into pieces.

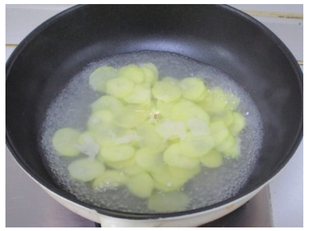
Intermediate Phase

Boil for 5 minutes.

Finishing Phase

On the other hand, even if the **images are similar**, the **food (in the text) might be different** in different situations.

Potato



Spring onion

Beans

Research Summary

To **supplement food in text**,

we propose a method ——

recognizing food entity candidates **based on both sentence similarity and image similarity**

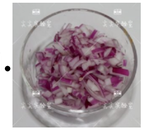
Food Recognition Based on Similarities

Target text-image pair

Cut into slices. 

Food is omitted in the sentence
(Want to supplement)

Text-image pair dataset

Chop the onion. 

Prepare a onion. 

Cut the meat. 

Compute the similarity { Text similarity / Image similarity

↓

Obtain the candidates with highest probability

Chop the onion. 

Examples of Experiment Results

- The example results of the sentence embedding method for calculating text similarity

Target text-image pair

Stir fry well and stand by

Text-image pair set with high similarity to the target.

Quickly add egg pieces.
Add egg pieces.
Pour in egg pieces and stir fry.
Pour in egg pieces.
Add egg pieces and stir fry.
Add egg pieces and fry for a while.
Wash the eggs.
Put in egg pieces

Evaluation

- Evaluation: compare the result with **manually labeled** results and compute the intersection.

  - Our method: 67.55%
    - Can supplement arbitrary food classes appearing in the dataset
  - (Baseline) Ordinary Inception V3: 43.57%
    - Cannot supplement food that are not included in the 10 classes over which the model is trained.

Thanks for listening!