

Cultural Adaptation of Recipes

Yong Cao^{1*}, Yova Kementchedjieva^{1*}, Ruixiang Cui¹,
Antonia Karamolegkou¹, Li Zhou^{1,2}, Megan Dare³, Lucia
Donatelli Saarland³, Daniel Hershcovich²

¹Department of Computer Science, University of Copenhagen

²University of Electronic Science and Technology of China

³Department of Language Science and Technology, Saarland University

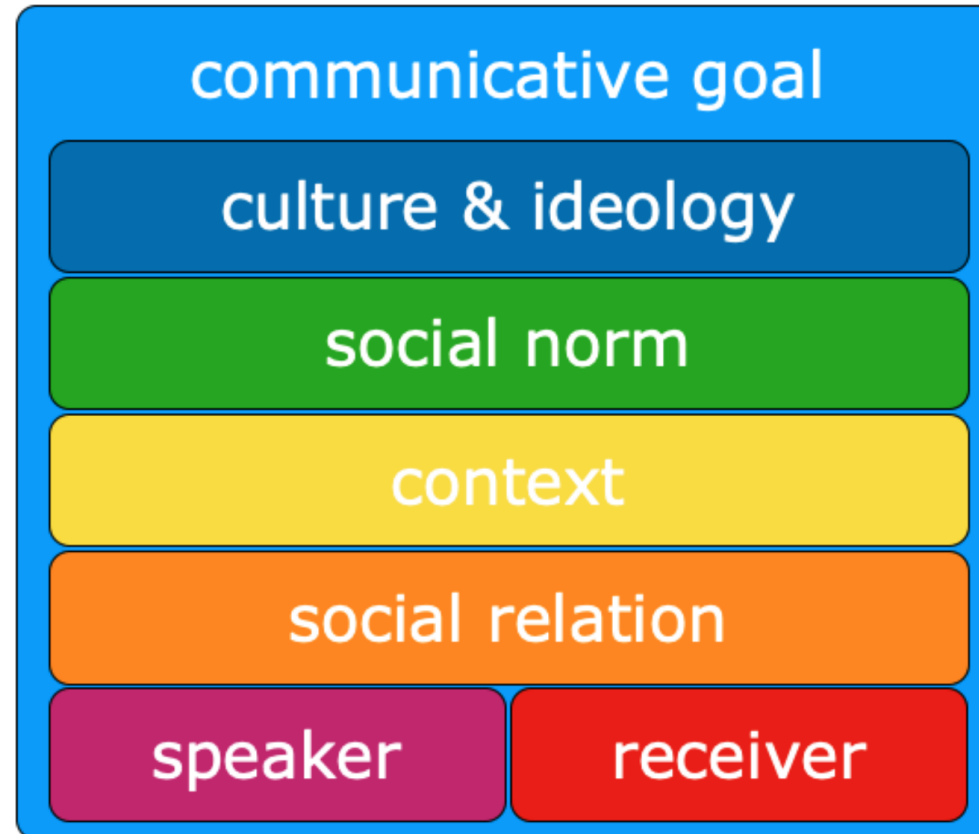
EACL 2023 workshop for Cross-Cultural
Considerations in NLP

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FACULTY OF SCIENCE



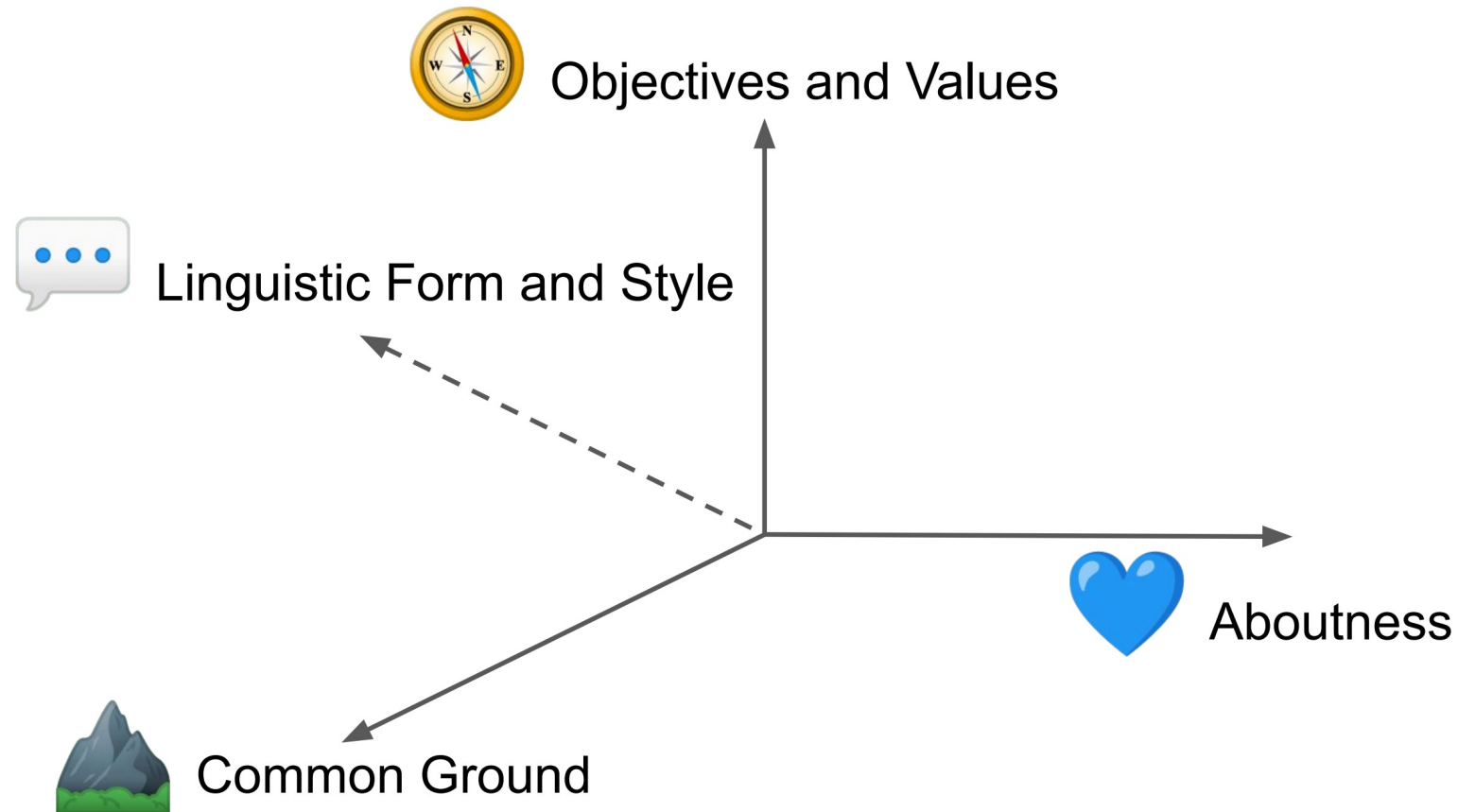
* Equal Contribution

NLP is for people (not just languages)



The Importance of Modeling Social Factors of Language: Theory and Practice.
Dirk et al., ACL 2021

Dimensions of culture



Challenges and Strategies in Cross-Cultural NLP
(Daniel et al., ACL 2022)

Recipe differences among cultures

- Ingredients
- Measurement units
- Tools
- Actions by cook

卷心菜番茄牛肉汤
Cabbage Tomato Beef Soup



Cabbage Beef Soup

Ingredients

- | | |
|--|---|
| <ol style="list-style-type: none"> 250克牛肉
250g beef 1个大西红柿
1 large tomato 适量葱, 姜片
Moderate amount of onion, ginger 适量糖, 盐
Moderate amount of sugar, salt 数片卷心菜叶子
A few cabbage leaves | <ol style="list-style-type: none"> 1 lb. ground beef 1 onion, chopped 2 soup cans water 1 can tomato soup 1 can beef bouillon soup 1 can drained kidney beans 1/2 head cabbage Salt and pepper 1 spoon of Hot sauce 1 can tomatoes, diced into small pieces |
|--|---|

Cooking Steps

- | | |
|--|--|
| <ol style="list-style-type: none"> 牛肉切小块, 焯水。
Cut beef into small pieces, blanched. 洗净后加入葱和姜片, 炖煮半小 时左右。
Wash beef, add green onion and ginger slices, and simmer for 0.5h. 捞出葱姜, 倒入 焖锅 焖一晚。
Take out the onion and ginger, put it into the stew pot and simmer overnight. 番茄去皮, 切块。倒入牛肉汤, 加入适量糖和 盐, 继续炖煮。
Peel the tomatoes and cut into cubes. Pour in the beef broth, add some sugar and salt, and continue to simmer. 等牛肉炖酥后, 加入卷心菜, 继续炖15-20分钟。
After the beef is stewed, add the cabbage and continue to simmer for 15-20 minutes. | <ol style="list-style-type: none"> Pressure cook cabbage for 8 minutes or cook on the stove and drain. Brown crumbled ground beef and onion. Then place all of the above ingredients into a crook-pot. Cook on low for 8 hours (add additional water). or on high for 7 to 8 hours. Serves 4. |
|--|--|

Recipe differences among cultures

(1) Literal translation into English of the Japanese recipe

Title: "Easy Meat Sauce"^{a b}

Ingredients (4 servings)

- 200 grams Ground meat
- 1 medium Onion
- 1 can Canned whole tomatoes
- 1/2 Carrot
- 2 clove Garlic
- 3 Shitake mushrooms
- 2 heaped tablespoons Ketchup
- 2 tbsp Japanese Worcestershire-style sauce (or tonkatsu sauce)
- 1/2 large cube *Soup stock cube
- 1 tbsp Flour
- 1 Olive oil (or vegetable oil)
- 1/2 tbsp Sugar

Method:

- (1) Blend all the vegetables in a food processor. If you don't have a processor, just finely chop them.
- (2) Heat some olive oil in a frying pan and fry the meat. Add the vegetables from Step 1 and sauté.
- (3) Add the flour and gently mix. Add the whole tomatoes, 200 ml of water, the soup stock cube, ketchup, sauce and sugar, and let it simmer for 5 minutes.
- (4) Season with salt, and it's done.
- (5) If you'd prefer it a little thicker, add some more flour.

^a<https://cookpad.com/us/recipes/152926-easy-meat-sauce> by "Nyamiane"

^bIn Japan, "Bolognese sauce" is called "meat sauce".

(2) English recipe

Title: "Spaghetti Bolognese for all"^a

Ingredients (6 servings)

- 1 dessertspoon vegetable oil
- 1 garlic clove, crushed
- 1 onion, finely chopped
- 500g beef mince
- 2 carrots, finely chopped
- 1 tablespoon tomato puree
- 1 (400g) tin chopped tomatoes
- 250ml beef stock
- 1/2 tsp salt
- 1/4 tsp pepper
- 1/4 tsp dried herbs

Methods:

- (1) Heat the oil in a large saucepan and brown the garlic, onions and mince.
- (2) Add the carrots and celery cook until tender.
- (3) Stir in the puree, stock, tomatoes and herbs. Cover and simmer for 40 minutes.

^a<http://allrecipes.co.uk/recipe/351/bolognese-sauce.aspx> by "tammie"

A Comparison of Cooking Recipe Named Entities between Japanese and English

Yoko et al., CEA 2017

Necessity of our work

Why are we doing Cultural adaptation for recipes?

- Recipe translation with **current machine translation technology proves inadequate** due to a lack of grounding in the physical and cultural space.

Our proposed benchmark: CulturalRecipes

- English-Chinese paired recipes sourced from two existing large-scale monolingual corpora
- Bidirectional datasets (English→Chinese and Chinese→English)
- Each dataset includes (1) a silver set, a large collection of noisy matches, and (2) a gold set, a smaller collection of high-quality matches

Recipe Matching

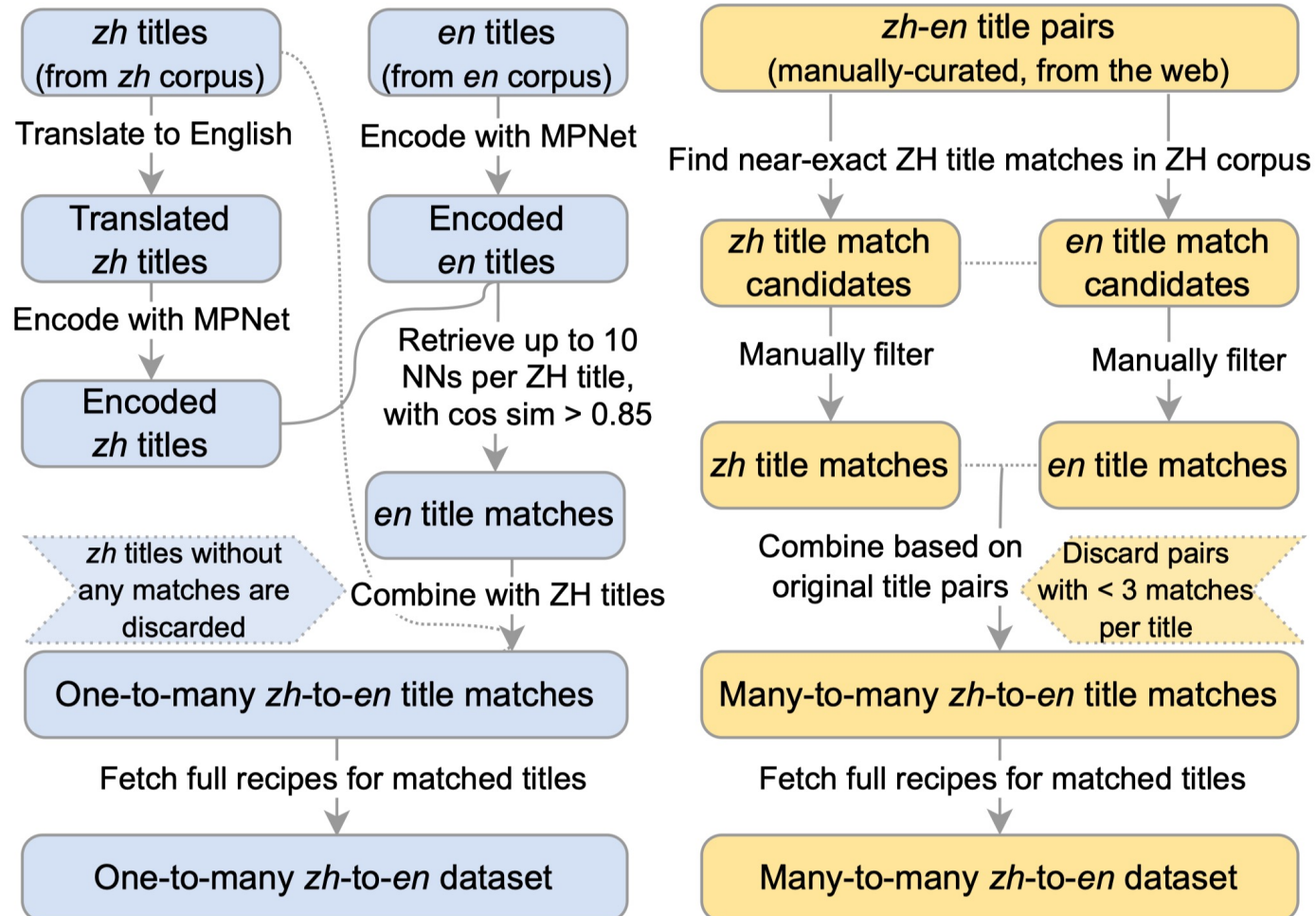


If two recipes have the same title, they describe the same dish.



If two recipes with a slightly different, but semantically equivalent title, they are the same dish.

Recipe Matching



Recipe Matching

Silver	# Recipes					Target # Tokens
	Source	Target	Train	Valid	Test	
<i>zh</i> → <i>en</i>	44,4k	144,6k	35,6k	4,4k	4,4k	130.8
<i>en</i> → <i>zh</i>	43,8k	120,7k	35,0k	4,4k	4,4k	136.6
Gold	# Title Pairs		# Recipe Pairs			
<i>zh</i> → <i>en</i>	82		795		134.6	
<i>en</i> → <i>zh</i>	52		386		141.0	

- Statistics of the CulturalRecipes silver and gold sets for both directions. Split sizes are based on number of source recipes.

Cross-cultural recipe adaptation task

- Extends the task of machine translation with the requirement of divergence from the source text semantics in order to **address cultural differences** in the target culture.
- Models: Machine translation / mT5.



Culture Adaptation



Direct Translation

Evaluation Metrics

- Surface-based Automatic Evaluation
 - BLEU, ROUGEL, BERTScore
- Structure-aware Automatic Evaluation
 - Similarity of AMRs
- Human Evaluation
 - Four dimensions relevant to the cultural adaptation of recipes

Experimental Results

		Surface-based			Structure-Aware	
		BLEU	ROUGE-L	BERTScore	Smatch	XS2
zh-en	MT-zs	3.05	13.5	54.6	23.5	42.6
	MT-ft	25.6	25.9	67.9	30.9	57.9
	mT5-ft	22.05	24.22	65.80	29.3	51.4
en-zh	MT-zs	2.1	27.3	64.9	24.0	41.2
	MT-ft	20.2	41.0	76.1	29.8	46.4
	mT5-ft	23.02	42.97	76.37	30.4	47.2

Experimental results in zero-shot (zs) mode and with fine-tuning (ft).

Human Evaluation

#37179154

1 of 1



Submit

```
1 == Input Recipe ==
2
3 Title:
4 Hearty Vegetable Soup,
5 Ingredients:
6 2 lean meaty soup bones (preferably beef shank) 1 c. each: any 5 vegetables: sliced carrots, diced celery, sliced zucchini, sliced green beans, sliced leeks, sliced parsnips,
  chopped cabbage and peeled and cubed potato 3 qt. water 1 can tomatoes, cut up 1 1/2 tsp. seasoned salt 1/2 tsp. seasoned pepper 1 c. barley 1 c. sliced fresh
  mushrooms,
7 Steps:
8 Brown soup bones either in skillet over high heat or in 400° oven. Combine all ingredients except barley and mushrooms in large soup kettle; bring to a boil. Reduce heat and
  simmer, covered, 2 hours. Add barley; simmer 1 hour longer. Add mushrooms; simmer 10 minutes. Remove soup bones from kettle; let cool slightly. Remove meat from bone;
  cut meat into pieces and return to soup. Refrigerate overnight. Skin any fat from surface; reheat soup and adjust seasonings before serving.
9
10 == Generate Recipe ==
11
12 Title: 营养蔬菜汤, Ingredients: 1个西红柿 1个土豆 1根胡萝卜 1个鸡蛋 适量盐 适量香油 适量葱花, Steps: 西红柿去皮切块,土豆切块,胡萝卜切块,葱花切碎。热锅冷油,放入葱花爆
  香,放入西红柿翻炒出汁。放入土豆,胡萝卜,翻炒均匀。放入适量水,大火烧开,转小火煮10分钟。放入盐,香油调味,出锅。
```

Grammar

1 2 3 4 5 6 7

Correctness

1 2 3 4 5 6 7

Preservation

1 2 3 4 5 6 7

Cultural Appropriateness

1 2 3 4 5 6 7

Human Evaluation

	Human Evaluation			Cultural
	Grammar	Correctness	Preservation	Appropriateness
MT-zs	3.7	3.5	4.3	3.9
MT-ft	6.1	5.8	4.2	5.3
mT5-ft	5.8	5.6	4.0	4.7

- Direct machine translation is not working in cultural adaptation.
- MT-ft scores higher on all metrics except preservation.

Summary

- We introduce the task of cross-cultural recipe adaptation and build a bidirectional ChineseEnglish dataset for it, CulturalRecipes.
- We experiment with various sequence-to-sequence approaches to adapt the recipes.
- Our work will enable cross-cultural comparative analysis in sociological and anthropological research.