

Supplementary Material

You Are What You Eat: Exploring Rich Recipe Information for Cross-Region Food Analysis

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I. 100 TOPICS FROM BOTH BC²TM AND BC²TM_NB

Fig. 1 and Fig. 2 show the discovered topics learned from BC²TM_NB and BC²TM. We can see that in the BC²TM_NB from Fig. 1, the common ingredients from different countries are filled with many discovered topics and make these topics less interpretable and distinguishable. This is because that BC²TM_NB model does not introduce the background topic. In contrast, our model BC²TM introduces the background topic and separates the common ingredients, such as salt, olive-oil and egg from cuisine-course specific ones, and thus can make discovered cuisine-course topics more distinguishable.

II. MORE EXAMPLES OF TOPIC VISUALIZATION

Fig. 3 shows more examples of topic visualization, where top five images are retrieved by our method. Most of retrieved food images are relevant to the topic. There are also some negative examples. For example, the retrieved food images from Topic#12 have some irrelevant food images. As the future work, we plan to consider these examples and find a way to solve them. For example, we can use the limb detection method to remove these kinds of food images.

III. MORE EXAMPLES OF MULTI-MODAL CUISINE SUMMARIZATION

Fig. 4 shows more topics for multi-modal cuisine summarization. For each cuisine, besides the selected five topics, we further select another five topics with higher scores according to $p(z|l)$.

IV. VISUALIZED RESULTS OF MORE TOPICS FOR CUISINE-COURSE PATTERN ANALYSIS

Besides the visualized results of Topic #68 in the manuscript, Fig. 5 shows visualized results for top 3 ranked cuisines for another two topics, namely Topic #61 and Topic #89.


topic 0 : olive-oil parmesan-cheese water garlic-powder italian-seasoning mozzarella-cheese fresh-rosemary bread garlic cheese
 topic 1 : soy-sauce oil egg vegetable-oil black-pepper cucumber green-onion fresh-cilantro chili-sauce sriracha
 topic 2 : panko-breadcrumb salt mayonnaise parmesan-cheese nori egg pepper black-pepper olive-oil rice-vinegar
 topic 3 : salt sugar vanilla-extract butter salted-butter ground-cinnamon cream-cheese sweet-chocolate cocoa-powder light-brown-sugar
 topic 4 : bacon celery bay-leaf red-potato baking-potato yukon-gold-potato parsnip baby-carrot turnip fennel-bulb
 topic 5 : salt olive-oil water garlic-clove butter pepper ground-pepper garlic white-wine zucchini
 topic 6 : corn-starch garlic soy-sauce oyster-sauce hoisin-sauce honey vegetable-oil spice-powder wine oil
 topic 7 : knoblauch olive tomaten wein mehl zucker gerieben sahnepetersilie kleine
 topic 8 : water sugar fresh-lemon-juice fresh-mint fresh-lime-juice pea bourbon strawberry lemon-juice vodka
 topic 9 : cream-cheese sour-cream baguette cracker worcestershire-sauce salted-butter puff-pastry goat-cheese tortilla-chip chicken-wing
 topic 10 : lemon ham simple-syrup sugar gin ice-cube fresh-lemon-juice vodka liqueur brandy
 topic 11 : nut-butter chili-sauce roasted-peanut sauce fresh-ginger brown-sugar peanut pepper rice-vinegar honey
 topic 12 : bell-pepper garlic-clove chicken-broth minced-garlic brown-sugar flank-steak soy-sauce pork-tenderloin sirloin-steak pork-chop
 topic 13 : feta-cheese dried-oregano purple-onion greek-yogurt pepper lemon tomato oregano pitted-kalamata-olive olive
 topic 14 : salt potato russet-potato black-pepper parmesan-cheese onion yukon-gold-potato garlic-powder cheddar-cheese cheese
 topic 15 : pepper brown-sugar soy-sauce peanut carrot bell-pepper rice-noodle firm-tofu zucchini green-bean
 topic 16 : tequila lime salt orange red-wine lime-juice cinnamon-stick orange-juice agave-nectar mexican-chocolate
 topic 17 : fresh-basil olive basil parmesan balsamic-vinegar nut butter basil-leaf knoblauch getrocknete
 topic 18 : salt enchilada-sauce sour-cream cilantro black-bean garlic-powder white-onion flour chopped-cilantro pork-shoulder
 topic 19 : chili cumin-seed salt basmati-rice mustard-seed turmeric-powder water coriander cilantro vegetable-oil
 topic 20 : salt chili-powder chicken-broth vegetable-oil corn butter long-grain-white-rice cayenne-pepper water white-rice
 topic 21 : white-wine arborio-rice salted-butter polenta chicken-broth finely-chopped-onion fresh-sage parmesan vegetable balsamic-vinegar
 topic 22 : olive-oil red-wine-vinegar white-wine-vinegar honey shallot cherry-tomato celery feta-cheese cider-vinegar vinaigrette
 topic 23 : milk dijon-mustard fresh-lemon-juice butter boneless-chicken-breast turkey salmon-fillet chicken-breast cajun-seasoning beef-tenderloin
 topic 24 : dijon-mustard salad-green blue-cheese arugula baby-spinach romaine-lettuce avocado fresh-lemon-juice baby-arugula green-bean
 topic 25 : cardamom clove ghee plain-yogurt cinnamon-stick cardamom-pod milk basmati-rice fennel-seed yoghurt
 topic 26 : rice saffron-thread white-wine saffron flat-leaf-parsley bell-pepper mussel frozen-pea lemon chorizo
 topic 27 : water milk sugar mango tea salt coconut-milk ice-cube black coconut
 topic 28 : olive-oil spanish-onion spanish-paprika smoked-paprika spanish-chorizo garlic-clove purple-onion pimento dried-oregano sweet-paprika
 topic 29 : spaghetti mozzarella-cheese ricotta-cheese lasagna-noodle salt tomato-sauce italian-sausage pasta pasta-sauce boneless-skinless-chicken
 topic 30 : fish-sauce garlic lime water cilantro green-onion lime-juice fresh-cilantro shallot chili-pepper
 topic 31 : sugar zucker baking-powder mehl cocoa-powder egg butter carp cheese white-sugar
 topic 32 : flour egg salt butter baking-powder salted-butter vanilla-extract milk sugar baking-soda
 topic 33 : peanut carrot lime-juice cucumber lime fresh-lime-juice fresh-mint purple-onion honey mint-leaf
 topic 34 : garlic onion black-pepper ground-cumin diced-tomato bell-pepper chicken yellow-onion chili-powder tomato-sauce
 topic 35 : olive-oil pepper corn-tortilla fresh-cilantro water chili-powder garlic-clove dried-oregano ground-cumin vegetable-oil
 topic 36 : bell-pepper sherry-vinegar garlic-clove tomato red-wine-vinegar bread chili bay-leaf stock chive
 topic 37 : olive-oil salt corn mayonnaise lime black-bean chili-powder corn-kernel queso-fresco canola-oil
 topic 38 : garlic-clove pepper bay-leaf shrimp vegetable-oil paprika cayenne-pepper garlic-powder lemon-wedge large-shrimp
 topic 39 : diced-tomato italian-sausage cannellini-bean yellow-onion celery baby-spinach kale bread pasta dried-basil
 topic 40 : avocado salt pepper chili fresh-cilantro lime sour-cream cilantro garlic black-bean
 topic 41 : sauce mozzarella-cheese purple-onion flour-tortilla tortilla mayonnaise tomato cayenne-pepper baby-spinach-leaf lettuce
 topic 42 : bell-pepper red-wine-vinegar cherry-tomato salt purple-onion romaine-lettuce lemon-juice black-pepper grape-tomato sugar
 topic 43 : greek-yogurt banana honey strawberry almond-milk nut-butter milk chia-seed blueberry fruit
 topic 44 : egg milk bread cinnamon butter vanilla-extract salt maple-syrup brown-sugar ground-cinnamon
 topic 45 : salt water canola-oil pea red-pepper-flake sugar ground-coriander chile-pepper cumin-seed shallot
 topic 46 : salt water garlic-clove butter salted-butter chopped-fresh-thyme chopped-onion chicken-broth fresh-rosemary flat-leaf-parsley
 topic 47 : flour garlic-powder water panko-breadcrumb oil onion-powder butter paprika chili sauce
 topic 48 : sugar light-brown-sugar fresh-cranberry fresh-ginger maple-syrup frozen-cranberry orange-rind fresh-orange-juice cranberry ground-cinnamon
 topic 49 : boneless-skinless-chicken onion chicken-breast chicken bell-pepper oil chicken-thigh boneless-chicken-breast sugar yellow-onion
 topic 50 : greek-yogurt cucumber lemon-juice salt fresh-dill garlic feta-cheese garlic-clove fresh-lemon-juice lemon
 topic 51 : egg salt egg-yolk salted-butter heavy-cream granulated-sugar flour sugar butter powdered-sugar
 topic 52 : water sugar sweet-chocolate ice-cream fresh-lemon-juice starch whipping-cream large-egg-white cocoa pinch
 topic 53 : bell-pepper green-onion rice-vinegar romaine-lettuce red-cabbage honey carrot chicken-breast fresh-cilantro radish
 topic 54 : ground-red-pepper worcestershire-sauce green-onion butter hot-sauce fresh-cilantro fresh-basil seasoning tarragon shell
 topic 55 : vegetable-broth yellow-onion butternut-squash sweet-potato pumpkin boneless-skinless-chicken fresh-ginger stock flour pepper
 topic 56 : oil salt green-chilies cumin-seed chili-powder ground-cumin mustard-seed potato curry-leaf asafoetida
 topic 57 : salt flour water dry-yeast sugar milk bread-flour butter egg instant-yeast
 topic 58 : ground-pork wonton-wrapper chicken-wing water-chestnut egg cabbage shrimp hoisin-sauce egg-roll-wrapper bamboo-shoot
 topic 59 : green-bean sweet-potato butter carrot cauliflower chicken-broth brussels-sprout yellow-onion zucchini salted-butter
 topic 60 : black-pepper green-onion monterey-jack chopped-onion green-chilies chile-pepper yellow-onion jalapeno-pepper milk chili-pepper
 topic 61 : onion ground-beef boneless-skinless-chicken chicken-breast chicken lean-ground-beef cooked-chicken garlic-powder ground-cumin chili-powder
 topic 62 : egg oil onion rice cabbage nut-oil oyster-sauce bell-pepper frozen-pea noodle
 topic 63 : flour pepper ketchup worcestershire-sauce cayenne-pepper fresh-lemon-juice fresh-lime-juice fresh-cilantro brown-sugar lemon-juice
 topic 64 : salt garam-masala onion ground-turmeric chili-powder ginger tomato coriander-powder garlic-paste oil
 topic 65 : bay-leaf chicken tomato-paste clove cinnamon-stick lamb heavy-cream chopped-tomato cinnamon meat
 topic 66 : greek-yogurt baking-powder salt baking-soda egg cinnamon banana vanilla-extract honey brown-sugar
 topic 67 : egg onion diced-tomato tomato-paste ground-beef crushed-tomato dried-oregano yellow-onion white-wine crushed-red-pepper-flake
 topic 68 : butter milk ground-cinnamon baking-powder honey large-egg-white chopped-pecan oat baking-soda cheddar-cheese
 topic 69 : water soy-sauce sesame-oil green-onion pepper scallion corn-starch wine spice-powder rice-wine
 topic 70 : salt olive-oil black-pepper pepper garlic garlic-clove fresh-parsley ground-pepper lemon water
 topic 71 : flour-tortilla salsa cheddar-cheese sour-cream corn-tortilla taco-seasoning chili-powder tortilla monterey-jack guacamole
 topic 72 : bread provolone-cheese butter pepper mozzarella-cheese bun pizza-sauce baguette mayonnaise ham
 topic 73 : mozzarella-cheese bread pepperoni tomato salami roasted-red-pepper italian-dressing salad-dressing italian-seasoning baguette
 topic 74 : coconut-milk red-curry-paste salt lemongrass kaffir-lime-leaf vegetable-oil coconut-oil lime onion curry-paste
 topic 75 : mozzarella-cheese italian-sausage bell-pepper marinara-sauce ricotta-cheese breadcrumb prosciutto pesto pasta-sauce basil-leaf
 topic 76 : shallot dijon-mustard haricot-verts basil-leaf caper goat-cheese olive egg fingerling-potato fresh-thyme-leaf
 topic 77 : dijon-mustard mayonnaise garlic-clove water ground-pepper sour-cream mustard sweet-onion white-vinegar fresh-basil
 topic 78 : mayonnaise paprika vegetable-oil avocado cayenne-pepper ground-cumin lemon-juice cayenne hot-sauce juice
 topic 79 : fresh-lemon-juice sugar lemon-juice flat-leaf-parsley fresh-lime-juice scallion balsamic-vinegar chopped-fresh-mint sliced-green-onion lemon-zest
 topic 80 : salt salted-butter hamburger-bun water worcestershire-sauce swiss-cheese arugula bacon white-bread sandwich-bread
 topic 81 : cucumber olive-oil purple-onion english-cucumber tomato pea avocado celery salt boneless-skinless-chicken
 topic 82 : garlic ground-cumin garlic-clove black-pepper ground-coriander fresh-ginger curry-powder water olive-oil coconut-milk
 topic 83 : water soy-sauce dashi sake miso scallion egg white-miso carrot konbu
 topic 84 : garlic bell-pepper tomato cheddar-cheese flour blue-cheese cheddar scallion canola-oil garlic-powder
 topic 85 : flour black-pepper chili-powder vegetable-oil dried-thyme ketchup barbecue-sauce celery sauce light-brown-sugar
 topic 86 : chicken chicken-broth ginger fresh-ginger noodle mushroom low-sodium-chicken firm-tofu vegetable star-anise
 topic 87 : salt olive-oil black-pepper ground-pepper pepper onion bell-pepper fresh-parsley vegetable-oil fresh-chive
 topic 88 : shallot white-wine salted-butter fresh-thyme heavy-cream black-pepper flat-leaf-parsley fresh-thyme-leaf mushroom chopped-fresh-thyme
 topic 89 : milk water sugar lemon whipped-cream vanilla-extract strawberry corn-starch powdered-sugar cocoa-powder
 topic 90 : soy-sauce salt sesame-oil sugar garlic ginger rice-vinegar scallion vegetable-oil fresh-ginger
 topic 91 : parmesan-cheese olive-oil black-pepper pepper garlic fresh-basil italian-seasoning garlic-clove onion flat-leaf-parsley
 topic 92 : salt white-onion onion chili garlic tomatillo garlic-clove lime-juice fresh-cilantro chopped-cilantro
 topic 93 : water sugar white-vinegar minced-garlic honey brown-sugar tomato-paste ketchup vinegar garlic-powder
 topic 94 : egg baking-powder water sugar baking-soda peanut flour white-sugar cake-flour oil
 topic 95 : flour milk butter salted-butter shallot sour-cream vegetable-oil heavy-cream chicken-broth ground-nut
 topic 96 : egg salt milk pepper butter black-pepper vegetable-oil cheddar-cheese onion bacon
 topic 97 : panko-breadcrumb sake soy-sauce honey parmesan-cheese corn-starch worcestershire-sauce brown-sugar salmon-fillet dijon-mustard
 topic 98 : carrot chicken-broth onion celery water black-pepper chicken bay-leaf garlic chopped-onion
 topic 99 : bay-leaf onion beef-broth butter gruyere-cheese flour baguette yellow-onion black-pepper white-wine

Fig. 1: Discovered 100 topics from BC²TM_NB, where the salt, egg and olive-oil are common ingredients, and shown in different colors (best viewed under magnification)






topic 0 : salt olive-oil bell-pepper spanish-onion sherry-vinegar garlic garlic-clove purple-onion spanish-chorizo potato
 topic 1 : ground-pepper onion bell-pepper fresh-parsley green-onion fresh-chive ground-cumin chopped-celery fresh-dill plum-tomato
 topic 2 : ground-cumin chili-powder fresh-cilantro vegetable-oil sour-cream dried-oregano corn-tortilla diced-tomato bell-pepper canola-oil
 topic 3 : feta-cheese dried-oregano purple-onion salt greek-yogurt red-wine-vinegar cucumber lemon lemon-juice cherry-tomato
 topic 4 : soy-sauce corn-starch honey garlic oil pepper hoisin-sauce bell-pepper nut-oil brown-sugar
 topic 5 : cayenne-pepper honey brown-sugar olive-oil white-vinegar cheddar curry-powder nut-butter sesame-seed chopped-cilantro
 topic 6 : sweet-potato green-bean chicken-broth brussels-sprout red-potato bacon fresh-green-bean broccoli parsnip small-red-potato
 topic 7 : orange red-wine lemon orange-juice brandy lime apple tomato-juice vodka brown-sugar
 topic 8 : fresh-thyme shallot bay-leaf tomato-paste fresh-thyme-leaf thyme fresh-rosemary dry-red-wine chopped-fresh-thyme fennel-bulb
 topic 9 : dijon-mustard olive-oil red-wine-vinegar shallot ground-pepper salt honey white-wine-vinegar salad-green arugula
 topic 10 : greek-yogurt banana honey strawberry almond-milk vanilla-extract cinnamon blueberry rolled-oat oat
 topic 11 : white-wine saffron-thread bell-pepper saffron chorizo fresh-parsley chorizo-sausage mussel smoked-paprika salt
 topic 12 : butter flour ground-cinnamon vanilla-extract salted-butter milk sugar chopped-pecan sour-cream vegetable-oil
 topic 13 : red-wine-vinegar tomato-juice avocado chive chopped-fresh-thyme medium-shrimp watermelon butternut-squash ground-coriander yellow-tomato
 topic 14 : sour-cream cheddar-cheese chili-powder taco-seasoning salsa black-bean green-onion cilantro ground-beef chopped-cilantro
 topic 15 : avocado tortilla-chip monterey-jack diced-tomato ha-avocado jalapeno-pepper chile-pepper yellow-onion plum-tomato rom-tomato
 topic 16 : black-bean avocado corn lime olive-oil corn-kernel chopped-cilantro cotija cilantro mayonnaise
 topic 17 : cream-cheese mayonnaise sour-cream lemon-juice goat-cheese shrimp cracker shallot fresh-lemon-juice chive
 topic 18 : fresh-lemon-juice hot-sauce fresh-lime-juice worcestershire-sauce celery ground-pepper fresh-cilantro ground-red-pepper pepper-sauce prepared-horseradish
 topic 19 : sugar water fresh-lemon-juice simple-syrup vodka lemon-juice ham lemon ice-cube gin
 topic 20 : sprout rice-noodle peanut brown-sugar zucchini firm-tofu fresh-basil lime-wedge fish-sauce oyster-sauce
 topic 21 : avocado romaine-lettuce cooked-chicken carrot iceberg-lettuce pea light-mayonnaise chicken-breast chili-powder white-wine-vinegar
 topic 22 : fish-sauce lime lime-juice bell-pepper fresh-cilantro cilantro chili-pepper shallot sriracha cilantro-leaf
 topic 23 : dijon-mustard worcestershire-sauce salmon-fillet milk soy-sauce honey lemon seasoning fresh-lemon-juice ground-beef
 topic 24 : sweet-chocolate fresh-lemon-juice ice-cream ground-cinnamon starch water pinch cocoa large-egg-white ground-ginger
 topic 25 : egg-yolk heavy-cream egg-white granulated-sugar powdered-sugar salted-butter cream sweet-chocolate large-egg-white confectioner-sugar
 topic 26 : tequila ground-cinnamon lime-juice mexican-chocolate cinnamon-stick lime lime-wedge cayenne-pepper fresh-lime-juice mexican-beer
 topic 27 : bread baguette parmesan fresh-basil prosciutto balsamic-vinegar olive ciabatta red-pepper-flake zucker
 topic 28 : enchilada-sauce corn-tortilla black-bean black-pepper yellow-onion tomato-sauce frozen-corn garlic-powder shredded-cheese shredded-lettuce
 topic 29 : chicken-broth chili-powder long-grain-white-rice rice long-grain-rice white-rice corn water tomato-sauce low-sodium-chicken
 topic 30 : pepper garlic-powder chicken-broth brown-sugar pork-tenderloin flank-steak beef-broth chicken-breast sirloin-steak onion-powder
 topic 31 : egg-milk cheddar-cheese bacon green-onion egg-white breakfast-sausage large-egg-white pork-sausage sausage
 topic 32 : salted-butter milk butter potato russet-potato sour-cream heavy-cream yukon-gold-potato baking-potato butternut-squash
 topic 33 : carrot black-pepper garlic-clove celery onion olive-oil bay-leaf pepper chicken-broth chopped-onion
 topic 34 : garlic garlic-powder dried-oregano zucchini ground-pepper parsley oregano fresh-parsley parmesan-cheese red-pepper-flake
 topic 35 : panko-breadcrumbs flour egg parmesan-cheese salt sake oil cheddar-cheese butter vegetable-oil
 topic 36 : ricotta-cheese mozzarella-cheese spaghetti ground-beef italian-sausage lasagna-noodle tomato-sauce parmesan pasta-sauce garlic-clove
 topic 37 : frozen-pea rice lemon chicken-thigh bay-leaf large-shrimp lemon-wedge arborio-rice roasted-red-pepper stock
 topic 38 : egg water baking-powder flour sugar milk oil baking-soda cake-flour vegetable-oil
 topic 39 : corn-starch sesame-oil wine-spice-powder oyster-sauce rice-wine sauce fresh-ginger dry-sherry hoisin-sauce
 topic 40 : turmeric ground-cumin cumin-seed salt ground-coriander curry-powder ground-turmeric pea chopped-cilantro lemon
 topic 41 : olive knoblauch tomaten wein mehl paprika rosmarin petersilie kleine sahne
 topic 42 : salt chopped-onion vegetable-oil butter chopped-fresh-thyme cheddar-cheese fresh-rosemary cayenne-pepper fresh-sage chicken-broth
 topic 43 : peanut almond walnut pecan baking-soda brown-sugar raisin cinnamon light-brown-sugar light-corn-syrup
 topic 44 : fresh-basil crushed-tomato onion pepper tomato-paste yellow-onion basil heavy-cream oregano pasta
 topic 45 : sesame-oil rice-vinegar carrot sesame-seed cabbage sugar napa-cabbage green-cabbage toasted-sesame-seed canola-oil
 topic 46 : baguette beef-broth bread gruyere-cheese butter bay-leaf yellow-onion stock onion dried-thyme
 topic 47 : fresh-lemon-juice cider-vinegar fresh-lime-juice watercress sherry-vinegar fennel-bulb blue-cheese fresh-orange-juice feta-cheese chopped-fresh-mint
 topic 48 : white-onion tomatillo onion cilantro garlic-clove chopped-cilantro seed juice serrano-chile chile
 topic 49 : flour dry-yeast water salt sugar bread-flour butter milk yeast instant-yeast
 topic 50 : nut-butter chili-sauce garlic sauce rice-vinegar peanut peanut-sauce roasted-peanut fresh-cilantro lime-zest
 topic 51 : sugar vanilla-extract salted-butter butter granulated-sugar flour powdered-sugar confectioner-sugar egg egg-yolk
 topic 52 : bell-pepper romaine-lettuce pepper cherry-tomato green-onion black-pepper dressing grape-tomato avocado honey
 topic 53 : egg panko-breadcrumbs corn-starch mayonnaise canola-oil brown-sugar sesame-seed chili ketchup chive
 topic 54 : parmesan-cheese dried-oregano diced-tomato dried-basil italian-seasoning fresh-parsley red-pepper-flake white-wine tomato-sauce pasta
 topic 55 : sauce purple-onion lettuce pepper chicken-breast boneless-skinless-chicken ground-cumin ground-beef romaine-lettuce mozzarella-cheese
 topic 56 : cumin-seed mustard-seed salt curry-leaf asafoetida chilli black-mustard-seed mint-leaf coconut chili-pepper
 topic 57 : mayonnaise tomato cheddar-cheese hamburger-bun chicken garlic-powder bread worcestershire-sauce tomato-sauce flour-tortilla
 topic 58 : olive-oil parmesan-cheese mozzarella-cheese italian-seasoning italian-sausage marinara-sauce bell-pepper pesto cheese prosciutto
 topic 59 : curry-powder fresh-ginger red-lentil sweet-potato coconut-milk carrot vegetable-broth vegetable pumpkin boneless-skinless-chicken
 topic 60 : ground-pork chicken-wing oil pepper garlic wonton-wrapper hoisin-sauce water-chestnut shrimp ground-white-pepper
 topic 61 : diced-tomato italian-sausage kale cannellini-bean zucchini pancetta parmesan ground-beef orzo bread
 topic 62 : coconut-milk red-curry-paste lemongrass fish-sauce kaffir-lime-leaf ginger fresh-lime-juice coconut-oil fresh-ginger green-onion
 topic 63 : ketchup vegetable-oil salted-butter blue-cheese cider-vinegar barbecue-sauce chopped-onion tomato-paste chicken-broth ground-turkey
 topic 64 : greek-yogurt feta-cheese lemon-juice fresh-dill cucumber fresh-lemon-juice garlic lemon lamb pepper
 topic 65 : chili fresh-cilantro salt lime lime-juice garlic tomato purple-onion fresh-lime-juice cilantro
 topic 66 : oil salt green-chilies ginger lemon-juice potato amchur cilantro-leaf ghee yoghurt
 topic 67 : baking-powder zucker carp cheese babyfinger ricotta-cheese cocoa-powder white-sugar mehl espresso
 topic 68 : soy-sauce sesame-oil green-onion scallion ginger fresh-ginger sugar rice-vinegar vegetable-oil water
 topic 69 : cardamom sugar water ghee clove black-mango cardamom-pod almond saffron
 topic 70 : white-wine salted-butter flour butter ground-pepper heavy-cream fresh-parsley red-wine mussel cognac
 topic 71 : garlic vegetable-oil oil garlic-clove canola-oil rice shallot minced-garlic carrot cooked-rice
 topic 72 : milk honey cinnamon vanilla-extract lemon ground-cinnamon whipped-cream brown-sugar orange coconut-milk
 topic 73 : egg milk bread cinnamon butter vanilla-extract maple-syrup brown-sugar ground-cinnamon heavy-cream
 topic 74 : baking-powder baking-soda egg flour salt granulated-sugar brown-sugar salted-butter vanilla-extract milk
 topic 75 : sugar brown-sugar water ketchup honey cider-vinegar light-brown-sugar white-vinegar fresh-ginger garlic-powder
 topic 76 : nori avocado rice-vinegar cucumber sesame-seed sushi-rice mayonnaise gari panko-breadcrumbs wasabi
 topic 77 : olive-oil black-pepper garlic-clove pepper ground-pepper lemon fresh-lemon-juice lemon-juice flat-leaf-parsley scallion
 topic 78 : chicken-broth chicken water garlic vegetable-broth low-sodium-chicken onion vegetable yellow-onion celery
 topic 79 : garlic-powder black-pepper paprika onion-powder cayenne-pepper cheese seasoning chili-powder smoked-paprika sauce
 topic 80 : flour-tortilla avocado salsa tortilla monterey-jack corn-tortilla bell-pepper refried-bean onion tomato
 topic 81 : shallot dijon-mustard salt bacon chopped-fresh-thyme vegetable-oil fresh-thyme-leaf swiss-cheese gruyere-cheese basil-leaf
 topic 82 : salt garlic-clove chili-powder paprika dried-thyme breadcrumb dijon-mustard ground-cumin sauce large-egg-white
 topic 83 : provolone-cheese mozzarella-cheese bread pepper pizza-sauce boneless-skinless-chicken onion ham bun chuck-roast
 topic 84 : onion garlic tomato-paste diced-tomato paprika yellow-onion garlic-clove tomato bay-leaf chicken
 topic 85 : olive-oil white-wine arborio-rice polenta parmesan italian-seasoning fresh-sage finely-chopped-onion sun-dried-tomato grated-pecorino
 topic 86 : fresh-basil parmesan-cheese flat-leaf-parsley mozzarella-cheese salad-dressing italian-seasoning basil olive italian-dressing dried-oregano
 topic 87 : chili-powder garam-masala ground-turmeric onion tomato coriander-powder garlic-paste green-chilies oil cilantro-leaf
 topic 88 : noodle mushroom cabbage sprout ground-pork star-anise baby-bok-choy bok-choy chicken firm-tofu
 topic 89 : mango coconut-milk milk ice-cube water tea coconut thai-basil sticky-rice banana
 topic 90 : cucumber tomato purple-onion english-cucumber pea boneless-skinless-chicken celery bell-pepper fresh-lemon-juice apple
 topic 91 : boneless-skinless-chicken chicken chicken-breast bell-pepper onion chicken-thigh boneless-chicken-breast shrimp ground-pepper beef
 topic 92 : mayonnaise black-pepper pepper dijon-mustard lemon-juice sour-cream fresh-cilantro vegetable-oil fresh-basil balsamic-vinegar
 topic 93 : spanish-paprika pimento smoked-paprika green-olive spanish-onion olive manchego-cheese spanish-smoked-paprika ground-cumin canola-oil
 topic 94 : black-pepper olive-oil flour bell-pepper garlic-clove salt turkey minced-garlic boneless-chicken-breast balsamic-vinegar
 topic 95 : black-pepper parmesan-cheese butter pepper salted-butter garlic-clove ground-pepper fresh-basil flat-leaf-parsley minced-garlic
 topic 96 : peanut carrot cucumber honey fresh-lime-juice purple-onion shredded-carrot green-onion lime-juice nut-butter
 topic 97 : dashi sake water miso white-miso soba-noodle kombu soy-sauce scallion miso-paste
 topic 98 : water chili ghee turmeric-powder basmati-rice coriander garlic-clove cilantro yogurt vegetable-oil
 topic 99 : ginger garam-masala fresh-ginger coconut-milk cinnamon-stick clove black-pepper yoghurt plain-yogurt lemon-juice

Fig. 2: Discovered 100 topics from BC²TM, where the salt, egg and olive-oil are common ingredients, and shown in different colors (best viewed under magnification)






Topic #2

Images					
	0.303	0.296	0.286	0.280	0.276
Recipe	Mexican Bean And Rice Casserole Salad	Smoky Black Bean Chili	Black Bean Soup	Carnitas	Grilled Chicken And Avocado Tacos
Cuisine	Mexican	Mexican	Mexican	Mexican	Mexican






Topic #12

Images					
	0.339	0.332	0.328	0.327	0.320
Recipe	Vanilla Buttercream Frosting	Buttermilk Pound Cake with Custard Sauce	Easy Pie Crust	Buttermilk Coffee Cake	Cinnamon Biscuits
Cuisine	American	American	American	American	American

Topic #72

Images					
	0.373	0.326	0.321	0.317	0.317
Recipe	Homemade Greek Yogurt	Greek Yogurt	Grilled French Toast	Cinnamon Roll French Toast Preschoolers Can Cook	Challah French Toast
Cuisine	Greek	Greek	French	French	French

Topic #73

Images					
	0.444	0.436	0.435	0.431	0.430
Recipe	Slow Cooker French Toast Casserole	Baked French Toast	Snickerdoodle French Toast	Easy French Toast for One	French Toast Restaurant Style
Cuisine	French	French	French	French	French

Topic #89






Images					
	0.283	0.278	0.278	0.275	0.273
Recipe	Clean Eating No Churn Mango Ice Cream	Restaurant Style Mango Lassi	Mango Avocado Smoothie	Tropical Avocado smoothie	Mango Smoothie
Cuisine	Thai	Indian	Greek	Greek	Greek

Fig. 3: More examples of topic visualization, where top five images are retrieved by our methods.



Fig. 4: An illustration of the generated cuisine summaries for (a) Chinese cuisine and (b) Italian cuisine, each composed of 10 topics including 5 top-ranked ingredients (the center position of each topic) and 8 top-ranked images for each topic. In the summaries, the larger an ingredient is, the larger the probability is.

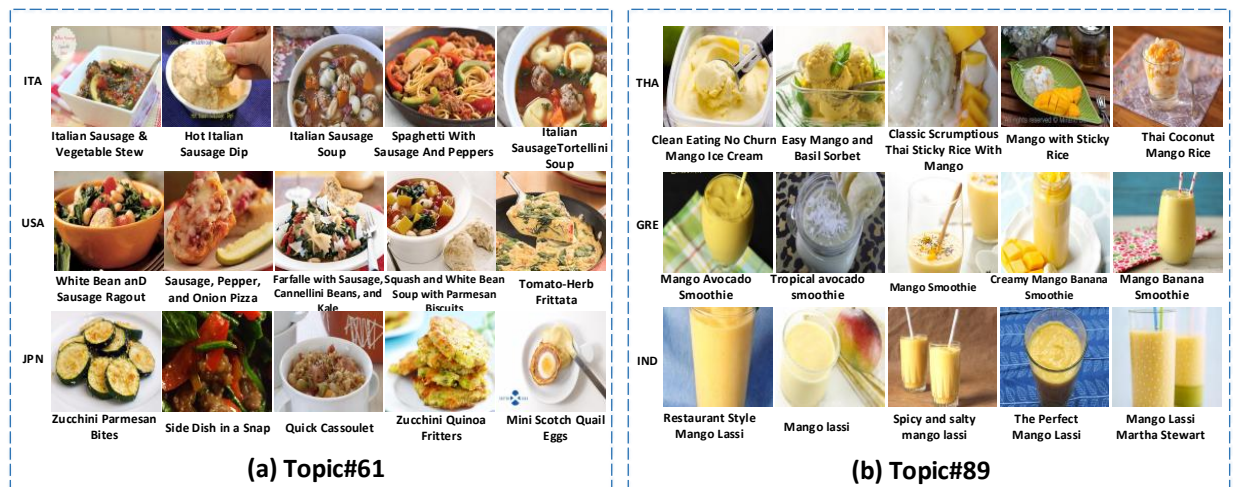


Fig. 5: Visualized results of Topic #61 and Topic #89 for top 3 ranked cuisines.