Overview of the NTCIR-11 Cooking Recipe Search Task

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ABSTRACT

This paper describes an overview of the NTCIR-11[1] Cooking Recipe Search pilot task (the first RecipeSearch task). In this pilot task, we explore the information access tasks associated with cooking recipes. Our subtasks include *ad hoc* recipe search and recipe pairing. We summarize the English/Japanese test collections and our task design to develop the collections, and then report official results of the evaluation experiments. In this task, a corpus of approximately 100,000 English recipes have been used for the English search. For the Japanese search, a corpus of approximately 440,000 Japanese recipes has been used. In the ad hoc and recipe pairing subtasks, 500 and 100 queries have been developed, in English and Japanese, respectively. In the task, four research groups participated, and 31 search runs in total have been submitted.

Keywords

cooking and eating activities, evaluation, test collections.

1. INTRODUCTION

Information access tasks involving food have traditionally focused on locating or ranking relevant restaurants given a user's information need. However, home cooking remains a fundamental method for acquiring a meal.

Recent surveys demonstrate that 'two in five [Americans] say they prepare meals at home five or more times a week and three in ten do so three to four times a week[1].' In Japan, the latest official statistics[2] shows that approximately 90% of males and females in all age groups eat meals prepared at home for breakfast and dinner. Unfortunately, 'only approximately 30% of males and approximately 50% of females in all age groups think that they have sufficient knowledge and skills for food choice and preparation[3].'

To improve this situation, efficient access to recipe information is necessary to acquire knowledge and skills in food preparation. Therefore, we propose **RecipeSearch**, a pilot task aimed at studying information access for recipe data[4]. This pilot task is challenging because users often have complex information needs (dietary constraints, course, dish, and ingredient requirements, etc.). Within this domain, we selected two subtasks to study. The first subtask, ad hoc search, considers a scenario in which a user searches for a recipe using a natural language question. This includes straightforward queries such as 'curry rice' as well as more complicated queries such as 'curry rice without gluten.' We expect these constraints to be common in real world queries because of dietary restrictions and the limited availability of some ingredients. The second subtask, recipe pairing, considers a scenario in which a user searches for a complementary recipe to some query dish. For example, a user may be interested in 'recipes complementing curry rice'. This subtask, although similar to IR (Information Retrieval) tasks such as diversification and contextual search, focuses on the unique properties of this domain.

In this task, we consider two types of search users: non-professionals and professionals. Non-professional users are general internet users who enjoy cooking for fun or for their daily living. Their search queries contain specific product names or abstract food names, and it is essential to relate those terms with concrete terms in the recipe data. Professional users in recipe search are experts such as dietitians who specialize in nutrition. It is important for them to associate recipe ingredients with standard food names that are defined in authoritative references[2, 3]. For both searches, IR systems need to perform **semantic interpretation** of food names and culinary words in order to associate users queries with relevant recipes.

2. TEST COLLECTIONS

We have developed English/Japanese recipe search collections. Each of the collections consists of a corpus, queries, and a set of relevance judgment data.

2.1 Corpus

For the English search, the Yummly Recipe Data corpus has been used. It includes approximately 100,000 recipes from Yummly[9] assembled in June 2014. Each recipe has a title, ingredient lines, preparation steps, and various types of metadata[5]. For the Japanese search, we have used a corpus of approximately 440,000 recipes issued in the Rakuten Data[5] provided by Rakuten, Inc. The recipe corpus was

[1] http://www.harrisinteractive.com/NewsRoom/HarrisPolls/tabid/447/mid/1508/articleId/444/ctl/ReadCustom\%20Default/Default.aspx
[2] http://www.e-stat.go.jp/SG1/estat/List.do?lid=000001054024
[3] http://www.maff.go.jp/e/pdf/shokuiku.pdf
[4] RecipeSearch homepage is: https://sites.google.com/site/ntcir11recipesearch
[5] https://developer.yummly.com/documentation/get-recipe-response-sample

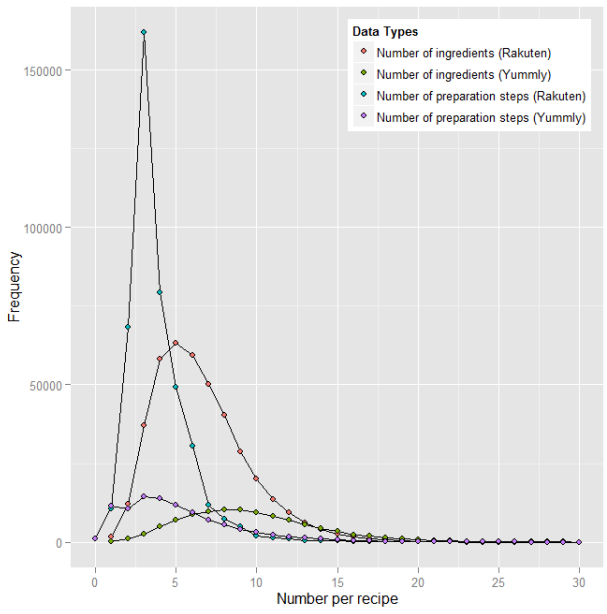

Figure 1: A comparison of the English/Japanese recipe data presenting the number of ingredients and preparation steps in recipes.

assembled from the Rakuten Recipe web site[6] in July 2012. The corpus consists of recipe titles, ingredient lines, preparation steps, various types of metadata, and "I made it!" report information. Figure 1 presents the distribution of the number of ingredients and preparation steps in the English/Japanese recipe data. Examples of English/Japanese recipes are presented in Table 18, Table 20, Table 21, Table 22, and Table 23.

2.2 Queries

English queries Queries are samples of submitted queries by real users on Yummly. To obtain technologically challenging queries, Yummly's in-house system for interpreting search queries is used to stratify server queries. The stratified queries are categorized according to the query type/difficulty. The details are explained in Section 5.1 and Section 5.2.

Japanese queries Queries are experimental queries that are manually created by adaptation of actual recipes in Rakuten Recipe and "STANDARD TABLES OF FOOD COMPOSITION IN JAPAN - 2010 -"[2]. The web site, the Rakuten Recipe web site provides a detailed search by using Boolean expressions of recipe titles, ingredient names, and any ad hoc keywords based on individual preferences in recipe search. Learning from this detailed search functionality, one of the organizers harvested characteristic keywords from popular recipes in Rakuten Recipe, replaced non-standard food names with standard food names, and assembled the edited keywords as plausible queries. Details are explained in Section 5.3 and Section 5.4.

[6] http://recipe.rakuten.co.jp/

2.3 Judgments

Because of the tight time constraints of the task, we passed on a dry-run session and a formal IR judgment. Judging a pool created by participants runs was suspected to be inefficient because there were expected to be many non-relevant documents and a very small number of relevant documents.

To construct a useful test bed for further discussions of recipe search evaluation, participants in our task were allowed to carry out any manual and/or automatic search to find as many relevant documents as possible. Some possible ways to obtain relevance judgment data are to create a small pool created by their own runs to judge, to perform a random manual search in the document collection, etc. System input for finding relevant documents may consist of any data, including formal run queries, answer examples, handmade dictionaries, participants' spontaneous search queries, etc.

Table 1: Number of queries and relevant documents.

Language	Subtask	# Queries	# RelDocs
EN	ad hoc	500	6254
EN	pairing	100	104
JA	ad hoc	500	760
JA	pairing	100	104

3. USER STUDY

To obtain the preliminary information for task design, a user study was performed to investigate what could be comprehensible queries for relevance assessment in the evaluation task.

3.1 A study of English queries

Annotations of 500 English query samples were obtained and queries were categorized as comprehensible or not. We collected annotations from two student assessors, a family member of a student assessor, and one of the task organizers.

- student-A: 269/500 ≈ 53.8% of queries are comprehensible. Others contain unknown words.
- student-B: 278/500 ≈ 55.6% of queries are comprehensible. Others contain unknown words.
- assessor-X: 433/500 ≈ 86.6% of queries are comprehensible. Others contain unknown words.
- task organizer: 335/500 ≈ 67.0% of queries are comprehensible. Others contain unknown words.

The number of queries, 5,000, is somewhat large for human annotation. We used an English learners word list that included 12000 English words[7]. These English words were classified into 12 levels according to the level of the English ability. Level 1 is novice, and Level 12 is the most advanced.

The percentage of 596/1217 ≈ 49% is understandable for English learners.

- 596 common words in the 5,000 queries and SVL12000 words.

[7] http://www.alc.co.jp/eng/vocab/svl/

Table 2: English queries for the user study (excerpts from 500 English query samples)

No.	Queries
1:	lemon sauce
2:	mexican chicken with tomato sauce
3:	sesame vegan
4:	ground beef vegetable pasta bake
5:	crock pot chicken stew mushrooms
6:	soft chocolate icing
7:	stuffed cabbage rolls low sodium
8:	fish sticks without eggs
9:	vegetarian corn appetizers
10:	cream cheese hors d'oeuvres

- 1217 words from the sampled queries (Krovetz stemming applied).

The SVL12000 words do not contain some typical cooking words, because the word list suggests words for English learners who need to increase their vocabulary for general English literacy. For example, Table 3 lists the frequent uncommon words that are not in the SVL list but in the Yummly queries.

Table 3: Common English words in the Yummly recipes and the SVL English word list. Words are applied with Krovetz stemming.

stem	df	Example usage in queries
crock	160	crock pot soups
gluten	124	gluten free cream sauce
vegan	96	vegan kale soup
smoothie	66	peach smoothie
chili	61	chili pepper
italy	59	italian dressing
vodka	48	coconut vodka drinks
dishes	38	filipino main dishes
frosting	38	healthy vanilla frosting
indian	37	indian lamb curry

3.2 A study of Japanese food names

For Japanese food names, we collected annotations from two student assessors, and two family members of one of the student assessors.

The annotation on 110 plausible queries made from Rakuten Recipe were obtained and categorized as comprehensible or not. The results are given as follows.

- student-A: 94/110 ≈ 85.5% of queries are comprehensible. Others contain unknown words.
- student-B: 94/110 ≈ 85.5% of queries are comprehensible. Others contain unknown words.
- assessor-X: 108/110 ≈ 98.2% of queries are comprehensible. Others contain unknown words.
- assessor-Y: 100/110 ≈ 90.9% of queries are comprehensible. Others contain unknown words.

Table 4 lists the English translation of the excerpts of 110 experimental queries for the user study. The original Japanese queries are summarized in Table 25. The number of comprehensible queries are the same between student-A and student-B, but their comprehensible queries are not the same.

Table 4: Experimental Japanese queries created from recipes. The English translations of excerpts are presented.

No.	Queries
1:	pork, stir-fried, cabbage, carrot, onion, bell pepper, oyster sauce
2:	pork, stir-fried, eggplant, sesame oil, gochujang
14:	beef, dressed with sauce, bamboo shoot, side dish
15:	beef, stewed dish, white radish, pressure cooker, konjak, garlic
109:	onion, miso soup, potato, white miso, low salt
110:	onion, kakiage, fresh onion, carrot, mitsuba, potato starch, wheat flour

The annotations of 794 Japanese standard food names were obtained and categorized as comprehensible or not.

- student-A: 598/794 ≈ 75.3% of queries are comprehensible. Others contain unknown words.
- student-B: 608/794 ≈ 76.6% of queries are comprehensible. Others contain unknown words.
- assessor-X: 764/794 ≈ 96.2% of queries are comprehensible. Others contain unknown words.
- assessor-Y: 760/794 ≈ 95.7% of queries are comprehensible. Others contain unknown words.

Table 5: Food names common in Rakuten recipes and the standard Japanese food name list[2]. English translations of excerpts of the most- and least-frequent words are presented.

No.	Food names	No.	Food names
1:	Mayonnaise	785:	Roasted flour
2:	Wheat flour	786:	Girella
3:	Sesame oil	787:	Hake
4:	Mirin	788:	Sorghum
5:	Carrot	789:	Masu trout
6:	Cabbage	790:	Lentils
7:	Soft flour	791:	Rocket
8:	Vinegars	792:	Rocket salad
9:	Cucumber	793:	Cos lettuce
10:	Onions	794:	Blue crab

4. TASK DESIGN

On the basis of the findings from the user study in Section 3.1 and Section 3.2, our task has been designed as follows.

4.1 Subtask: Ad hoc recipe search

This subtask is a basic ad hoc retrieval task to carry out a recipe search with simple keywords. It is similar to NTCIR-3/4/5 WEB, NTCIR-7/8 IR4QA, and NTCIR-8/9 GeoTime, but the recipe search is more technically challenging because it requires a complex Boolean (AND/OR/NOT) search.

In the recipe search, semantic interpretation is necessary to process ambiguous words. Both search users and recipe authors utilize their own vocabulary of cooking-related words that are not normalized, standardized, officially defined, or orthographic writing. Therefore, the ad hoc recipe search requires a progressive query formulation using synonyms, paraphrases, spelling variants, abstract nouns, categorical words, etc.

For example, in "fresh juice cocktails vodka," a search system would need to know what "fresh juice" and "cocktails" mean because they may be different expressions in a recipe. Another example is an abstract word or categorical word such as "fruit pie," where you need to know that "fruit" could be "apple," "blueberry," etc.

Synonyms of negation words are even more challenging to perform semantic interpretation. For example, in searching "eggless banana bread," a retrieved recipe of banana bread must not contain eggs, egg whites, and egg yolks in the ingredient lines as they are negated, but words such as eggless, no-egg, and egg-free may appear in the recipe title, as they are acceptable in a relevant recipe.

For the Japanese ad hoc recipe search, analogous queries with English queries were manually developed by one of the task organizers. To give a guideline for relevancy in the ad hoc recipe search, example answers of the released queries were provided to participants for the English/Japanese ad hoc recipe search. The details of the query development are described in Section 5.1 and Section 5.3.

4.2 Recipe pairing

This subtask is a simple form of menu planning where a user submits a recipe and receives a complementary dish. For example, a user has selected a main dish and would like to find a complementary side dish or dessert, such as "Sweet and Sour Chicken" accompanied with "Fried Rice" in a Chinese course. Another user may want to eat "Pineapple Chicken" with "Hawaiian Dessert," as they are both Hawaiian cuisine.

It can be said that the ad hoc recipe search has some analogy to error correction in NLP (Natural Language Processing) tasks[8].

(A) Error correction in NLP tasks
e.g., I has a cheese burger. ⇒ I have a cheese burger.

(B) Recipe ad hoc in NTCIR-11 RecipeSearch
e.g., fruit pie ⇒ apple pie

On the other hand, recipe pairing has a resemblance to a voice interactive system[9].

(C) Voice interactive system in NLP tasks
Q: What's the weather? ⇒ A: It's raining today.

(D) Recipe pairing in NTCIR-11 RecipeSearch
Main: Pineapple Chicken ⇒ Side: Hawaiian Dessert

"Complementary" in recipe pairing can be subjective. For example, the possible criteria for a good pairing include:

- different courses (e.g., a soup and salad, not two soups or two salads)
- contrast in heaviness/richness (if main dish is heavy, light salad)
- contrast in flavor (not two very spicy dishes)
- different ingredients
- different preparations
- same/similar cuisine
- same/similar holiday/occasion/season

To ensure what can be relevant documents, the organizers provided example answer-pairs of a main dish and side dish as a guideline to the participants. English answer pairs are recipes with different courses that are often viewed in the same session on Yummly. For Japanese recipe pairing, each of the answer pairs was chosen from a popular recipe author's repertory. The details of the query development are described in Section 5.2 and Section 5.4.

5. QUERY DEVELOPMENT

English queries were sampled from Yummly's real users queries. Japanese queries were constructed from actual recipes in the Rakuten Recipe corpus.

5.1 EN1: English ad hoc recipe search

To avoid failure of the relevance assessment, comprehensible queries should be chosen for the formal run. According to the user study in Section 3.1, some real user US queries can be difficult to understand for people who live in Japan because of the different food culture and unknown product names. To include relatively common topics for general internet users, 500 initial queries were collected in the following way.

Step-1 50,000 unique queries were sampled using a query sampling algorithm (stratified by distance, filtered by number of searches), and query filtering according to the length of the queries (four words or longer).

Step-2 To avoid queries that are not comprehensible, three types of hand-made dictionaries (country names, function words, English translation of Japanese food names[10]) and the term occurrence in the query pool were used to reduce the number of incomprehensible queries.

Step-3 Short-word queries are not comprehensible in general. For queries that contain the negating function words, "without," "no," "free," or "not," queries that are five words or longer were chosen. For queries that do not contain these negating function words, queries that are seven words or longer were chosen.

[8]Error Detection and Correction Workshop 2012 (https://sites.google.com/site/edcw2012/)

[9]Speech Recognition & Voice Interactive System (http://www.ar.media.kyoto-u.ac.jp/seminar/onsei1308.html)

[10]http://www.mext.go.jp/component/b_menu/shingi/toushin/__icsFiles/afieldfile/2010/11/16/1299052_1_1.pdf

Step-4 To diversify the queries diversified[11], the chosen queries were classified by the first query term, and a query was chosen from each class in a circular order until the number of the queries becomes N. ($N = 200$ for each negation/positive query set)

Step-5 If the queries contain a lengthy word, it tends to contain spelling mistakes. We call this type of query a "spelling queries." To make a query set more challenging, 100 spelling queries were chosen from the query pool by using a hand-made word list to find spelling errors.

By using the above steps, 500 queries (200 negation, 200 positive, 100 spelling queries) were collected. To give a guideline for relevance assessment, we tried to associate each query to an example answer recipe. Here, example answer recipes are the most clicked recipes (with at least 10 clicks) for each query. Unfortunately, only 222 queries out of the 500 initially developed queries were associated with the example answers because of the extreme long-tail nature of the user queries. To supplement the query set, 278 frequently clicked queries were gathered from another 5,000 query samples that were simply applied with the query sampling algorithm. Finally, the 500 query set for the formal run (released for the participants) consisted of 222 strategically chosen queries (comprehensible for the Japanese residentiary), and 287 random queries (relatively incomprehensible for the Japanese residentiary).

5.2 EN2: English recipe pairing

One of the organizers gathered pairs of main dishes and side dishes/salads/desserts that are often clicked by the same user within a short time period. With this algorithm, most of the pairs share a cuisine or diet, e.g., two Cuban dishes or two vegan dishes. To supplement some pairs that are less directly related, alternate methods for generating the pairs using the main/side pairs on the web site were also attempted. The 100 pairs for the formal run consisted of three types (PairedType field in JSON): side (28), salad (23), and dessert (49) (for a total of 100).

5.3 JA1: Japanese ad hoc recipe search

Learning from the English ad hoc query set that was created with real user queries, actual Japanese recipes were adapted to develop ad hoc queries.

Step-1 By using three types of hand made dictionaries (negating, nutritious, and explanatory words) and the category name of the recipe (the third level category of the Rakuten Recipe information), 1,240 popular recipes that have distinctive characteristics were pooled.

Step-2 The pooled recipes were assessed whether they look appealing as relevant recipes, and 500 recipes were chosen as example answers.

Step-3 The 500 chosen recipes were manually parsed, and classified into four data types: dish names, ingredient names, negating conditions, and explanatory conditions.

[11]If not diversified, too many queries contained "cream cheese" or "pork" and such.

Step-4 To emulate the vocabulary mismatch between queries and relevant recipes in the English ad hoc search, a dictionary of synonyms was manually assembled for the parsed words by using standard Japanese food names[2] and proper food names on the internet. To determine which names could be synonymous, some other resources were also utilized, such as Japanese Wikipedia and Q & A sites.

Step-5 The 500 edited recipes were transformed into a JSON format and released as a formal run query set.

5.4 JA2: Japanese recipe pairing

Queries for English recipe pairing were pairs of popular recipes that the same users clicked in different searches in a short time period. Unfortunately, the search server log for the Japanese recipe search was not available. Instead of the user's click-through data, we used the home cooking repertoire of popular recipe authors. Japanese queries for recipe pairing were developed using the following steps.

Step-1 Gather recipes of the main-dish type (meat dish, fish dish, egg, pasta, etc.) with a moderate cooking time (not too short, not too long), a moderate cost of ingredients (not too cheap, not too expensive), a moderate number of ingredient numbers (seven or more, 10 or less), and cooking occasion IDs including both '2:hospitality' and '3:celebratory.'

Step-2 Exclude recipes that were already chosen for the Japanese recipe ad hoc search. Select popular recipes that have one or more "i-made-it" reports.

Step-3 Generate candidate pairs per user in the order of ingredient numbers of the main dish. Each pair contains the N-best side dishes that have largest number of ingredients that are not duplicates of the main dish ingredients.

Step-4 Manually assess the pair candidates, and the 100 most plausible pairs were chosen. To normalize the food names in the pairs, a dictionary of synonyms was assembled in the same way as the process of Japanese ad hoc query development. The 100 normalized recipes were transformed into a JSON format, and released as a formal run query set.

6. OFFICIAL TASK RESULTS

Four groups including one organizer's group participated in the NTCIR-11 RecipeSearch task. Table 6 summarizes the participating groups. Table 7 lists the number of submitted runs for subtask1/2 in English/Japanese.

In our task, the file name of each run must contain the (1) Group ID, (2) Subtask Type, (3) Run Type, and (4) Run ID.

e.g.,
GROUP-EN1-BASE-01
GROUP-EN1-BASE-02
GROUP-JA1-TEST-01
GROUP-JA1-TEST-02

(1) Group ID: does not exceed five alpha-numeric characters.

(2) Subtask Type: EN1, EN2, JA1, JA2.

Table 6: NTCIR-11 RecipeSearch participants.

Group ID	Organization
HCU	Hiroshima City University, JAPAN
OKSAT	Osaka Kyoiku University, JAPAN
OPU	Okayama Prefectural University, JAPAN
GUKUR*	Gunma University, JAPAN (Task Organizer) Kiryu University, JAPAN RMIT, Australia

*GUKUR is a collaborative participant group consisting of three
organizations including a Task Organizer's organization.

Table 7: Number of runs for each subtask.

Group ID	English		Japanese	
	EN1 Ad hoc	EN2 Pairing	JA1 Ad hoc	JA2 Pairing
HCU	–	–	2	–
OKSAT	4	–	1	–
OPU	–	–	–	4
GUKUR	5	5	5	5
Total	9	5	8	9

(3) Run Type: BASE, ORCL, TEST.

(4) Run ID: two digit numbers[12] starting from 01.

Table 8: Subtask type description.

Abbr.	Description
EN1	English recipe ad hoc (subtask1)
EN2	English recipe pairing (subtask2)
JA1	Japanese recipe ad hoc (subtask1)
JA2	Japanese recipe pairing (subtask2)

As an initial attempt to evaluate the recipe search effectiveness, we report the three basic evaluation measures in Table 10 for the runs submitted by HCU[4], OKSAT[6], OPU[7], and GUKUR[8].

6.1 Official results for the English subtasks

Table 11 summarizes the search effectiveness of the English ad hoc recipe search (EN1). We briefly describe the submitted runs as follows.

GUKUR-EN1-BASE-01
Indri (default settings), no-stemming, no-stopping.
System input: queries (all terms).

GUKUR-EN1-BASE-02
Indri (default settings), no-stemming, no-stopping.
System input: queries (dropping negation terms).

GUKUR-EN1-ORCL-01
Indri (default settings), no-stemming, no-stopping.
System input: queries, answer examples (recipe title).

[12]In the task, there was no limit on the number of run submissions. The largest number of the run submissions by a group was five.

Table 9: Run type description.

Abbr.	Description
BASE	Vanilla search. System input consists of only queries.
ORCL	Vanilla search. System input consists of answer examples. (Queries may be also included in the system input.)
TEST	Any input, any system for testing. (In addition to testing data, queries and answer examples may be included in the system input.)

Table 10: Evaluation measures.

Abbr.	Description
MAP	Mean average precision.
MRR	Mean reciprocal rank.
MSnDCG	Microsoft version of nDCG. (normalized discounted cumulative gain)

GUKUR-EN1-ORCL-02
Indri (default settings), no-stemming, no-stopping.
System input: queries, answer examples (recipe title, top ingredient lines).

GUKUR-EN1-ORCL-03
Indri (default settings), no-stemming, no-stopping.
System input: queries, answer examples (recipe title, all ingredient lines).

OKSAT-EN1-TEST-01
GRAM base index, probabilistic model.
System input: queries, a hand-made dictionary.

OKSAT-EN1-TEST-02
GRAM base index, probabilistic model.
System input: queries, answer examples, hand-made dictionaries.

OKSAT-EN1-TEST-03
GRAM base index, probabilistic model.
System input: queries, answer examples, expanded words by Wiki, Weblio and Google, hand-made dictionaries.

OKSAT-EN1-TEST-04
GRAM base index, probabilistic model.
System input: queries, answer examples, expanded words by Wiki, Weblio and Google, hand-made dictionaries.

Table 12 summarizes the search effectiveness for the English recipe pairing (EN2). We briefly describe the submitted runs as follows.

GUKUR-EN2-ORCL-01
Indri (default settings), no-stemming, no-stopping.
System input: answer examples (recipe title).

GUKUR-EN2-ORCL-02
Indri (default settings), no-stemming, no-stopping.
System input: answer examples (recipe title, three attribute types).

Table 11: Official results for EN1 (Ad hoc).

Run ID	MAP	MRR	MSnDCG
GUKUR-EN1-BASE-01	0.1949	0.3566	0.4381
GUKUR-EN1-BASE-02	0.2080	0.3859	0.4571
GUKUR-EN1-ORCL-01	0.2381	0.6352	0.4893
GUKUR-EN1-ORCL-02	0.2126	0.6691	0.4362
GUKUR-EN1-ORCL-03	0.2815	0.9389	0.5347
OKSAT-EN1-TEST-01	0.6790	0.8190	0.7822
OKSAT-EN1-TEST-02	0.6999	0.8357	0.7954
OKSAT-EN1-TEST-03	0.7287	0.8407	0.8162
OKSAT-EN1-TEST-04	0.7499	0.8564	0.8288

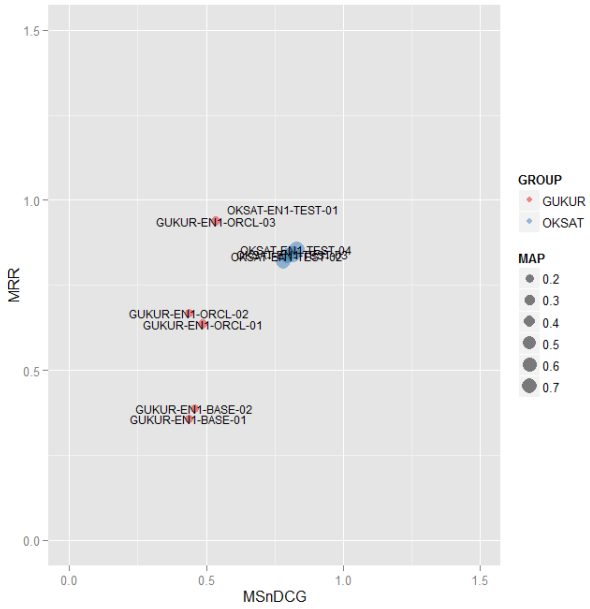

Figure 2: Scatter diagram of MAP, MRR, and MSnDCG for EN1 (Ad hoc).

Table 12: Official results for EN2 (Pairing).

Run ID	MAP	MRR	MSnDCG
GUKUR-EN2-ORCL-01	0.6255	0.6252	0.7031
GUKUR-EN2-ORCL-02	0.6795	0.6792	0.7466
GUKUR-EN2-ORCL-03	0.7824	0.7820	0.8315
GUKUR-EN2-ORCL-04	0.6888	0.6883	0.7429
GUKUR-EN2-ORCL-05	0.9725	0.9725	0.9795

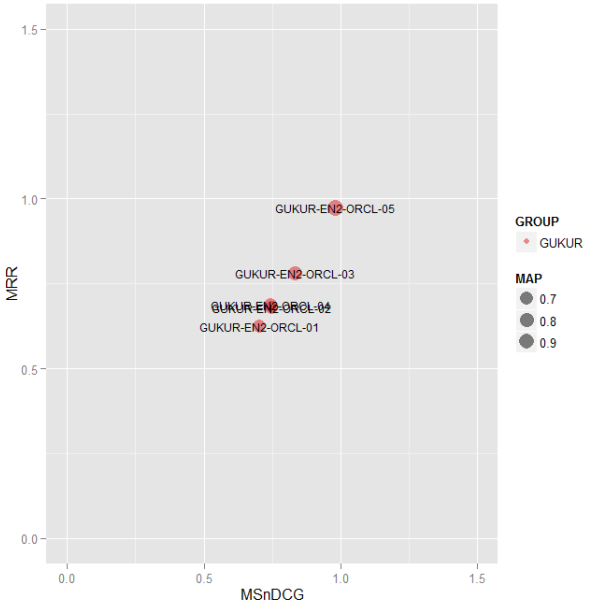

Figure 3: Scatter diagram of MAP, MRR, and MSnDCG for EN2 (Pairing).

GUKUR-EN2-ORCL-03
Indri (default settings), no-stemming, no-stopping.
System input: answer examples (recipe title, all attributes).

GUKUR-EN2-ORCL-04
Indri (default settings), no-stemming, no-stopping.
System input: answer examples (recipe title, top ingredient lines).

GUKUR-EN2-ORCL-05
Indri (default settings), no-stemming, no-stopping.
System input: answer examples (recipe title, all ingredient lines).

6.2 Official results for the Japanese subtasks

Table 13 summarizes the search effectiveness for the Japanese ad hoc recipe search (JA1). We briefly describe the submitted runs as follows.

GUKUR-JA1-BASE-01
Indri (default settings), no-stemming, no-stopping, word-breaking (mecab and ipadic).
System input: queries (dish name).

GUKUR-JA1-BASE-02
Indri (default settings), no-stemming, no-stopping, word-breaking (mecab and ipadic).
System input: queries (dish name, ingredient names).

GUKUR-JA1-BASE-03
Indri (default settings), no-stemming, no-stopping, word-breaking (mecab and ipadic).
System input: queries (dish name, negation/explanation conditions).

GUKUR-JA1-BASE-04
Indri (default settings), no-stemming, no-stopping, word-breaking (mecab and ipadic).
System input: queries (all).

GUKUR-JA1-TEST-01
Indri (default settings), no-stemming, no-stopping, word-breaking (mecab and ipadic).
System input: answer examples, a hand-made dictionary.

HCU-JA1-BASE-01
Solr (BM25), stemming, stopping.

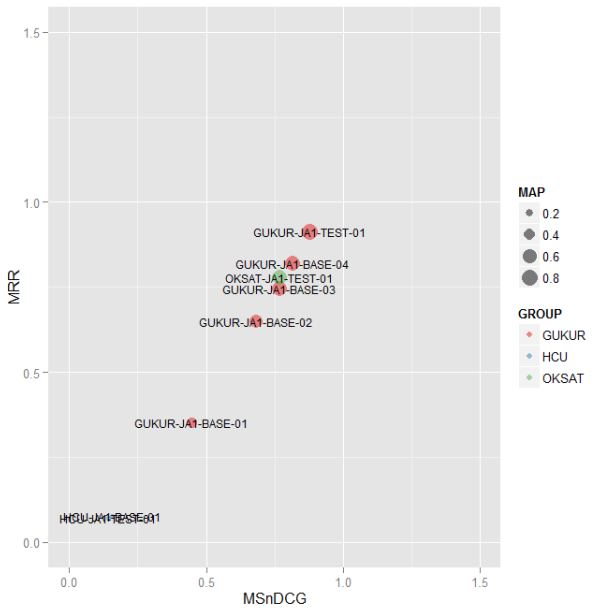

Figure 4: Scatter diagram of MAP, MRR, and MSnDCG for JA1 (Ad hoc).

System input: queries

HCU-JA1-TEST-01
Solr (BM25), stemming, stopping.
System input: queries, a hand-made dictionary.

OKSAT-JA1-TEST-01
GRAM base index, probabilistic model.
System input: queries, a hand-made dictionary.

Table 13: Official results for JA1 (Ad hoc).

Run ID	MAP	MRR	MSnDCG
GUKUR-JA1-BASE-01	0.3146	0.3517	0.4476
GUKUR-JA1-BASE-02	0.5846	0.6490	0.6811
GUKUR-JA1-BASE-03	0.6871	0.7465	0.7688
GUKUR-JA1-BASE-04	0.7489	0.8207	0.8157
GUKUR-JA1-TEST-01	0.8168	0.9138	0.8780
HCU-JA1-BASE-01*	0.0706	0.0763	0.1575
HCU-JA1-TEST-01*	0.0667	0.0700	0.1441
OKSAT-JA1-TEST-01	0.6849	0.7786	0.7676

*The group HCU identified some problems in their system, after their run submission, and performed additional experiments independently[4].

Table 14 summarizes the search effectiveness for the Japanese recipe pairing (JA2). We briefly describe the submitted runs as follows.

GUKUR-JA2-BASE-01
Indri (default settings), no-stemming, no-stopping, word-breaking (mecab and ipadic).
System input: side dish information in formal run queries (dish name).

GUKUR-JA2-BASE-02
Indri (default settings), no-stemming, no-stopping, word-breaking (mecab and ipadic).
System input: side dish information in formal run queries (ingredient names).

GUKUR-JA2-BASE-03
Indri (default settings), no-stemming, no-stopping, word-breaking (mecab and ipadic).
System input: side dish information in formal run queries (dish name, ingredient names).

GUKUR-JA2-TEST-01
Indri (default settings), no-stemming, no-stopping, word-breaking (mecab and ipadic).
System input: answer examples (dish name, top ingredient names), a hand-made dictionary.

GUKUR-JA2-TEST-02
Indri (default settings), no-stemming, no-stopping, word-breaking (mecab and ipadic).
System input: answer examples (dish name, all ingredient names), a hand-made dictionary.

OPU-JA2-ORCL-01
leave-one-out evaluation, material core name used.
System input: answer examples

OPU-JA2-ORCL-02
closed data evaluation, material core name used.
System input: answer examples

OPU-JA2-ORCL-03
leave-one-out evaluation, exact material name used.
System input: answer examples

OPU-JA2-ORCL-04
closed data evaluation, exact material name used.
System input: answer examples

Table 14: Official results for JA2 (Pairing)

Run ID	MAP	MRR	MSnDCG
GUKUR-JA2-BASE-01	0.3272	0.3273	0.4308
GUKUR-JA2-BASE-02	0.3992	0.4054	0.4961
GUKUR-JA2-BASE-03	0.6577	0.6598	0.7308
GUKUR-JA2-TEST-01	0.3890	0.3891	0.4917
GUKUR-JA2-TEST-02	0.9326	0.9401	0.9495
OPU-JA2-ORCL-01	0.0100	0.0100	0.0100
OPU-JA2-ORCL-02	0.5333	0.5500	0.5370
OPU-JA2-ORCL-03	0.0000	0.0000	0.0000
OPU-JA2-ORCL-04	0.9233	0.9400	0.9270

6.3 Supplementary results

The official results in Tables 11, 12, 13, and 14 show the evaluation values calculated by using a basic NTCIR evaluation tool[13]. The evaluation values are the same as the values calculated by using the standard evaluation tool of TREC[14],

[13]NTCIREVAL.130507 `http://research.nii.ac.jp/ntcir/tools/ntcireval-en.html`
[14]trec_eval `http://trec.nist.gov/trec_eval/`

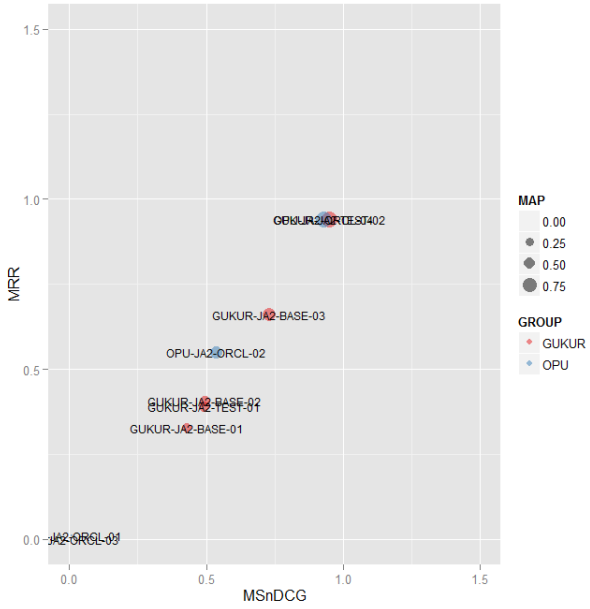

Figure 5: Scatter diagram of MAP, MRR, and MSnDCG for JA2 (Pairing)

with the exception in the HCU-JA1-BASE-01 and HCU-JA1-TEST-01 runs. Unlike other submitted runs, these two runs contain ties that have the same document weights for multiple documents searched for a topic.

The evaluation values can be different when a run contains ties because the document ranking for ties is obtained differently by NTCIREVAL and by trec_eval.

- NTCIREVAL: document ranking is based on the document position in the run file.
- trec_eval: document ranking is based on the document weight in the run file.

Table 15 lists the different evaluation values for the HCU-JA1-BASE-01 and HCU-JA1-TEST-01 runs obtained by NTCIREVAL (indicated by 'n' in parentheses) and trec_eval (indicated by 't' in parentheses). It should be noted that nDCG and MSnDCG calculated by NTCIREVAL are not the same, and the value for MSnDCG calculated with NTCIREVAL is a value for nDCG calculated with the latest version of trec_eval. Hence, MSnDCG(n) corresponds to nDCG(t) in Table 15.

In theory, the searched results in the vertical search must be sorted by each document's unparalleled weight. However, there is a good possibility that multiple documents have the same content in our task design, wherein search systems need to equate a query term with its synonyms in the documents. The differences in the evaluation values in Table 15 are due to our task design and do not indicate improper operations of the evaluation tools or submitted runs.

The official results in Tables 11, 12, 13, and 14 are based on two relevance levels: L0 (not relevant) and L1 (relevant). In addition to the binary relevance levels, a multi-level relevance evaluation is worth considering. The participant group, GUKUR submitted multi-level relevance judgments

Table 15: Additional results for JA1 (Ad hoc)

Run ID	MAP(n)	MRR(n)	MSnDCG(n)
HCU-JA1-BASE-01	0.0706	0.0763	0.1575
HCU-JA1-TEST-01	0.0667	0.0700	0.1441
Run ID	MAP(t)	MRR(t)	nDCG(t)
HCU-JA1-BASE-01	0.0688	0.0752	0.1559
HCU-JA1-TEST-01	0.0647	0.0701	0.1427

for JA1 that contain L0 (not relevant), L1 (somewhat similar to the answer recipe), L2 (highly similar to the answer recipe), and L3 (answer recipe itself) for 111 out of the 500 topics. Only 22.2% of the total of 500 topics were given multi-level relevance judgments owning to the difficulty in creating a pool of similar recipes. The details are explained in the participant paper by GUKUR[8].

Table 16 lists the evaluation values for the multi-level relevance of all 500 topics (indicated by 'a' in parentheses) and the 111 partial topics (indicated by 'p' in parentheses) in comparison with the binary relevance evaluation (indicated by 'b' in a parenthesis) for all 500 topics.

Table 16: Multi-level relevance for JA1 (Ad hoc)

Run ID	MAP(a)	MRR(a)	MSnDCG(a)
GUKUR-JA1-BASE-01	0.3241	0.3487	0.4528
GUKUR-JA1-BASE-02	0.6006	0.6442	0.6941
GUKUR-JA1-BASE-03	0.7088	0.7430	0.7843
GUKUR-JA1-BASE-04	0.7699	0.8168	0.8329
GUKUR-JA1-TEST-01	0.8400	0.9099	0.9035
HCU-JA1-BASE-01	0.0714	0.0756	0.1586
HCU-JA1-TEST-01	0.0669	0.0693	0.1439
OKSAT-JA1-TEST-01	0.7131	0.7766	0.7972
Run ID	MAP(b)	MRR(b)	MSnDCG(b)
GUKUR-JA1-BASE-01	0.3146	0.3517	0.4476
GUKUR-JA1-BASE-02	0.5846	0.6490	0.6811
GUKUR-JA1-BASE-03	0.6871	0.7465	0.7688
GUKUR-JA1-BASE-04	0.7489	0.8207	0.8157
GUKUR-JA1-TEST-01	0.8168	0.9138	0.8780
HCU-JA1-BASE-01	0.0706	0.0763	0.1575
HCU-JA1-TEST-01	0.0667	0.0700	0.1441
OKSAT-JA1-TEST-01	0.6849	0.7786	0.7676
Run ID	MAP(p)	MRR(p)	MSnDCG(p)
GUKUR-JA1-BASE-01	0.2750	0.3860	0.4580
GUKUR-JA1-BASE-02	0.3621	0.5584	0.5545
GUKUR-JA1-BASE-03	0.4060	0.5600	0.5940
GUKUR-JA1-BASE-04	0.4298	0.6414	0.6228
GUKUR-JA1-TEST-01	0.5392	0.8538	0.7679
HCU-JA1-BASE-01	0.0413	0.0604	0.1292
HCU-JA1-TEST-01	0.0347	0.0457	0.1123
OKSAT-JA1-TEST-01	0.4614	0.7473	0.6774

7. CONCLUSIONS

For our pilot task, the organizers proposed two preliminary subtasks. These subtasks were sufficiently challenging, and yet the scope was moderately limited so that participants could get acclimated to the recipe data and the pur-

pose of the search.

From the viewpoint of document processing, this pilot task has introduced interesting problems of semantic analysis in documents. The omission of understood subjects or objects and the general background information for food and cooking are frequent in cooking recipes. A semantic analysis of culinary words and phrases is also important for this task. The major outcomes of this task include task-specific methodologies of query development and judgments, various experiments conducted by participating systems, and active discussions in the workshop meeting.

8. ACKNOWLEDGMENTS

This work was partly supported by JSPS KAKENHI Grant Number 26330363. For the English subtasks, we used Yummly Recipe Data v1 provided by Yummly. For the Japanese subtasks, we used the Rakuten Data provided by Rakuten, Inc. We express our gratitude to the data providers.

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APPENDIX

A. EXAMPLES IN ENGLISH

Samples, examples, and excerpts of the English experimental data in the task are presented as follows.

Table 17: Examples of English ad hoc queries.

Topic ID	Queries
EN0001	oregano garlic olive oil pasta
EN0002	gingerbread cookie icing no egg whites
EN0003	portobello mushroom with goat cheese
EN0004	flourless no bake chocolate cake
EN0005	onion ring batter no milk
EN0006	roll with self rising flour
EN0007	minute rice with chicken broth
EN0008	honey mustard dressing dairy free
EN0009	caesar salad dressing dairy free
EN0010	energy bar no bake healthy

Table 18: A sample of English recipe data.

Recipe ID	Recipe Data
EN00000001	[{"recipeID":"EN00000001","title":"Vietnamese Iced Milk Coffee","ingredientLines":["16 ice cubes","125ml sweetened condensed milk","50g dark roast ground coffee beans or to taste","1 litre water"],"preparationSteps":["Brew coffee with water using your preferred method to make brewed coffee. Spoon 2 tablespoons of sweetened condensed milk into each of 4 coffee cups. Pour 250ml fresh hot coffee into each cup and stir to dissolve the milk.","Serve guests cups of coffee and give each one a tall glass with 4 ice cubes, and a long handled spoon. Guests pour hot coffee over the ice cubes and stir briskly with the long handled spoon, making an agreeable clatter with the ice cubes to chill the coffee."]}

Table 19: Examples of English pairing queries.

Topic ID	Queries
EN1001	{"topicID":"EN1001","mainDish":{"title":"Grilled Pork Chops with Garlic Lime Sauce","ingredientLines":["6 (1/2-inch-thick) boneless pork chops","2 tablespoons chopped fresh cilantro","1/3 cup olive oil","1/4 teaspoon dried hot red-pepper flakes","1 garlic clove, minced","1/4 cup fresh lime juice"],"preparationSteps":["Whisk together lime juice, garlic, red-pepper flakes, and 1/4 teaspoon salt, then add oil in a slow stream, whisking well. Whisk in cilantro.","Prepare a gas grill for direct-heat cooking over medium-high heat. Pat pork dry and season with salt and pepper. Oil grill rack, then grill pork chops, covered, turning over once, until just cooked through, 5 to 6 minutes total. Serve drizzled with some vinaigrette, and with remainder on the side.","Cooks\u0027 note: If you aren\0027t able to grill outdoors, chops can be cooked in a hot lightly oiled large (2-burner) ridged grill pan over moderately high heat.","Per serving: [236] calories, [16] g fat ([3] g saturated), [65] mg cholesterol, [40] mg sodium, [1] g carbohydrates, [0] g fiber, [22] g protein","Nutritional analysis provided by Nutrition Data","Per serving: 236 calories, 16 g fat (3 g saturated), 1 g carbs, 0 g fiber, 22 g protein, 40 mg sodium, 65 mg cholesterol","Nutritional analysis provided by Nutrition Data","See Nutrition Data\0027s analysis of this recipe ?"],"attributes":["course-Main Dishes"],"totalTimeInSeconds":1800},"pairedDish":{"title":"Corn on the Cob with Mint-Feta Butter","ingredientLines":["8 large ears of corn, shucked, each cob cut crosswise into 4 pieces","1/4 cup finely chopped mint","7 ounces feta, finely crumbled (1 1/2 cups)","1/2 stick unsalted butter, softened"],"preparationSteps":["Stir together butter, feta, mint, and a rounded 1/2 teaspoon salt in a large bowl.","Cook corn in a large pot of boiling water until crisp-tender, about 3 minutes. Transfer with tongs to butter mixture and toss until well coated.","Cooks\0027 note: Mint-feta butter can be made 2 days ahead and chilled."],"attributes":["course-Side Dishes","holiday-summer"],"totalTimeInSeconds":1200},"pairedType":"side"}
EN1002	{"topicID":"EN1002","mainDish":{"title":"Apple Cinnamon Pork Roast","ingredientLines":["1 (16-ounce) bag coleslaw mix (to add later)","3 granny smith apples, chopped (to add later)","1 tablespoon lemon juice","1 cup apple cider or juice","1/2 teaspoon cinnamon","1/4 teaspoon pepper","1/2 teaspoon kosher salt","1 teaspoon dried thyme","1 onion, sliced in wedges","2-3 pound pork-loin roast"],"preparationSteps":[],"attributes":["course-Main Dishes","holiday-fall","holiday-sunday-lunch"]},"pairedDish":{"title":"Acorn Squash with Cranberry Apple Stuffing","ingredientLines":["2 tablespoons grapeseed oil or coconut oil","1 teaspoon ground cinnamon","? cup dried cranberries","2 apples, peeled, cored and chopped into ? inch pieces","boiling water","2 acorn squash"],"preparationSteps":["Cut squash in half and with a spoon, remove pulp and seeds In a 9 x 13 inch baking dish place squash cut-side down Pour ?-inch boiling water into baking dish (or use ? inch room temperature apple juice for extra sweetness) Place dish in oven and bake squash for 30 minutes at 350 ° In a large bowl, combine apples, cranberries, cinnamon and oil to make stuffing Remove squash from the oven after 30 minutes Turn halves over and stuff center of each squash half with apple mixture Return to oven and bake for 30-35 minutes (or longer) until squash and apples are tender"],"attributes":["holiday-fall","course-Side Dishes","holiday-thanksgiving"],"totalTimeInSeconds":4200},"pairedType":"side"}

B. EXAMPLES IN JAPANESE

Samples, examples, and excerpts of the Japanese experimental data in the task are presented as follows.

Table 20: A sample of Japanese recipe data (recipe information) excerpted from data samples of the Rakuten Data[5].

Column	Sample data
recipe ID	1234567890
user ID	0987654321
top-level category	主食
second-level category	パスタ
third-level category	和風パスタ
recipe title	簡単！小松菜としめじの和風パスタ
motivation of cooking this recipe	和風味で子供でも食べられるパスタを作ってみました。
introduction of recipe	冷蔵庫に残っているような青菜やきのこなど何でも使ってアレンジできます！
recipe image file name	1234567890.jpg
recipe name	和風パスタ
tag1	和風パスタ
tag2	小松菜
tag3	しめじ
tag4	ウィンナー
tips	和風といってもベースはイタリアンにすることで、よりおいしくできます。
cooking time ID	3
occasion ID	1
cost ID	4
servings	3
publication date	2012/07/01

Table 21: A sample of Japanese recipe data (ingredient information) excerpted from data samples of the Rakuten Data[5].

Column	Sample data
recipe ID	1234567890
ingredient	小松菜
amount	1 束

Table 22: A sample of Japanese recipe data (process information) excerpted from data samples of the Rakuten Data[5].

Column	Sample data
recipe ID	1234567890
step	2
procedure description	お湯が沸騰したらお鍋にパスタをいれ、フライパンを弱火にかけてオリーブオイルと少量の刻みみんにくを入れて少し焦げ目がつくまで炒める。

Table 23: A sample of Japanese recipe data ("I made it" report information) excerpted from data samples of the Rakuten Data[5].

Column	Sample data
recipe ID	1234567890
user ID	0001234567
comment	簡単そうなので普段のレパートリーに追加してみました。ほうれん草とエリンギなど、いろいろ組み合わせています。
ower's reply	野菜の種類も気にせず、普段のパスタの味付けが増えるのがうれしいですよね。
create date	2012/07/10

Table 24: Definition of the cooking ID, occasion ID, and cost ID, excerpted from the DATA SPECIFICATION file of the Rakuten Data[5].

ID type	Definition
cooking time ID	1:within 5 min 2:around 10 min 3:around 15 min 4:around 30 min 5:around 1 h 6:over 1 h 1:5 分以内 2:約 10 分 3:約 15 分 4:約 30 分 5:約 1 時間 6:1 時間以上 (in Japanese)
occasion ID	1:ordinal 2:hospitality 3:celebratory 4:snacks 5:outgoing 6:present 7:for pregnants 8:baby food 1:普段の料理 2:おもてなし 3:お祝い 4:おつまみ 5:おでかけ 6:贈り物 7:妊婦さん 8:離乳食 (in Japanese)
cost ID	1:under 100 yen 2:around 300 yen 3:around 500 yen 4:around 2,000 yen 6:around 3,000 yen 7:around 5,000 yen 8:over 10,000 yen 1:100 円以下 2:300 円前後 3:500 円前後 4:1,000 円前後 5:2,000 円前後 6:3,000 円前後 7:5,000 円前後 8:10,000 円以上 (in Japanese)

Table 25: Excerpts of 110 experimental Japanese queries created from actual recipes.

No.	Queries
1:	豚肉, 炒め物, キャベツ, にんじん, 玉ねぎ, ピーマン, オイスターソース
2:	豚肉, 炒め物, なす, ごま油, コチュジャン
14:	牛肉, 和え物, たけのこ, 箸休め
15:	牛肉, 煮物, 大根, 圧力鍋, こんにゃく, にんにく
29:	鶏肉, グラタン, マカロニ, 新玉ねぎ, ブロッコリー
30:	鶏肉, 炊き込みご飯, ひじき, えのき
31:	にんじん, ポタージュ, 豆乳, 圧力鍋, ローリエ
32:	にんじん, さつまいも, グラッセ, 粗引きコショウ
51:	大根, 煮物, べっこう煮, 鶏肉
52:	大根, サラダ, 柿, グレープフルーツ, ヨーグルト
61:	白菜, 大根, 浅漬け, 柚子, 塩麹
62:	白菜, オリーブ油, ベーコン, コーン, コンソメスープ
71:	キャベツ, サラダ, コールスロー, 塩分控えめ, ワインビネガー, セロリ
72:	キャベツ, 炒め物, ウィンナー, 粒マスタード
81:	じゃがいも, ジャーマンポテト, ウィンナー, こしょう, 粒マスタード, パセリ
82:	じゃがいも, 煮物, 韓国風, コチュジャン, 春菊, 豚薄切り肉
91:	きゅうり, サラダ, 中華, シャキシャキ, ベーコン, もやし, 酢, しょうゆ
92:	きゅうり, 酢の物, わかめ, ミニトマト, 酢, ごま
109:	たまねぎ, 味噌汁, じゃがいも, 白味噌, 減塩
110:	たまねぎ, かき揚げ, 新たまねぎ, にんじん, 三つ葉, 片栗粉, 小麦粉

Table 29: Excerpts of 500 Japanese ad hoc queries.

No.	Queries
1	{”topicID”:”JA0001”,”dishName”:” 味噌味/厚揚げ/野菜/蒸し煮/料理”,”foodNames”:[” 白菜”,” だいこん”,” たまねぎ”,” にんじん”,” ねぎ”,” 塩”,” 厚揚げ”,” だし類/和風だし/素”,” てんさい糖”,” 酒”,” しょうゆ”,” みりん”,” みそ”,” しょうが”],”negation”:[” お肉を使わない”],”explanation”:[]}
2	{”topicID”:”JA0002”,”dishName”:” ミートソース”,”foodNames”:[” 肉類/うし/ひき肉”,” たまねぎ”,” にんじん”,” 生しいたけ”,” ピーマン”,” トマト缶詰/水煮”,” セロリ”,” にんにく”, ” だし類/コンソメ”,” ケチャップ”,” 砂糖”,” 塩”,” こしょう”,” オレガノ”],”negation”:[” オイルなし”],”explanation”:[]}
73:	{”topicID”:”JA0073”,”dishName”:” 豆乳/野菜/シチュー”,”foodNames”:[” 厚揚げ”,” たまねぎ”,” 白菜”,” かぼちゃ”,” にんじん”,” しめじ”,” まいたけ”,” 米粉”,” 豆乳”,” みそ”,” 塩”,” こしょう/白”],”negation”:[” 乳製品を使わない”],”explanation”:[” アレルギー”]}
74:	{”topicID”:”JA0074”,”dishName”:” 牛丼”,”foodNames”:[” 肉類/うし/ばら”,” たまねぎ/新たまねぎ”,” だし類/顆粒”,” しょうゆ”,” 砂糖”,” みりん”,” 酒”,” しょうが”,” ごはん”,” 鶏卵”,” 紅しょうが”,” 七味唐辛子”],”negation”:[” 水無し”],”explanation”:[” ツユだく”]}
139	{”topicID”:”JA0139”,”dishName”:” 酸辣湯/スープ”,”foodNames”:[” 肉類/ぶた”,” たけのこ”,” 乾しいたけ”,” 絹ごし豆腐”,” あさり”,” ねぎ”,” にんじん”,” しょうが”,” 植物油脂類/ごま油”,” だし類/中華スープ/素”,” 酒”,” しょうゆ”,” 酢”,” こしょう”,” かたくり粉”,” 鶏卵”,” ラー油”],”negation”:[],”explanation”:[]}
140	{”topicID”:”JA0140”,”dishName”:” 韓国/チヂミ”,”foodNames”:[” 小麦粉”,” 白玉粉”,” 鶏卵”,” 塩”,” だし類/中華スープ/素”,” 肉類/ぶた/ひき肉”,” にら”,” たまねぎ”,” しょうゆ”,” 酢”,” コチュジャン”,” 植物油脂類/ごま油”,” 砂糖”,” ごま/白”,” ねぎ”,” にんにく”],”negation”:[],”explanation”:[]}
499	{”topicID”:”JA0499”,”dishName”:” 人参/サラダ”,”foodNames”:[” にんじん”,” みそ”,” ねりごま/白”,” 酢”,” 豆乳”,” 砂糖”],”negation”:[],”explanation”:[” マクロビマヨネーズ”]}
500	{”topicID”:”JA0500”,”dishName”:” 黒豆煮”,”foodNames”:[” 黒豆”,” 三温糖”,” 塩”,” しょうゆ”,” 重曹”],”negation”:[],”explanation”:[” ふっくら”,” 柔らかい”,” さびた釘”]}

Table 30: Excerpts of the Japanese recipe pairing queries.

No.	Queries
1	{”topicID”:”JA1001”,”MainDish”:{”dishName”:” ソテー/豚肉/リンゴ/粒マスタード”,”foodNames”:[” 肉類/ぶた/こまぎれ”,” りんご”,” ワイン/白”,” 牛乳”,” マスタード/粒”,” 塩”,” しょうゆ”]},”SideDish”:{”dishName”:” スープ/パリソワール”,”foodNames”:[” じゃがいも”,” たまねぎ”,” 長ねぎ”,” だし類/ブイヨン/チキン”,” 豆乳”,” 牛乳”,” バター”,” 塩”,” こしょう”,” だし類/コンソメ”,” 粉寒天”,” パセリ”]},”time”:” 約 15 分”,”cost”:”300 円前後”,”servings”:”4”,”occasion”:[” 普段の料理”,” おもてなし”]}
2	{”topicID”:”JA1002”,”MainDish”:{”dishName”:” 鱈/あんかけ/甘酢”,”foodNames”:[” 鱈”,” 小麦粉”,” 塩”,” こしょう”,” しょうゆ”,” 砂糖”,” 酢”,” かたくり粉”,” にんじん”,” たまねぎ”]},”SideDish”:{”dishName”:” 揚げ/ネギ/カリカリ/ごま油/炒め”,”foodNames”:[” 油揚げ”,” 長ねぎ”,” わけぎ”,” かつお節”,” ごま油”,” 塩”,” 赤唐辛子”]},” time”:”5 分以内”,”cost”:”100 円以下”,”servings”:”2”,”occasion”:[” 普段の料理”,” おつまみ”]}
3	{”topicID”:”JA1003”,”MainDish”:{”dishName”:” 鶏肉/ピカタ/チーズ”,”foodNames”:[” 肉類/にわとり/もも”,” じゃがいも”,” 塩”,” こしょう”,” 小麦粉”,” 卵類/鶏卵”,” バジル”,” ケチャップ”,” マスタード/粒”,” ピザ用チーズ”]},”SideDish”:{”dishName”:” 小松菜/ウインナー/煮浸し”,”foodNames”:[” こまつな”,” ウインナーソーセージ” ,” 油揚げ”,” だし類/和風だし”,” 酒”,” みりん”,” しょうゆ”,” 砂糖”,” 塩”]},”time”:” 約 10 分”,”cost”:”300 円前後”,”servings”:”2〜3”,”occasion”:[” 普段の料理”,” おつまみ”,” 妊婦さん”]}
4	{”topicID”:”JA1004”,”MainDish”:{”dishName”:” カルパッチョ/カツオ”,”foodNames”:[” かつお/刺身用”,” みずな”,” たまねぎ”,” ポン酢”,” オリーブ油”,” ブラックペッパー”,” マヨネーズ”]},”SideDish”:{”dishName”:” 豚汁/具沢山”,”foodNames”:[” 肉類/ぶた/こまぎれ”,” だいこん”,” にんじん”,” ごぼう”,” こんにゃく”,” しめじ”,” 木綿豆腐”,” 長ねぎ”,” だし類/ほんだし”,” 塩”,” しょうゆ”,” みそ”]},”time”:” 約 30 分”,”cost”:”500 円前後”,”servings”:” 約 5〜7”,”occasion”:[” 普段の料理”]}
5	{”topicID”:”JA1005”,”MainDish”:{”dishName”:” ハンバーグ”,”foodNames”:[” ひき肉”,” たまねぎ”,” パン粉”,” 卵類/鶏卵”,” マヨネーズ”,” 塩”,” こしょう”,” バジル/粉” ,” 油”]},”SideDish”:{”dishName”:” 煮物/根菜”,”foodNames”:[” だいこん”,” にんじん”,” じゃがいも”,” しょうゆ”,” だし/顆粒”,” みりん”,” 砂糖”,” 味の素”,” 肉類/うし/ 脂身”]},”time”:” 約 15 分”,”cost”:”500 円前後”,”servings”:”3〜5”,”occasion”:[” 普段の料理”]}
96	{”topicID”:”JA1096”,”MainDish”:{”dishName”:” 海鮮中華炒め”,”foodNames”:[” えび”,” ほたて”,” エリンギ”,” 白菜”,” ブロッコリー”,” ウェイパァー”,” かたくり粉”]},”SideDish”:{”dishName”:” けんちん汁”,”foodNames”:[” ごぼう”,” だいこん”,” にんじん”,” たまねぎ”,” ねぎ”,” こんにゃく”,” 豆腐”,” だしの素/かつお”,” しょうゆ”,” 酒”]},”time”:” 約 30 分”,”cost”:”500 円前後”,”servings”:”4”,”occasion”:[” 普段の料理”,” おもてなし”,” 妊婦さん”]}
97	{”topicID”:”JA1097”,”MainDish”:{”dishName”:” トマト/カニ玉”,”foodNames”:[” 卵類/鶏卵”,” トマト”,” カニ缶”,” ごま油”,” 塩”,” こしょう”,” だし類/中華だし/素”,” 砂糖”,” しょうゆ”,” 砂糖”,” かたくり粉”]},”SideDish”:{”dishName”:” ご馳走サラダ”,”foodNames”:[” レタス”,” キャベツ”,” ラディッシュ”,” アボカド”,” 生ハム”,” えび/有頭”,” ワイン/白”,” スモークチーズ”,” 塩”,” オリーブ油”]},”time”: ” 約 15 分”,”cost”:”1,000 円前後”,”servings”:”4”,”occasion”:[” 普段の料理”,” おもてなし”,” お 祝い”,” おつまみ”,” 妊婦さん”]}
98	{”topicID”:”JA1098”,”MainDish”:{”dishName”:” スパムおにぎり”,”foodNames”:[” スパム/缶”,” 卵類/鶏卵”,” 大葉”,” ごはん”,” 海苔”,” マヨネーズ”,” こしょう/黒”,” めんつゆ”,” 砂糖”,” サラダ油”]},”SideDish”:{”dishName”:” けんちん汁”,”foodNames”:[” 白菜”,” さといも”,” だいこん”,” にんじん”,” えのきたけ”,” しめじ”,” こんにゃく”,” 木綿豆腐”,” 油揚げ”,” ごぼう”,” だし類/和風だし/素”,” しょうゆ”,” 塩”,” 酒”,” ごま油”]},”time”:” 約 1 時間”,”cost”:”500 円前後”,”servings”:” 約 10”,”occasion”:[” 普段の料理”,” おもてなし”,” お祝い”,” おつまみ”]}
99	{”topicID”:”JA1099”,”MainDish”:{”dishName”:” グラタン”,”foodNames”:[” マカロニ”,” 肉類/にわとり/もも”,” じゃがいも”,” たまねぎ”,” 小麦粉”,” 豆乳”,” だし類/コンソメ”,” 塩”,” こしょう”,” バター”,” ピザ用チーズ”]},”SideDish”:{”dishName”:” チャプチェ”,”foodNames”:[” はるさめ”,” 肉類/ぶた/うすぎり”,” にんじん”,” ピーマン”,” たけのこ/水煮”,” しいたけ”,” 砂糖”,” 豆板醤”,” 酒”,” しょうゆ”,” しょうが”,” ごま油”,” いりごま/白”]},”time”:” 約 30 分”,”cost”:”500 円前後”,”servings”:”3”,”occasion”:[” 普段の料理”,” おもてなし”,” お祝い”,” おつまみ”]}
100	{”topicID”:”JA1100”,”MainDish”:{”dishName”:” さば/カレー/照り焼き”,”foodNames”:[” さば/切り身”,” カレー粉”,” しょうゆ”,” 酒”,” みりん”,” 塩”,” こしょう”,” 小麦粉”,” オリーブ油”]},”SideDish”:{”dishName”:” 春巻き”,”foodNames”:[” はるまきの皮”,” じゃがいも”,” プロセスチーズ”,” 牛乳”,” バター”,” 塩”,” こしょう”,” ナツメグ”,” 小麦粉”]},”time”:” 約 30 分”,”cost”:”500 円前後”,”servings”:”5”,”occasion”:[” 普段の料理”,” おもてなし”,” お祝い”,” おつまみ”,” おでかけ”]}