

Cultural Adaptation of Recipes

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EACL 2023 workshop for Cross-Cultural
Considerations in NLP

UNIVERSITY OF COPENHAGEN
FACULTY OF SCIENCE

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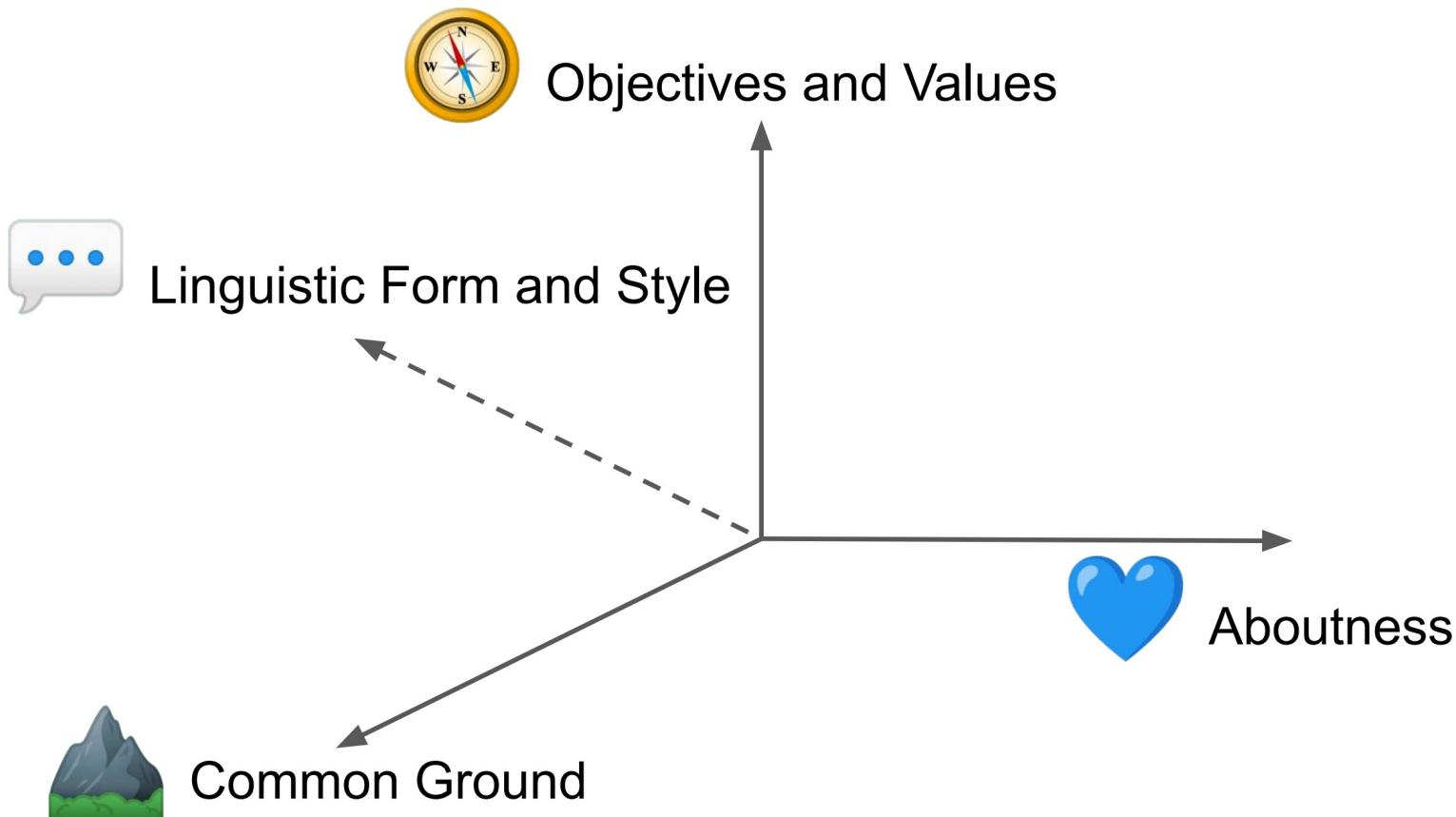


NLP is for people (not just languages)



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

																					
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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"

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

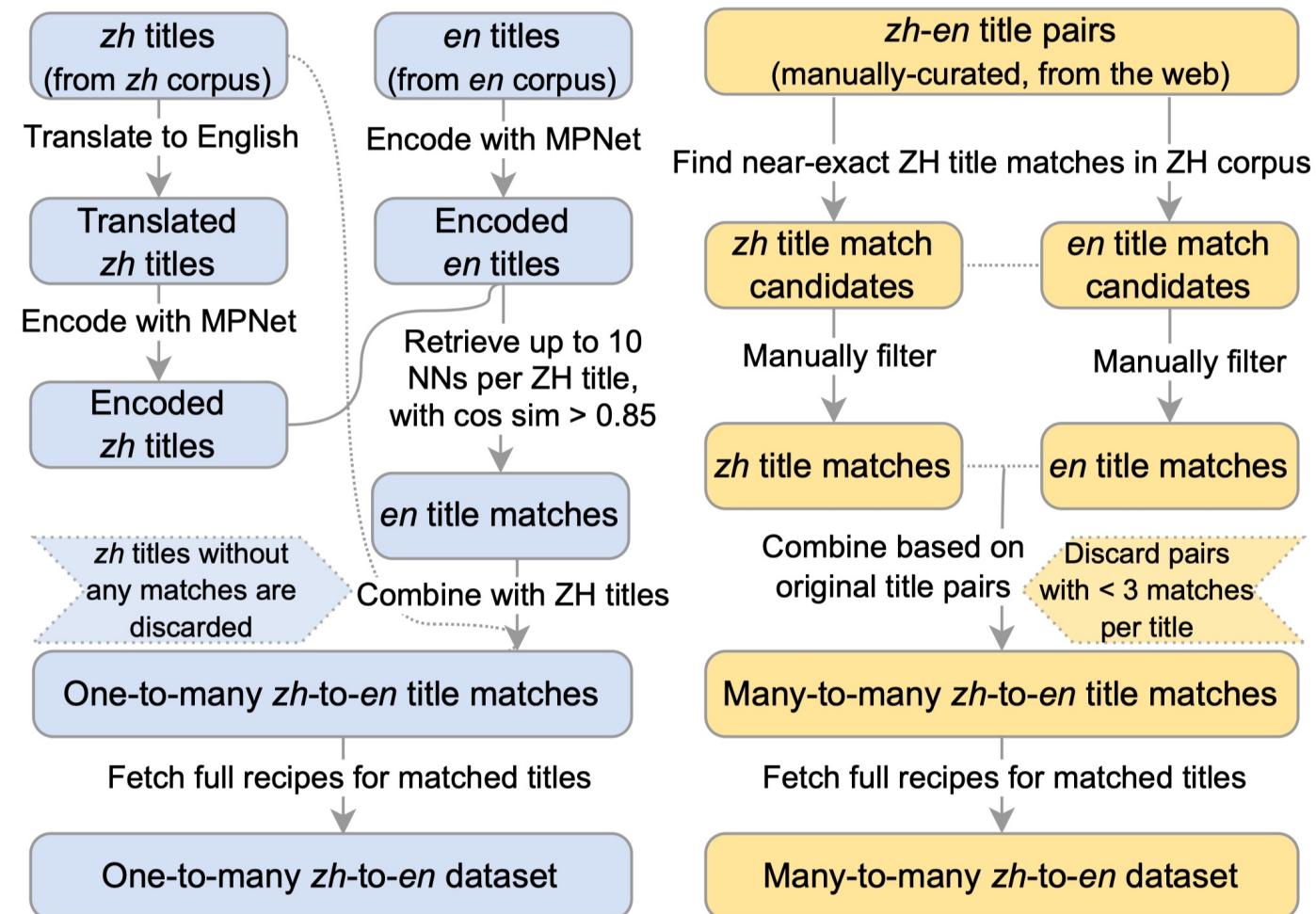


If two recipes have the same title, they describe the same dish.



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 Appropriateness
	Grammar	Correctness	Preservation		
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.