Distance functions for knowledge-based cocktail recommendation

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April 11, 2015

1. Introduction

The cocktail recommendations made by bartenders in a bar have to be appropriate to the guest to be successful. An automatic recommendation system for cocktail recipes can combine knowledge and huge volumes of recipes — such as from books — to find appropriate recommendations. If an exemplary favorite is given, the appropriate recommendation must be similar to the favorite, but not too obviously so. This recommender system aims to find more appropriate recommendations than a human expert — the bartender. Personalization is implicitly given by an exemplary favorite of the user. The target group comprises bartenders.

The necessary methodical steps to develop a recommender system for cocktail recipes are considered in [Sip15]. It contains three main challenges: the knowledge stored in ontology with feature extraction and recommendation based on distance functions, the pre-extraction for cocktail books and the validation using expert knowledge. The first of these challenges is considered in this paper.

Section 2 shows an overview about the experimental platform. Section 3 explains how the pre-extraction is made to work with the feature extraction. The feature extraction with an ontology is considered in Section 4. Section 5 shows the distance function for the ingredients, preparation, glassware and all combined in a cocktail distance function. An alternative approach with a balance distance is considered to find adaptations. In Section 6, it follows a experiment of coherence and the distinction of clusters, which are made by domain expert. Section 7 shows how the distance functions are used to get a recommendation for a given exemplary favorite. The last section provides the conclusion and prospects for future work.

2. Experimental platform

Cocktails recipes primarily contain a title and a list of ingredients. Every ingredient contains a quantity with an optional measurement unit. Additional information includes preparation, such as shake or stir and the selected glassware. The following example is a prototype of a cocktail recipe.

Manhattan Cocktail
(1882 Harry Johnson, Bartenders Manual, p. 162)
1 dash of gum syrup, very carefully;
1 dash of bitters (orange bitters);
1 dash of curacao, if required;
1/2 wine glass of whiskey;
1/2 wine glass of sweet vermouth;
stir up well; strain into a fancy cocktail glass;

Such recipes can be found in books or blogs, which form the sources for this recommender system. The experimental platform contains several components (Figure 1): the pre-extraction parses sources to get a clean and normalized raw data set. The ontology component offers to find ontology items with a raw string and a chosen taxonomy such as ingredients, preparations, glassware or units. The feature extraction is in the center, and is dependent on the pre-processing and ontology. The feature extraction converts the pre-extracted data with help of ontology to the target structure, which contains only ontology items and optional meta information.

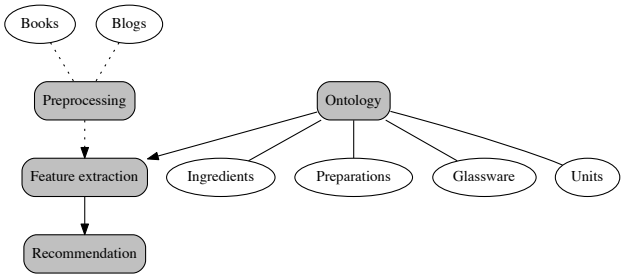

Figure 1: Architecture overview of cocktail recommender system

Depending on the output of feature extraction, the recommendation finds recommendable cocktail recipes of the given cocktail recipe example. The extraction is partially mocked by manually pre-extracted examples. Pre-processing is planned for the future, which is visualized by dotted lines.

From the technical perspective, each component is written in Scala 2.11[1] with some additional technologies: The ontology is realized with the ontology description language RDF[2], the Resource Description Framework. Requests to RDF are written in SPARQL[3] and computed with the banana-rdf 0.7[4] library. The feature extraction including distance functions is written in pure Scala. The pre-extracted examples are persistent in XML. The reading of the pre-extracted examples is realized by the scala-xml 1.0[5] library.

Graph visualization is realized using Graphiz 2.38[6] and the RDF format is converted to the necessary data format DOT by the rdf2dot[7] library.

3. Pre-extracting

The pre-extraction is realized as a cocktail recipe pool, which is persistent as a simple XML structure. A cocktail is separated into a title, a list of ingredients, a preparation and a chosen glass. Each ingredient contains a quantity with a unit and a value and an ingredient name.

```
<cocktails>
  <cocktail>
    <title>Manhattan</title>
    <ingredients>
      <ingredient>
        <quantity><value>6</value><unit>cl</unit></quantity>
        <name>rye</name>
      </ingredient>
      <ingredient>
        <quantity><value>4</value><unit>cl</unit></quantity>
        <name>red vermouth</name>
      </ingredient>
      <ingredient>
        <quantity><value>1</value><unit></unit></quantity>
        <name>orange zest</name>
      </ingredient>
      <ingredient>
        <quantity><value>1</value><unit></unit></quantity>
        <name>Angostura</name>
      </ingredient>
    </ingredients>
    <preparation>stir</preparation>
    <glass>cocktail glass</glass>
  </cocktail>
  ...
</cocktails>
```

Listing 1: Preprocessed example written in XML

The XML structure is designed to read data in an easy way. Every part of information is put in one tag and converted in a data structure (Equation 1).

$$\begin{aligned} &Cocktail(title : String, List[Ingredient], \\ &preparation : String, glassware : String) \\ &Ingredient(q : Quanitity, name : String) \\ &Quantity(unit : String, value : String) \end{aligned} \tag{1}$$

[1] http://www.scala-lang.org
[2] http://www.w3.org/RDF
[3] http://www.w3.org/TR/rdf-sparql-query
[4] https://github.com/w3c/banana-rdf
[5] https://github.com/scala/scala-xml
[6] http://www.graphviz.org
[7] https://github.com/hannibalhh/rdf2dot

4. Feature extraction with an ontology

The feature extraction uses the ontology component to find features in the raw data structure. Because of the XML structure, the feature extraction does not have to decide whether a string is an ingredient or anything else. This information is already given by manual pre-extraction.

The main task of the ontology component is to find an item for a given name and a taxonomy. For this, a concrete ontology has to be designed. The ontology component contains categories separated into the following taxonomies: ingredient, preparation, glassware and units. These are different kinds of items that are addressed and identified by an always unique URI.

The RDF model contains a set of triples (*resource*, *property*, *atomic value*). Instead of atomic values, such as labels or titles, there could also be other triples. This nested definition is used to model trees. Every property can have a URI for ensuring a unique address. The property describes the edge that connects the left with the right one. There are predefined properties.

```
<rdf:RDF
 xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
 xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
 xmlns:c="http://www.myclassicbar.com/rdf#">
 ...
</rdf:RDF>
```

Listing 2: RDF schemas

The minimal structure of RDF (Listing 2) contains the root element $rdf : RDF$ with three name spaces [HKRS07]: rdf contains elements such as *property* or *type* that are extended by the name space $rdfs$, which contains elements such as $Class$. The name space c is the self-invented name space for the domain-specific elements such as $factor$. The semantic of the elements will be explained in the following chapters.

4.1. Ingredients

Each ingredient category is a property (Listing 3) with the type of ingredient, an URI about itself and a literal as a name.

```
<rdf:Property
  rdf:type="cocktail://ingredient/basic"
  rdf:about="cocktail://ingredient/gin"
  rdfs:Literal="gin"/>
```

Listing 3: RDF property

The type is referenced to the ingredient class (Listing 4). The ingredient class contains two subclasses, which represent the basic categories such as *gin* and subordinates such as *London dry gin*. The superordinates such as *spirits* are explicitly excluded, because the shared properties between two *spirits* such as *absinthe* and *gin* are too low.

```
<rdfs:Class rdf:about="cocktail://ingredient">
 <rdfs:label>ingredient</rdfs:label>
</rdfs:Class>
<rdfs:Class rdf:about="cocktail://ingredient/basic">
  <rdfs:label>basic category of ingredient</rdfs:label>
  <rdfs:subClassOf>cocktail://ingredient</rdfs:subClassOf>
</rdfs:Class>
<rdfs:Class rdf:about="cocktail://ingredient/subordinate">
  <rdfs:label>subordinate ingredient</rdfs:label>
  <rdfs:subClassOf>cocktail://ingredient</rdfs:subClassOf>
</rdfs:Class>
```

Listing 4: RDF Class

The query to RDF, which is written in SPARQL, has to map $(name, type(ingredient)) \rightarrow Item$ (Listing 5). SPARQL is a kind of SQL, so it used a *select* query. It allows one to declare triples with bound and free variables. There are two kinds of triples that are important. The first one binds an ingredient $kindof0$ to their literal $name$. The $name$ is bound with a filter to an uncapitalized exemplary string of $Plymouth$. The second one binds the ingredient to a $type0$ that is defined as a subclass of the ingredient class. This is either a basic category or a subordinate. Assuming that the ingredients are found, there could be parent categories. These are requested in optional statements. Only a triple $(?kindof_x\, kindof\, ?kindof_{x+1})$ and a type check are necessary. The type check is needed to prevent items that are not ingredients from appearing in the result. The maximum tree depth is defined as four, so only three parents could be found. The result is a

```
SELECT  ?type0 ?kindof0 ?type1 ?kindof1
        ?type2 ?kindof2 ?type3 ?kindof3
WHERE {
  ?kindof0 <rdfs:Literal> ?name .
  ?kindof0 <rdf:type> ?type0 .
  ?type0 <rdfs:subClassOf> "cocktail://ingredient"
  FILTER ( lcase(str(?name)) = "Plymouth" )
  OPTIONAL {
    ?kindof0 <c:kindof> ?kindof1 .
    ?kindof1 <rdf:type> ?type1 .
    ?type1 <rdfs:subClassOf> "cocktail://ingredient"
    OPTIONAL {
      ?kindof1 <c:kindof> ?kindof2 .
      ?kindof2 <rdf:type> ?type2 .
      ?type2 <rdfs:subClassOf> "cocktail://ingredient"
      OPTIONAL {
        ?kindof2 <c:kindof> ?kindof3 .
        ?kindof3 <t:type> ?type3 .
        ?type3 <rdfs:subClassOf> "cocktail://ingredient"
      }
    }
  }
}
```

Listing 5: Ingredient query written in SPARQL

list of ingredients that represents the ingredient path in the ingredient tree. The searched ingredient I is always the first item in the path. The variables $kindof_x$ and $type_x$ are URIs. The result is mapped in data structures. The data structure is chosen by $type_x$, which implements the trait (Equation 2). The variable $kindof_x$ is the value uri.

$$trait\ Item\{\ val\ uri : String\ \} \tag{2}$$

Names that are not found are a special kind of $item$, which also has a URI (Equation 3). Identification is always possible with the URI. The path has a minimal size of 1.

$$cocktail : //unknown/?name \tag{3}$$

In the example (Figure 2), there are a subordinate ingredient $Plymouth$, which has a parent gin as a basic category of ingredients, and the superordinate $spirits$, which is not declared as an ingredient.

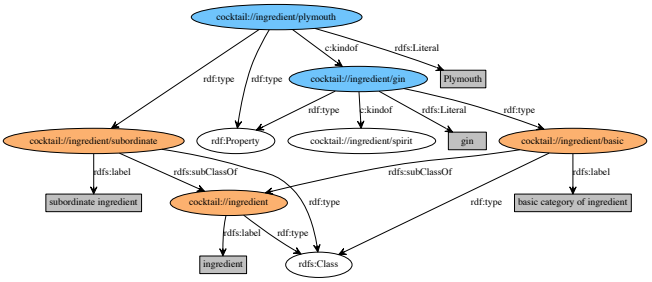

Figure 2: Gin categories

The path of $Plymouth$ contains itself and the parent gin (Equation 4). The superordinate is ignored and the types are represented by the chosen data structure such as $BasicIngredient$

$$path_I(Plymouth) = \tag{4}$$
$$SuboridinateIngredient(\text{cocktail://ingredient/plymouth}) ::$$
$$BasicIngredient(\text{cocktail://ingredient/gin}) :: Nil$$

4.2. Preparations

The preparation is represented by a small set of actions such as $stir$ or $shake$. There is no parent of an action. The query (Listing 6) contains a type check of preparation. It also uses a filter that binds an uncapitalized string of $name$ to the searched string $build$, which means stirring in the glass that is used for drinking.

```
SELECT ?preperation
WHERE { ?preperation <rdfs:Literal> ?name .
  ?preperation <rdf:type> <cocktail://cocktail/preparation>
  FILTER ( lcase(str(?name)) = "build" )
}
```

Listing 6: Preparation query written in SPARQL

The categories (Figure 3) are designed as ingredients, the name and the type are checked, but there are no parent categories. $Build$ differs from $stir$ only in a practical way. This is why it is represented in the ontology only as a synonym of $stir$. Synonyms are realized with two literals that are connected to the same property.

In this case, the result of the path of $build$ is a list with only one item (Equation 5).

$$path_P(build) = Preparation(\text{cocktail://preparation/stir}) :: Nil \tag{5}$$

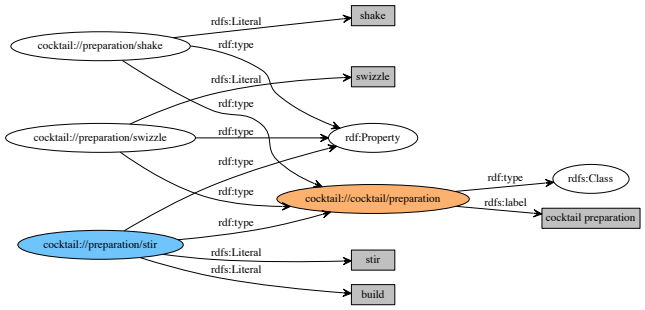

Figure 3: Preparation categories

4.3. Glassware

Glassware is highly diverse [Sip15]; there are many names for the same glass or a very similar one. If the name is ignored and only the figure is considered, a glass can be classified into a small number of figures. This could be done automatically, but in this approach it is done manually.

Glassware is separated into classes of bottles or drinking glasses, which are realized in RDF as subclasses of glassware. The drinking glasses are manually classified into a small number of raw figures, such as *highballs*, *tumblers*, *ballons*, *goblets*, or *cocktail glasses* (little bowls). They are represented as properties with the type of *drinking glass*. The names, such as *julep cup* or *silver cup*, are recognized as synonyms (Figure 4). The hierarchy of glassware in the ontology is tendentiously flat, but there examples, such as the *julep cup*, which have the same figure but are not of the same material. The *julep cup* is a special kind of *whiskey tumbler*, but it is made of silver.

```
SELECT  ?type0 ?kindof0 ?type1 ?kindof1
WHERE {
  ?kindof0 <rdfs:Literal> ?name .
  ?kindof0 <rdf:type> ?type0 .
  ?type0 <rdfs:subClassOf> "cocktail://glassware"
  FILTER ( lcase(str(?name)) = "julep cup" )
  OPTIONAL {
    ?kindof0 <c:kindof> ?kindof1 .
    ?kindof1 <rdf:type> ?type1 .
    ?type1 <rdfs:subClassOf> "cocktail://glassware"
  }
}
```

Listing 7: Glassware query written in SPARQL

The query (Listing 7) also has a type check. The type has to be a subclass of the glassware. The uncapitalized exemplary string of *julep cup* has to be the name. One kind of triple is allowed as an option. This also has to be a subclass of glassware.

The result (Equation 6) is a path with a size of 2. It contains first the silver cup and then the whiskey tumbler.

$$path_G(julep\ cup) = \quad (6)$$
$$DrinkingGlass(\text{cocktail://glassware/silver/cup}) ::$$
$$DrinkingGlass(\text{cocktail://glassware/whiskeytumbler}) :: Nil$$

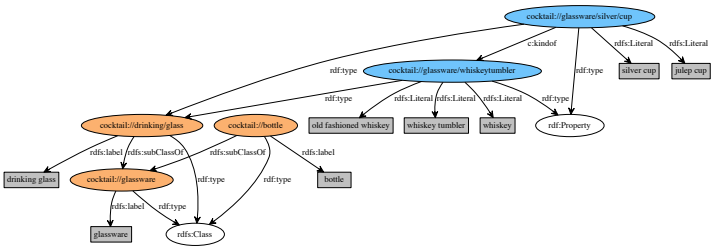

Figure 4: Glassware categories

4.4. Units

The main task of the unit in the ontology is to identify measurement units and their converting factor to the standard unit *cl*. Conversion is necessary to normalize the quantity. The measurement units are separated into quantitative and qualitative units. Quantitative units such as *cl* are scalable, while qualitative units such as *dash* are not scalable. There are metric units such as *ml* and American or British units such as *ounce*. For non-metric units, there are synonyms such as singular and plural words. In particular, since qualitative units such as *slice* or *piece* are not delimitable, they are presented as synoyms, too.

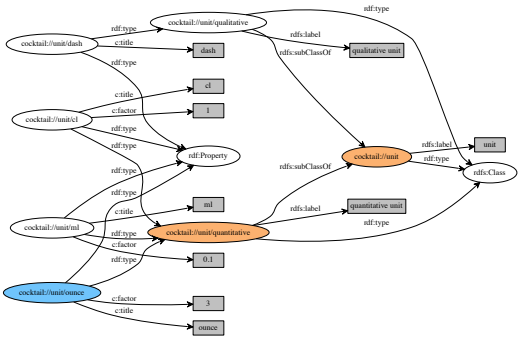

Figure 5: Unit categories

Quantitative and qualitative units are subclasses of units that represent the necessary types in the query (Listing 8). The uncapitalized string of name will have to match the exemplary name *dash*.

```
SELECT  ?type ?unit ?factor
WHERE {
  ?unit <rdfs:Literal> ?name .
  ?unit <rdfs:type> ?type .
  ?type <rdfs:subClassOf> "cocktail://unit"
  FILTER ( lcase(str(?name)) = "dash" )
  OPTIONAL {
    ?unit <c:factor> ?factor
  }
}
```

Listing 8: Unit query written in SPARQL

The conversion of a quantity q, which contains a value and a unit, to another unit u, is defined with the factor to the standard unit (Equation 7). In the example, the 30 *ml* are converted to 1 *ounce*.

$$convert(q, u) = Quantity(\frac{value(q) * factor(unit)}{factor(u)}, u) \quad (7)$$

$$convert(Quantity(30, ml), ounce) = Quantity(\frac{30 * 0.1}{3}, ounce)$$

4.5. Balance

The cocktail balance represents four pieces of information: the amounts of sweet, sour, water and alcohol. This is an abstract point of view on the cocktail. It is necessary to get these four parts of information for every ingredient. But this information is not always available and the ontology does not contain all the information. Therefore, it needs a default logic approach. For example, the ontology does not contain balance information for a concrete gin product, but the balance of the gin prototype is known. Then the balance information of gin has to be used.

```
<rdfs:Class rdf:about="cocktail://ingredient/superordinate">
  <rdfs:label>superordinate ingredient</rdfs:label>
 </rdfs:Class>
```

Listing 9: Superordinate class

A basic category may not share specific information, but superordinates, such as spirits, contain these details. Then this information must be used. In this case, superordinates share some of these properties. The superordinates are added to the ontology (Listing 9), but it is not a subclass of ingredient to prevent useless ingredient similarities (described in subsection 4.1).

```
SELECT DISTINCT  ?sweet0 ?sour0 ?alcohol0 ?water0 ?sweet1
          ?sour1 ?alcohol1 ?water1 ?sweet2 ?sour2 ?alcohol2
          ?water2 ?sweet3 ?sour3 ?alcohol3 ?water3
WHERE {
  ?kindof0 <rdfs:Literal> ?name
  FILTER ( str(?kindof0) = "cocktail://ingredient/plymouth" )
  OPTIONAL { ?kindof0 <c:sweet> ?sweet0 }
  OPTIONAL { ?kindof0 <c:sour> ?sour0 }
  OPTIONAL { ?kindof0 <c:alcohol> ?alcohol0 }
  OPTIONAL { ?kindof0 <c:water> ?water0 }
  OPTIONAL { ?kindof0 <c:kindof> ?kindof1
    OPTIONAL { ?kindof1 <c:sweet> ?sweet1 }
    OPTIONAL { ?kindof1 <c:sour> ?sour1 }
    OPTIONAL { ?kindof1 <c:alcohol> ?alcohol1 }
    OPTIONAL { ?kindof1 <c:water> ?water1 }
    OPTIONAL { ?kindof1 <c:kindof> ?kindof2
      OPTIONAL { ?kindof2 <c:sweet> ?sweet2 }
      OPTIONAL { ?kindof2 <c:sour> ?sour2 }
      OPTIONAL { ?kindof2 <c:alcohol> ?alcohol2 }
      OPTIONAL { ?kindof2 <c:water> ?water2 }
      OPTIONAL { ?kindof2 <c:kindof> ?kindof3
        OPTIONAL { ?kindof3 <c:sweet> ?sweet3 }
        OPTIONAL { ?kindof3 <c:sour> ?sour3 }
        OPTIONAL { ?kindof3 <c:alcohol> ?alcohol3 }
        OPTIONAL { ?kindof3 <c:water> ?water3 }
      }
    }
  }
}
```

Listing 10: Balance query written in SPARQL

The balance query is designed for search by known ingredient URI (Listing 10). Self-declared and domain-specific elements such as $c : sweet$ are used to declare balance information. These information could be missing, so all declarations in where clause are optional. Only the ingredient URI has to be there.

It is necessary to declare a triple—in this case to find the literal name—because a SPARQL filter does not work otherwise. The balance information must also be in parent ingredient, so it is declared the $kindof$ triple. If another balance exists, then the information will be found. As the tree depth is limited to four, this query contains three nested $kindof$ triples.

In this example, the given ingredient *Plymouth* does not have balance information. The basic category *gin* has alcohol and water in the proportion 0.47 and 0.53, respectively. The superordinate has alcohol and water in the proportion 0.4 and 0.6, respectively. As sweet is not declared, the default value of the balance property, which is not found, is 0.

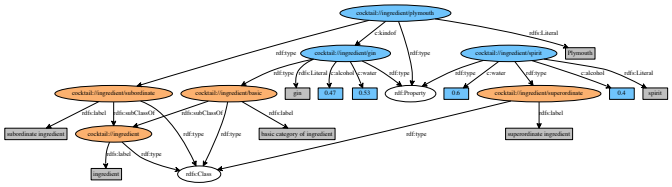

Figure 6: Balance in ingredient categories

The path contains the balance information of all single ingredients — first *Plymouth*, then *gin* and finally *spirits* (Equation 8). The question mark is used as a symbol to indicate that the information is not known. The first information to be known is part of the result.

$$balance(water, alcohol, sweet, sour) \quad (8)$$
$$path_B(Plymouth) = (?, ?, ?, ?) ::$$
$$(0.53, 0.47, ?, ?) :: (0.6, 0.4, ?, ?) :: Nil$$
$$balance(Plymouth) = (0.53, 0.47, 0, 0)$$

5. Distances for recommendation

The distances are the main part of the recommendation component because they say something about the shared facts of two values such as ingredients.

The necessary data structure for the distances is the *path*. The *stepDistance* of two paths is the minimal count of steps to find two equal items in the path. In the example (Figure 7), the two paths are combined in one graph. Equals URI are presented by one node. The orange edges show the steps required to get the equal node b. Three steps are necessary here.

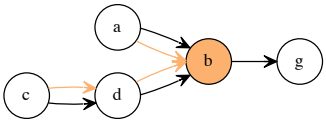

Figure 7: Graph of steps

The *stepFunction* (Figure 8) has several aims. The

first is to scale the *stepDistance* between 0 and 1. The second is to ensure that the *stepDistance* is independent of the path sizes. The last of these is that the *stepDistance* has to approximate smoothly to 1. If no equal item is found, then the distance is 1.0.

$$stepFunction(n) = 1 - \frac{0.85}{\sqrt{n}} \tag{9}$$

The *stepFunction* is only designed along these aims and there is no relation to the knowledge. If the step count is 0 then the *stepDistance* must also be 0. Because of the maximum depth of four in the graph, only three steps per path are possible. There are six maximum steps. Therefore the value n is defined in the range $[1..6] \in \mathbb{N}$. The *stepFunction* cannot be negative.

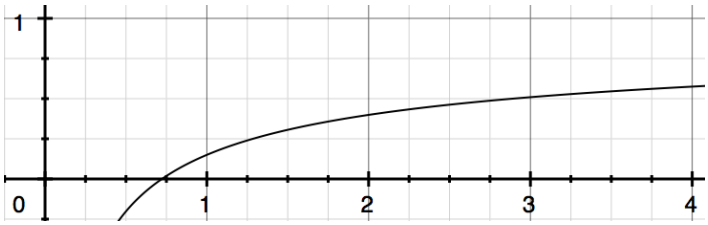

Figure 8: Graph of step function

5.1. Ingredient distance

The distance of a distance pair (I_a, I_b) is a path distance (Equation 10). A quantity weighting is added, because the quantity says something about the importance. 6 *cl gin* are more important than 1 *cl sugar syrup*. The weight is the quantity in relation to the volume of the cocktail. The volume of the sum of quantities of all quantitatively-measured ingredients. All quantities are transformed to the standard unit *cl*.

$$d_{DPI} = stepDistance(I_a, I_b) \cdot \frac{quantity(I_a)}{volume(a)} \tag{10}$$

The *stepDistance* has the lowest value 0, if both ingredients are the same. The quantity could be different. A different quantity has no effect because it is multiplied by 0. Therefore, d_{DP} has to be divided into two kinds of distance functions: the ingredient-based distance function (Equation 10) and the quantity-based distance function (Equation 11).

$$d_{DPQ} = |\frac{quantity(I_a)}{volume(a)} - \frac{quantity(I_b)}{volume(b)}| \tag{11}$$

The distance pair distance is dependent on the *stepDistance* (Equation 12).

$$d_{DP} = if(stepDistance == 0)\, d_{DPQ}\, else\, d_{DPI} \tag{12}$$

A cocktail recipe contains a list of ingredients. The order must not affect the distance, because the order could be different and would not change the recipe. If there is an ingredient I_a of the cocktail a, the aim is to find the most similar ingredient to I_a in the ingredients of cocktail b.

The distance d_I (Equation 13) between ingredients of recipe a and the ingredients of b represent the ingredient distance between two recipes. It uses the distance d_{DP}, which maps an ingredient to another ingredient. As mappings are not completely accurate, the distance must be calculated in both directions to catch all the ingredients in the distance. The distance d_I sums up all the minimum d_{DP} distances in both directions. One direction is already scaled to 1 because the ingredients are weighted by the ratio. The sum of the two directions must be divided by 2 to scale d_I to 1.

$$d_I(a,b) = \frac{\sum_{i=0}^{n} min(d_{DP}(I_{a_i}, I_{b_j})) + \sum_{j=0}^{m} min(d_{DP}(I_{b_j}, I_{a_i}))}{2} \tag{13}$$

In the following example are two different recipes — a Negroni and a Mezcal Negroni.

Negroni	Mezcal Negroni
3.0 cl Punt e Mes	3.5 cl Tlacuache silver
3.0 cl Plymouth	Leyenda
3.0 cl Campari	3.5 cl Carpano Antica For-
1.0 piece orange zest	mula
(stir, whiskey tumbler)	2.0 cl Gran Classico
	(stir, cocktail glass)

The distance pairs are the following (Listing 11). First, there are the mappings of ingredients of the *Mezcal Negroni* recipe to the ingredients of the *Negroni* recipe. This follows the mapping in the other direction. If there is no similar ingredient, it is visualized by a question mark. The distance is displayed in the middle. All distances are ingredient-based, because there are no equal ingredients. As the *Tlacuache silver Leyenda* does not have a similar ingredient, the *stepDistance* is 1 and, because of the ratio to the volume of the recipe, the d_{DP} is 0.39. This has a huge effect. The *Gran Classico* and *Campari* are types of bitter liquors. *Carpano Antica Formula* and *Punt e Mes* are types of *red vermouth*. The *stepDistance* is low, but their ratio is also low, so their effect in the d_{DP} is not very high. Taking the other direction is also similar. The *Plymouth* does not have a similar ingredient, which takes the most effect. The distances are rounded off to two decimal places.

The sums of the mappings are not equal (Equation 14). In this case, they are very similar. The ingredient distance d_I (Equation 15) says that these drinks have some similarities such as *redvermouth*, because in the range of 0 to 1 it is in the middle, but they have differences such as *gin* and *mezcal*.

$$sum(Negroni \rightarrow Mezcal\ Negroni) = 0.63 \tag{14}$$

$$sum(Mezcal\ Negroni \rightarrow Negroni) = 0.62$$

$$d_I = \frac{0.63 + 0.62}{2} = 0.63 \tag{15}$$

```
Mezcal Negroni => Negroni with Punt e Mes
IngredientBased[2.0 cl Gran Classico <= (0.40,0.09) =>
3.0 cl Campari]
IngredientBased[3.5 cl Carpano Antica Formula <= (0.40,0.16) =>
3.0 cl Punt e Mes]
IngredientBased[3.5 cl Tlacuache silver Leyenda <= (1.00,0.39) =>
?]

Negroni with Punt e Mes => Mezcal Negroni
IngredientBased[1.0 piece orange zest <= (1.00,0.05) => ?]
IngredientBased[3.0 cl Campari <= (0.40,0.13) =>
2.0 cl Gran Classico]
IngredientBased[3.0 cl Plymouth <= (1.00,0.32) => ?]
IngredientBased[3.0 cl Punt e Mes <= (0.40,0.13) =>
3.5 cl Carpano Antica Formula]
```

Listing 11: Negroni Cocktail Distance

5.2. Preparation distance

The preparation distance is a simple path distance (Equation 16).

$$d_P(p_a, p_b) = stepDistance(p_a, p_b) \tag{16}$$

For example (Equation 17), the distance between *stir* and *build* is 0 because it is only a synonym. The preparations *shake* and *stir* are absolutely different and have the maximum distance.

$$\begin{aligned} d_P(build, stir) &= 0.0 \\ d_P(shake, stir) &= 1.0 \end{aligned} \tag{17}$$

5.3. Glassware distance

The glassware distance is also a simple path distance (Equation 18).

$$d_G(g_a, g_b) = stepDistance(g_a, g_b) \tag{18}$$

For example, the distance between a *whiskey tumbler* and a *cocktail glass* is 1.0, because there are no similarities in the paths. A *silver cup* contains *whiskey tumbler* in the path. One step is necessary here.

$$\begin{aligned} d_G(whisky\,tumbler, cocktail\,glass) &= 1.0 \\ d_G(whisky\,tumbler, silver\,cup) &= 0.15 \end{aligned} \tag{19}$$

5.4. Cocktail distance

The combined function — the cocktail distance — uses the ingredient, preparation and glassware. Since the ingredient distance is the most important part, the weight is 0.6; preparation and glassware split the remaining 0.4 in equal parts.

$$d_C(c_a, c_b) = 0.6 d_I(i(c_a), i(c_b)) + 0.2 d_P(p(c_a), p(c_b)) + 0.2 d_G(g(c_a) g(c_b)) \tag{20}$$

The cocktail distance in the example of Negroni and Mezcal Negroni (Listing 11) is about 0.58 (Equation 21). This distance is high because both recipes have many differences.

$$\begin{aligned} d_C = 0.58 = \\ 0.8 d_I(0.63 + 0.62/2 = 0.63) \\ + 0.2(d_P((stir, stir) = 0.00) \\ + 0.2(d_G((cocktail\,glass, whiskey\,tumbler) = 1.00) \end{aligned} \tag{21}$$

An example of two very similar recipes (Listings 12) contains only ingredients, which have a similar ingredient. As the *stepDistance* is very low, the ingredient distance is low, and the preparation and glassware distance in 0. The cocktail distance is only 0.06. One of these recipes should not lead to a recommendation of the other because they are too similar.

```
Negroni => Negroni with Punt e Mes
QuantityBased[1.0 piece orange zest <= (0.00,0.00) =>
1.0 piece orange zest]
QuantityBased[3.0 cl Campari <= (0.00,0.00) => 3.0 cl Campari]
IngredientBased[3.0 cl Gin <= (0.15,0.05) => 3.0 cl Plymouth]
IngredientBased[3.0 cl red Vermouth <= (0.15,0.05) =>
 3.0 cl Punt e Mes]

Negroni with Punt e Mes => Negroni
QuantityBased[1.0 piece orange zest <= (0.00,0.00) =>
 1.0 piece orange zest]
QuantityBased[3.0 cl Campari <= (0.00,0.00) => 3.0 cl Campari]
IngredientBased[3.0 cl Plymouth <= (0.15,0.05) => 3.0 cl Gin]
IngredientBased[3.0 cl Punt e Mes <= (0.15,0.05) =>
3.0 cl red Vermouth]
CocktailDistance = 0.06 =
0.6 ingredient(0.09 + 0.09 / 2 = 0.09)
+ 0.2 preparation((stir,stir) => 0.00)
+ 0.2 glass((whiskey tumbler,whiskey tumbler) => 0.00)
```

Listing 12: Cocktail distance of two Negroni recipes

In an example of two absolutely different recipes (Listings 13), there is no similar ingredient and no similar preparation or glassware. The cocktail distance is 1. One of these recipes is also not a good recommendation for the other.

```
Manhattan => Gin Fizz
IngredientBased[1.0 piece Angostura <= (1.00,0.05) => ?]
IngredientBased[1.0 piece orange zest <= (1.00,0.05) => ?]
IngredientBased[4.0 cl red vermouth <= (1.00,0.36) => ?]
IngredientBased[6.0 cl Rye <= (1.00,0.55) => ?]

Gin Fizz => Manhattan
IngredientBased[2.0 cl soda <= (1.00,0.15) => ?]
IngredientBased[2.0 cl sugar syrup <= (1.00,0.15) => ?]
IngredientBased[3.0 cl lemon juice <= (1.00,0.23) => ?]
IngredientBased[6.0 cl Gin <= (1.00,0.46) => ?]
CocktailDistance = 1.00 =
0.6 ingredient(1.00 + 1.00 / 2 = 1.00)
+ 0.2 preparation((stir,shake) => 1.00)
+ 0.2 glass((cocktail glass,collins glass) => 1.00)
```

Listing 13: Cocktail distance of a Manhattan and Gin Fizz

5.5. Balance distance

The balance distance is an alternative to the cocktail distance. The aim is to find adaptations. Every ingredient has a balance. The balance of a cocktail is the sum of all single ingredients (Equation 22).

$$balance(c) = \sum_{i=1}^{n} balance_i(water, alcohol, sweet, sour) \tag{22}$$

$$d_B(balance) = water + alcohol + sweet + sour \tag{23}$$

$$d_B(c_a, c_b) = d_B(|balance(c_A) - balance(c_B)|) \tag{24}$$

The difference between two balances (Equation 23) is a balance with a difference in each component, such as *sour*. The balance distance is the difference between the summed up balance of c_a and c_b (Equation 24); all components will be added up to a scalar distance.

The balance distance is not scaled to 1. A balance such as $balance(1, 1, 1, 1)$ is unrealistic. An ingredient with a high ratio of alcohol such as *Absinth* does not contain a high ratio of sugar such as syrup. It is more realistic that the sum is 1. An ontology cannot ensure this, because the default values can always break this constraint. With huge volumes of data, an empirical maximum value can be computed to scale this distance function.

```
Mezcal Negroni
2.0 cl Gran Classico:
Balance(alcohol=0.28,sweet=0.20,sour=0.00,water=0.60)
3.5 cl Carpano Antica Formula:
Balance(alcohol=0.18,sweet=0.00,sour=0.25,water=0.74)
3.5 cl Tlacuache silver Leyenda:
Balance(alcohol=0.40,sweet=0.00,sour=0.00,water=0.60)
MezcalNegroniBalance(alcohol=0.29,sweet=0.14,sour=0.00,water=0.65)

Negroni
1.0 piece orange zest:
Balance(alcohol=0.00,sweet=0.00,sour=0.00,water=0.00)
3.0 cl Campari:
Balance(alcohol=0.25,sweet=0.20,sour=0.00,water=0.60)
3.0 cl Plymouth:
Balance(alcohol=0.47,sweet=0.00,sour=0.00,water=0.53)
3.0 cl Punt e Mes:
Balance(alcohol=0.18,sweet=0.15,sour=0.00,water=0.74)
NegroniBalance(alcohol=0.28,sweet=0.11,sour=0.00,water=0.59)
BalanceDistance = 0.10 =
DifferenceOfBalance(alcohol=0.00,sweet=0.03,sour=0.00,water=0.06)
```

Listing 14: Negeroni Balance Distance

In the example of Negroni and Negroni Mezcal (Listing 11), the cocktail distance is very high because the two drinks do not share many properties. The balance distance shows more shared properties (Listing 14). The sum of all ingredient balances is very similar, because both have the same alcohol strength and sweetness, and differ only slightly from the dilution with water. The balance distance is only 0.1. These recipes are not the same, but have a similar characteristic that qualifies one of them to be a recommendation for the other.

6. Experiment by domain expert

The aim of the experiment is analyze the precision of the cocktail distance function. A domain expert assumed that classic recipes, which have been popular since a long time are distinct to all other classic recipes. A recipes, which were not distinct to the others would be forgotten. 52 recipes, clustered by domain expert into 19 clusters, are used for an initial measurement of how well the distances work. The recipes are from five different historic cocktail books.

- Jerry Thomas, How to Mix Drinks (1862)
- Harry Johnson, Bartenders' Manual (1882)
- Harry Craddock, Savoy Cocktail Book (1930)
- Virginia Elliott and Phil D. Stong, Shake em up! (1930)
- David A. Embury, Fine Art of Mixing Drinks (1948)

The clusters contains recipes that differ in only small things such as a different kind of gin order with or without a lemon twist. They use different kinds of units such as *wineglasses* or *ounces*. These recipes are pre-extracted and are persistent in an XML data structure (section 3). The reference to the book is added to be able to reconstruct these recipes.

One file is used for each cluster that represents the idea of one classic cocktail:

- lemonade.xml (three recipes)
- crusta.xml (three recipes)
- brandypunch.xml (two recipes)
- julep.xml (three recipes)
- alexander.xml (two recipes)
- aromatic.xml (two recipes)
- vermouth.xml (three recipes)
- flip.xml (two recipes)
- tomcollins.xml (two recipes)
- absinth.xml (three recipes)
- eggnogg.xml (two recipes)
- whiskeysour.xml (two recipes)
- manhattan.xml (three recipes)
- daiquiri.xml (nine recipes)
- japanesecocktail.xml (two recipes)
- jackrose.xml (two recipes)
- ginfizz.xml (two recipes)
- cloverclub.xml (three recipes)
- sidecar.xml (two recipes)

The manual pre-extraction into the data structure (Equation 1) has to simplify the recipes in terms of vocabulary, data structure and knowledge: Recipes in historic books contains or-relations (Equation 25). That means, for example, that either bourbon or rye have to used, not both. An optional ingredient could pose the same problem. The target data structure supports only one. Only one ingredient was chosen for pre-extraction.

$$\begin{aligned} 3\ ounce\ bourbon\ or\ rye \\ optionally\ 1\ dash\ Angostura \end{aligned} \tag{25}$$

Recipes contain ranges or quantities (Equation 26). Often, it means seasoning an ingredient. The average was chosen for pre-extraction.

$$2 - 4\ dashes\ bitters \tag{26}$$

Recipes contain solid ingredients (Equation 27). The mapping of solids to liquids allows one to find better similarities to other recipes. Converting the measurements is not enough, because it is necessary to combine a qualitative unit such as $half$ with an ingredient such as *lemon*. The ontology has to know that one *lemon* contains about 5 *cl* in order to convert this correctly. The conversion to the liquid quantity of the ingredient was done manually.

$$\begin{aligned} half\ small\ lemon \rightarrow 2.5\ cl \\ piece\ orange \rightarrow 1\ cl\ orange\ juice \\ 5\ cl\ lemon\ lemonade \rightarrow 4\ cl\ soda, \\ 0.5\ cl\ lemon\ juice, 0.5\ cl\ sugar \end{aligned} \tag{27}$$

Recipes also contain fillers (Equation 28), which are ingredients that lack a concrete quantity. That does not mean a *dash* or a *splash*, which is always a small quantity. A filler could be more than 10 *cl*. The concrete quantity chosen must be realistic in the perspective of the glassware.

$$fill\ with\ soda \tag{28}$$

Recipes contain comments that are not always necessary to make a cocktail. In some cases, such as when using a *Crusta* or a *Julep*, which are more complicated, knowing these comments may prove useful. But it is not dependent on distances. Recipes contain ingredients along with their origins (Equation 29). The ontology contains categories such as *Jamaica Rum*, but if an origin is not known, the ingredient will not be recognized, because the ontology knows only the whole name. The ontology is maintained with all spellings.

$$\begin{aligned} Jamaica\,Rum \\ Demerara\,Rum \end{aligned} \tag{29}$$

Recipes contain the known default names of ingredients. Since recipes should be short, ingredient names are as short as possible. The problem is that the names are not distinct. *Chartreuse* is a company, but usually the product *Chartreuse Verte* is meant. The *vermouth* is a category, but *red vermouth* is meant; therefore, *vermouth* is a *superordinate* to prevent that this is matched and *vermouth* is added to *red vermouth* as a synonym.

$$\begin{aligned} Chartreuse &\rightarrow Chartreuse\,Verte \\ Vermouth &\rightarrow Red\,Vermouth \end{aligned} \tag{30}$$

Recipes contain numbers and fractions as words (Equation 31). It needs synonyms of numbers or fractions in the ontology. These are manually converted to a *double* value.

$$\begin{aligned} One &\rightarrow 1 \\ 1/3 &\rightarrow \frac{1}{3} \\ half &\rightarrow 0.5 \\ one\,third &\rightarrow \frac{1}{3} \end{aligned} \tag{31}$$

Recipes contains compound and separate spellings as well as singular and plural words. All are represented as synonyms to recognize that these are the same.

$$\begin{aligned} wine - glass &\rightarrow wineglass \\ wine\,glass &\rightarrow wineglass \\ dashes &\rightarrow dash \end{aligned} \tag{32}$$

Recipes contain many different spellings (Equation 33). These spellings are persistent in the ontology as another synonym. The result is an ontology which greater than it is useful.

$$\begin{aligned} one\,slice\,of\,lemon \\ lemon\,slice \end{aligned} \tag{33}$$

Recognition and support of these issues make it possible to get distances that are more precise.

It is assumed that the maximum distance of a cocktail in one hand-made cluster must be low enough, so that recipes of other clusters have a chance to get a higher distance. The measurement of coherence (Figure 9) shows the distances within a clusters. It is sorted in descending order. The first, the *julep.xml* cluster has a maximum distance of 0.34. The last one, the *flip.xml*, has a maximum value of 0.09. These are positive results, because recipes in the clusters are also similar in perspective of the distance function.

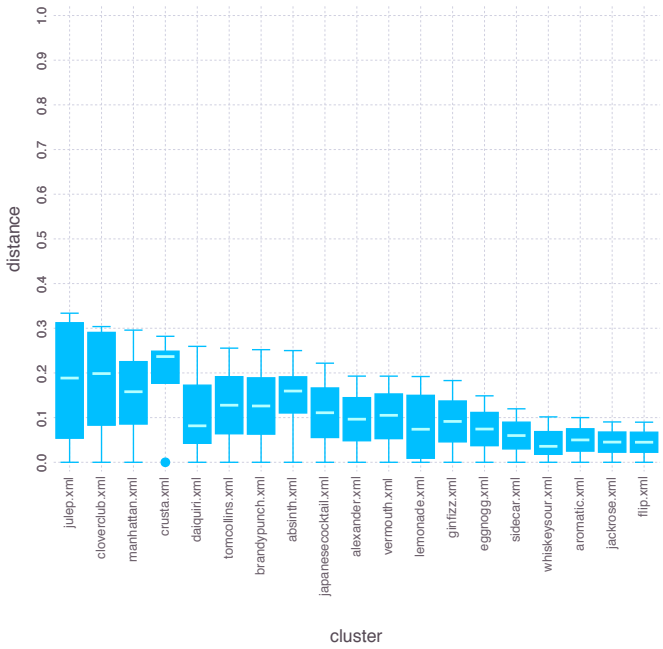

Figure 9: Coherency of clusters

The next measurement shows the distances of each recipe to every recipe that is outside its own cluster (Figure 10). It is sorted in increasing order. The first, *brandypunch.xml*, is about 0.29. The last, *julep.xml*, is about 0.60. Most of these distances are bigger, which shows that recipes in a cluster are coherent and the clusters are distinct from each other. This is a positive results, because the distance function represents the domain knowledge, which means that classics are distinct.

The clusters could be more distinct if the following is recognized: Solids such as mint in a julep may be of high importance in one cocktail. The quantity is irrelevant because this is a natural ingredient and the intensity is unstable; hence, the quantity of mint differs strongly. Ingredients such as *orgeat* or *absinth* always have high intensity.

An unsolved problem is that different authors of recipes have different opinions. One says that a cocktail should be stirred, another believes that it must be shaken. The result is that the same idea of a recipe could occur in another cluster.

The time taken for calculating distances is very high. 2,702 distance calculations without any caching mech-

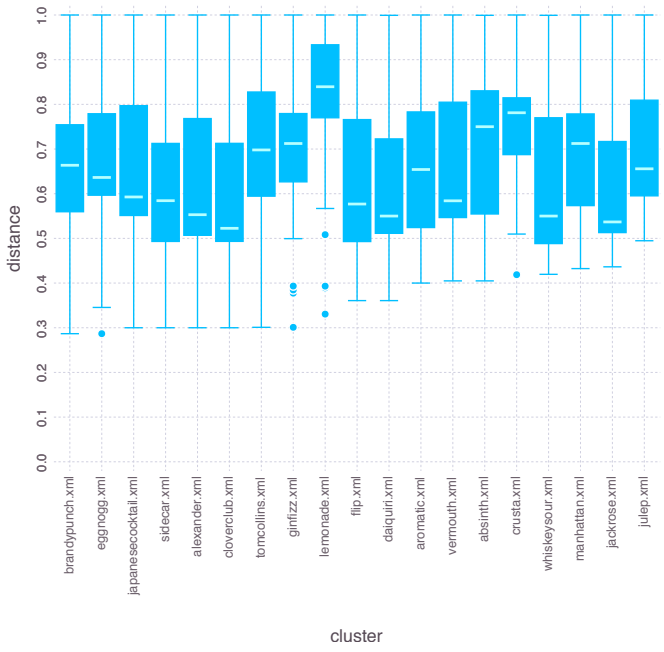

Figure 10: Distinction of clusters

anism or indexing needs about 38.2 seconds and with simple map caching it needs about 6.8 seconds. The ontology queries are the bottlenecks, because they are used often but are very slow. If more spellings are supported, the number of necessary queries increases and performance drops. Hence, an indexing mechanism is necessary.

7. Recommendation by example

Recommendations could be from the perspective of ingredients or balance. In the first approach, the ingredients of the example and the recommendation is nearly the same, but the balance has changed. In this approach, the aim is to find recipes that have nearly the same balance of the given example. But cocktails that are too similar have to be removed.

The recommendation approach uses the nearest neighbor classification nn (Equation 34) of the given example e. The balance distance d_B shows which cocktails have the same characteristic if the balance distance is close to 0. A higher distance has no validity because it could result from a heavy change in one component of the balance such as *sour*. In the first instance, it uses all cocktail recipes that have a lower d_B than the threshold $t_B = 0.1$. The nearest neighbor with the cocktail distance d_C which is lower than threshold $t_C = 0.2$ has to be removed from recommendation r, because the recipe is too similar.

$$r = nn_{d_B}(e, t_B) \setminus nn_{d_C}(e, t_C) \tag{34}$$

The recommendation is a list of cocktails. This is ordered increasingly by balance distance.

The hand-made clusters were used as a flattened recipe list to test this approach. The result is shown as as graph (Figure 11). Orange nodes are the examples e. Each recipe was used once as an example. They are grouped along with their recommendations. The cocktail distance is in brackets behind the name. 30 % of the recipes do not have a recommendation, because no recipes met the given constraints as the dataset is too small. The thresholds could be softer, but this would lead to lower precision.

The biggest cluster is *daiquiri.xml*. This cluster can be found in the recommendation. A good recommendation of a *Jack Rose* or a *Whiskey Sour* is a *Daiquiri*. This recommendation contains the result, but in the same recommendation there are also recipes which are very near to the the *Daiquiri*. Clusters showed that classics are distinct from other classics. A recipe could be a good recommendation, but not all members of the cluster that contains this recipe have to occur in one recommendation. Clusters could used to remove such duplicates.

The recommendation of the example *Albemarle Fizz* contains the *Tom Collins* and the *Side Car*. From the perspective of cocktail structure, the fizz is sour with a splash of soda. A collins is a sour that is topped up with soda. The recommendations are not the same but have a similar characteristic, which makes this a good recommendation. Another example is the *Cold Rum Flip*, which has only the recommendation of *Real Georgia Mint Julep*. This does not make sense because the flip is a drink with egg and the julep contains mint. Issues with mint have already been discussed. Egg or cream are missing in the balance and cannot be recognized.

8. Conclusion and future work

This paper has shown that the cocktail distance and the balance distance have an expected precision. The opinions of different authors cannot be changed or handled. Numerous optimizations are needed, especially to recognize ingredients correctly. In this process, the pre-extraction can be simplified step by step. The performance optimization of ontology with an indexer is also useful.

The introduced recommendation approach of found recipes with the same balance and different ingredients must be compared with this opposite approach. Perhaps both can be appropriate and dependent only on the guest's preferences.

With a greater number of recognized recipes, a validation of the recommendation approach with domain experts is possible. For this case, a platform for a validation by the user is necessary, which offers recommendations and a rating of whether or not it is appropriate.

References

[HKRS07] Hitzler, Pascal ; Krötzsch, Markus ; Rudolph, Sebastian ; Sure, York: *Semantic Web: Grundlagen*. Springer-Verlag, 2007

[Sip15] Sippel, Sigurd: Knowledge-based Recommendations for cocktail recipes. (2015). `http://users.informatik.haw-hamburg.de/~ubicomp/projekte/master2014-sem/sippel/bericht.pdf`

A. Recommendation map

Figure 11: Recommendation with nearest neighbor approach

B. XML of hand-made clusters

B.1. lemonade.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
    <cocktail>
        <title>Soda cocktail</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>teaspoon</unit></quantity><name>white sugar</name></ingredient>
```

```
            <ingredient><quantity><value>2</value><unit>dashes</unit></quantity><name>bitters</name></ingredient>
            <ingredient><quantity><value>1</value><unit>bottle</unit></quantity><name>soda</name></ingredient>
            <ingredient><quantity><value>1</value><unit></unit></quantity><name>lemon slice</name></ingredient>
        </ingredients>
        <preparation>stir</preparation>
        <glass>soda glass</glass>
        <book><title>How to mix Drinks</title><author>Jerry Thomas</author><published>1862</published></book>
    </cocktail>
    <cocktail>
        <title>Lemonade</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>tablespoon</unit></quantity><name>sugar</name></ingredient>
            <ingredient><quantity><value>2</value><unit></unit></quantity><name>fruit in season</name></ingredient>
            <ingredient><quantity><value>1</value><unit>bottle</unit></quantity><name>soda</name></ingredient>
            <ingredient><quantity><value>1</value><unit></unit></quantity><name>lemon slice</name></ingredient>
        </ingredients>
        <preparation>stir</preparation>
        <glass>large bar glass</glass>
        <book><title>Bartenders Manual</title><author>Harry Johnson</author><published>1882</published></book>
    </cocktail>
    <cocktail>
        <title>Soda Cocktail #2</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>lump</unit></quantity><name>sugar</name></ingredient>
            <ingredient><quantity><value>4</value><unit>dashes</unit></quantity><name>Angostura</name></ingredient>
            <ingredient><quantity><value>1</value><unit>wineglass</unit></quantity><name>soda</name></ingredient>
            <ingredient><quantity><value>1</value><unit></unit></quantity><name>lemon juice</name></ingredient>
        </ingredients>
        <preparation>stir</preparation>
        <glass>long tumbler</glass>
        <book><title>Savoy Cocktail Book</title><author>Harry Craddock</author><published>1930</published></book>
    </cocktail>
</cocktails>
```

B.2. crusta.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
    <cocktail>
        <title>Brandy Crusta</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>Brandy</name></ingredient>
            <ingredient><quantity><value>1.5</value><unit>dashes</unit></quantity><name>maraschino</name></ingredient>
            <ingredient><quantity><value>1</value><unit></unit></quantity><name>orange twist</name></ingredient>
        </ingredients>
        <preparation>stir</preparation>
        <glass>wine glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
    <cocktail>
        <title>Brandy Crusta #2</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>dash</unit></quantity><name>lemon juice</name></ingredient>
            <ingredient><quantity><value>1</value><unit></unit></quantity><name>lemon peel</name></ingredient>
            <ingredient><quantity><value>1</value><unit>tablespoon</unit></quantity><name>white sugar</name></ingredient>
            <ingredient><quantity><value>2</value><unit>oz</unit></quantity><name>brandy</name></ingredient>
        </ingredients>
        <preparation>stir</preparation>
        <glass>wine glass</glass>
        <book><title>How to mix Drinks</title><author>Jerry Thomas</author><published>1862</published></book>
    </cocktail>
    <cocktail>
        <title>Brandy Crusta #3</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>wineglass</unit></quantity><name>brandy</name></ingredient>
            <ingredient><quantity><value>1</value><unit>dash</unit></quantity><name>Boker's bitters</name></ingredient>
            <ingredient><quantity><value>4.5</value><unit>drops</unit></quantity><name>lemon juice</name></ingredient>
            <ingredient><quantity><value>1</value><unit></unit></quantity><name>lemon peel</name></ingredient>
            <ingredient><quantity><value>2</value><unit>dashes</unit></quantity><name>maraschino</name></ingredient>
            <ingredient><quantity><value>3.5</value><unit>dashes</unit></quantity><name>orchard syrup</name></ingredient>
        </ingredients>
        <preparation>stir</preparation>
        <glass>wine glass</glass>
        <book><title>Bartenders Manual</title><author>Harry Johnson</author><published>1882</published></book>
    </cocktail>
</cocktails>
```

B.3. brandypunch.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
    <cocktail>
        <title>Brandy Punch</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>teaspoon</unit></quantity><name>raspberry Syrup</name></ingredient>
            <ingredient><quantity><value>2</value><unit>tablespoons</unit></quantity><name>white sugar</name></ingredient>
            <ingredient><quantity><value>1</value><unit>wineglass</unit></quantity><name>water</name></ingredient>
            <ingredient><quantity><value>1.5</value><unit>wineglasses</unit></quantity><name>brandy</name></ingredient>
            <ingredient><quantity><value>1</value><unit>teaspoon</unit></quantity><name>orange</name></ingredient>
            <ingredient><quantity><value>1</value><unit>teaspoon</unit></quantity><name>pineapple</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>tumbler</glass>
    </cocktail>
    <cocktail>
        <title>Mississippi Punch</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>wineglass</unit></quantity><name>brandy</name></ingredient>
            <ingredient><quantity><value>0.5</value><unit>wineglasses</unit></quantity><name>jamaica rum</name></ingredient>
            <ingredient><quantity><value>0.5</value><unit>wineglasses</unit></quantity><name>bourbon</name></ingredient>
            <ingredient><quantity><value>1.5</value><unit>tablespoons</unit></quantity><name>white sugar</name></ingredient>
            <ingredient><quantity><value>2</value><unit>cl</unit></quantity><name>lemon juice</name></ingredient>
            <ingredient><quantity><value>0.5</value><unit>wineglass</unit></quantity><name>Water</name></ingredient>
            <ingredient><quantity><value>1</value><unit>piece</unit></quantity><name>orange</name></ingredient>
            <ingredient><quantity><value>1</value><unit></unit></quantity><name>berries</name></ingredient>
        </ingredients>
```

```
        <preparation>shake</preparation>
        <glass>tumbler</glass>
        <book><title>How to mix Drinks</title><author>Jerry Thomas</author><published>1862</published></book>
    </cocktail>
</cocktails>
```

B.4. julep.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
    <cocktail>
        <title>Real Georgia Mint Julep</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>teaspoon</unit></quantity><name>white powdered sugar</name></ingredient>
            <ingredient><quantity><value>3</value><unit>quarters</unit></quantity><name>cognac</name></ingredient>
            <ingredient><quantity><value>12</value><unit>sprigs</unit></quantity><name>mint</name></ingredient>
        </ingredients>
        <preparation>stir</preparation>
        <glass>tumbler</glass>
        <book><title>How to mix Drinks</title><author>Jerry Thomas</author><published>1862</published></book>
    </cocktail>
    <cocktail>
        <title>Mint Julep</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>teaspoon</unit></quantity><name>white pulverized sugar</name></ingredient>
            <ingredient><quantity><value>1.5</value><unit>wineglasses</unit></quantity><name>cognac</name></ingredient>
            <ingredient><quantity><value>4</value><unit>sprigs</unit></quantity><name>mint</name></ingredient>
            <ingredient><quantity><value>1</value><unit>slice</unit></quantity><name>orange</name></ingredient>
        </ingredients>
        <preparation>stir</preparation>
        <glass>tumbler</glass>
        <book><title>How to mix Drinks</title><author>Jerry Thomas</author><published>1862</published></book>
    </cocktail>
    <cocktail>
        <title>Brandy Julep</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>teaspoon</unit></quantity><name>white pulverized sugar</name></ingredient>
            <ingredient><quantity><value>1.5</value><unit>wineglasses</unit></quantity><name>brandy</name></ingredient>
            <ingredient><quantity><value>4</value><unit>sprigs</unit></quantity><name>mint</name></ingredient>
            <ingredient><quantity><value>1</value><unit>slice</unit></quantity><name>orange</name></ingredient>
        </ingredients>
        <preparation>stir</preparation>
        <glass>tumbler</glass>
        <book><title>How to mix Drinks</title><author>Jerry Thomas</author><published>1862</published></book>
    </cocktail>
</cocktails>
```

B.5. alexander.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
    <cocktail>
        <title>Alexander</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>sweet cream</name></ingredient>
            <ingredient><quantity><value>1</value><unit>parts</unit></quantity><name>Creme de cacao</name></ingredient>
            <ingredient><quantity><value>4</value><unit>teaspoonful</unit></quantity><name>gin</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
    <cocktail>
        <title>Alexander #2</title>
        <ingredients>
            <ingredient><quantity><value>2</value><unit>parts</unit></quantity><name>gin</name></ingredient>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>Creme de cocoa</name></ingredient>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>lime juice</name></ingredient>
            <ingredient><quantity><value>1</value><unit>pony</unit></quantity><name>thick sweet cream</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Shake em up!</title><author>Virginia Elliott and Phil D. Stong</author><published>1930</published></book>
    </cocktail>
</cocktails>
```

B.6. aromatic.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
    <!-- aromatic with wine aperitifs -->
    <cocktail>
        <title>Dubonnet Cocktail</title>
        <ingredients>
            <ingredient><quantity><value>0.5</value><unit>part</unit></quantity><name>Gin</name></ingredient>
            <ingredient><quantity><value>0.5</value><unit>part</unit></quantity><name>Dubonnet</name></ingredient>
        </ingredients>
        <preparation>stir</preparation>
        <glass>cocktail glass</glass>
        <book><title>Savoy Cocktail Book</title><author>Harry Craddock</author><published>1930</published></book>
    </cocktail>
    <cocktail>
        <title>Dubonnet</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>Dubonnet</name></ingredient>
            <ingredient><quantity><value>2</value><unit>part</unit></quantity><name>Gin</name></ingredient>
        </ingredients>
        <preparation>stir</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
</cocktails>
```

B.7. vermouth.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
    <cocktail>
        <title>Fancy Vermouth Cocktail</title>
        <ingredients>
            <ingredient><quantity><value>2</value><unit>dashes</unit></quantity><name>bitters</name></ingredient>
            <ingredient><quantity><value>2</value><unit>dashes</unit></quantity><name>maraschino</name></ingredient>
            <ingredient><quantity><value>1</value><unit>wineglass</unit></quantity><name>red vermouth</name></ingredient>
            <ingredient><quantity><value>1</value><unit></unit></quantity><name>lemon slice</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>How to mix Drinks</title><author>Jerry Thomas</author><published>1862</published></book>
    </cocktail>
    <cocktail>
        <title>Vermouth Cocktail</title>
        <ingredients>
            <ingredient><quantity><value>2</value><unit>dashes</unit></quantity><name>bitters</name></ingredient>
            <ingredient><quantity><value>1</value><unit>wineglass</unit></quantity><name>red vermouth</name></ingredient>
            <ingredient><quantity><value>1</value><unit></unit></quantity><name>lemon slice</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>How to mix Drinks</title><author>Jerry Thomas</author><published>1862</published></book>
    </cocktail>
    <cocktail>
        <title>Vermouth Cocktail #2</title>
        <ingredients>
            <ingredient><quantity><value>4.5</value><unit>dashes</unit></quantity><name>gum</name></ingredient>
            <ingredient><quantity><value>2.5</value><unit>dashes</unit></quantity><name>Boker's bitters</name></ingredient>
            <ingredient><quantity><value>1</value><unit>wineglass</unit></quantity><name>vermouth</name></ingredient>
            <ingredient><quantity><value>2</value><unit>dashes</unit></quantity><name>maraschino</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Bartenders Manual</title><author>Harry Johnson</author><published>1882</published></book>
    </cocktail>
</cocktails>
```

B.8. flip.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
    <cocktail>
        <title>Cold Rum Flip</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>teaspoon</unit></quantity><name>powdered sugar</name></ingredient>
            <ingredient><quantity><value>1</value><unit>wineglass</unit></quantity><name>jamaica rum</name></ingredient>
            <ingredient><quantity><value>1</value><unit></unit></quantity><name>egg</name></ingredient>
            <ingredient><quantity><value>1</value><unit>pinch</unit></quantity><name>nutmeg</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>medium glass</glass>
        <book><title>How to mix Drinks</title><author>Jerry Thomas</author><published>1862</published></book>
    </cocktail>
    <cocktail>
        <title>Rum Flip</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit></unit></quantity><name>egg</name></ingredient>
            <ingredient><quantity><value>1</value><unit>tablespoons</unit></quantity><name>powdered sugar</name></ingredient>
            <ingredient><quantity><value>2</value><unit>oz</unit></quantity><name>rum</name></ingredient>
            <ingredient><quantity><value>1</value><unit></unit></quantity><name>nutmeg</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>medium size glass</glass>
        <book><title>Savoy Cocktail Book</title><author>Harry Craddock</author><published>1930</published></book>
    </cocktail>
</cocktails>
```

B.9. tomcollins.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
    <cocktail>
        <title>Tom Collins Gin</title>
        <ingredients>
            <ingredient><quantity><value>5.5</value><unit>dashes</unit></quantity><name>gum syrup</name></ingredient>
            <ingredient><quantity><value>1</value><unit>wineglass</unit></quantity><name>gin</name></ingredient>
            <ingredient><quantity><value>3</value><unit>cl</unit></quantity><name>lemon juice</name></ingredient>
            <ingredient><quantity><value>1</value><unit>wineglass</unit></quantity><name>seltzer water</name></ingredient>
        </ingredients>
        <preparation>stir</preparation>
        <glass>large bar glass</glass>
        <book><title>How to mix Drinks</title><author>Jerry Thomas</author><published>1862</published></book>
    </cocktail>
    <cocktail>
        <title>Tom Collins</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>oz</unit></quantity><name>lemon juice</name></ingredient>
            <ingredient><quantity><value>1</value><unit>tablespoon</unit></quantity><name>powdered sugar</name></ingredient>
            <ingredient><quantity><value>2</value><unit>oz</unit></quantity><name>gin</name></ingredient>
            <ingredient><quantity><value>1</value><unit>wineglass</unit></quantity><name>seltzer water</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>long tumbler</glass>
        <book><title>Savoy Cocktail Book</title><author>Harry Craddock</author><published>1930</published></book>
    </cocktail>
</cocktails>
```

B.10. absinth.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
```

```
    <cocktail>
        <title>Absinthe Cocktail #2</title>
        <ingredients>
            <ingredient><quantity><value>3</value><unit>parts</unit></quantity><name>Absinthe</name></ingredient>
            <ingredient><quantity><value>2</value><unit>parts</unit></quantity><name>Water</name></ingredient>
            <ingredient><quantity><value>1</value><unit>teaspoonful</unit></quantity><name>Sugar Syrup</name></ingredient>
            <ingredient><quantity><value>1</value><unit></unit></quantity><name>Lemon twist</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
    <cocktail>
        <title>Absinthe Cocktail #3</title>
        <ingredients>
            <ingredient><quantity><value>0.75</value><unit>wineglass</unit></quantity><name>absinthe</name></ingredient>
            <ingredient><quantity><value>0.25</value><unit>wineglass</unit></quantity><name>water</name></ingredient>
            <ingredient><quantity><value>3.5</value><unit>dashes</unit></quantity><name>gum syrup</name></ingredient>
            <ingredient><quantity><value>1</value><unit>dash</unit></quantity><name>Anisette</name></ingredient>
            <ingredient><quantity><value>1</value><unit>dash</unit></quantity><name>Boker's bitters</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Bartenders Manual</title><author>Harry Johnson</author><published>1882</published></book>
    </cocktail>
    <cocktail>
        <title>Absinthe Cocktail #4</title>
        <ingredients>
            <ingredient><quantity><value>0.5</value><unit>part</unit></quantity><name>absinthe</name></ingredient>
            <ingredient><quantity><value>0.5</value><unit>part</unit></quantity><name>water</name></ingredient>
            <ingredient><quantity><value>1</value><unit>dash</unit></quantity><name>angostura bitters</name></ingredient>
            <ingredient><quantity><value>1</value><unit>dash</unit></quantity><name>syrup</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Savoy Cocktail Book</title><author>Harry Craddock</author><published>1930</published></book>
    </cocktail>
</cocktails>
```

B.11. eggnogg.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
    <cocktail>
        <title>Egg Nogg</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>dash</unit></quantity><name>fine sugar</name></ingredient>
            <ingredient><quantity><value>1</value><unit></unit></quantity><name>egg</name></ingredient>
            <ingredient><quantity><value>1</value><unit>wineglass</unit></quantity><name>cognac</name></ingredient>
            <ingredient><quantity><value>0.5</value><unit>wineglass</unit></quantity><name>santa cruz rum</name></ingredient>
            <ingredient><quantity><value>1</value><unit>wineglass</unit></quantity><name>milk</name></ingredient>
            <ingredient><quantity><value>1</value><unit>pinch</unit></quantity><name>nutmeg</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>tumbler</glass>
        <book><title>How to mix Drinks</title><author>Jerry Thomas</author><published>1862</published></book>
    </cocktail>
    <cocktail>
        <title>Egg Nogg #2</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit></unit></quantity><name>egg</name></ingredient>
            <ingredient><quantity><value>1</value><unit>tablespoon</unit></quantity><name>sugar</name></ingredient>
            <ingredient><quantity><value>1</value><unit>pony-glass</unit></quantity><name>Jamaica Rum</name></ingredient>
            <ingredient><quantity><value>1</value><unit>wineglass</unit></quantity><name>brandy</name></ingredient>
            <ingredient><quantity><value>1</value><unit>wineglass</unit></quantity><name>rich milk</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>tumbler</glass>
        <book><title>Bartenders Manual</title><author>Harry Johnson</author><published>1882</published></book>
    </cocktail>
</cocktails>
```

B.12. whiskeysour.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
    <cocktail>
        <title>Whiskey Sour</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>sugar syrup</name></ingredient>
            <ingredient><quantity><value>2</value><unit>parts</unit></quantity><name>lemon juice</name></ingredient>
            <ingredient><quantity><value>8</value><unit>parts</unit></quantity><name>Rye</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
    <cocktail>
        <title>Whiskey Sour #2</title>
        <ingredients>
            <ingredient><quantity><value>0.5</value><unit>tablespoon</unit></quantity><name>sugar</name></ingredient>
            <ingredient><quantity><value>3.5</value><unit>dashes</unit></quantity><name>lemon juice</name></ingredient>
            <ingredient><quantity><value>3.5</value><unit>dashes</unit></quantity><name>gum syrup</name></ingredient>
            <ingredient><quantity><value>1</value><unit>squirt</unit></quantity><name>soda</name></ingredient>
            <ingredient><quantity><value>1</value><unit>wine glass</unit></quantity><name>whiskey</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Bartenders Manual</title><author>Harry Johnson</author><published>1882</published></book>
    </cocktail>
</cocktails>
```

B.13. manhattan.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
```

```
    <cocktail>
        <title>Manhattan (Sweet)</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>Italian Vermouth</name></ingredient>
            <ingredient><quantity><value>2</value><unit>parts</unit></quantity><name>Whisky</name></ingredient>
            <ingredient><quantity><value>1</value><unit>dash</unit></quantity><name>Angostura</name></ingredient>
            <ingredient><quantity><value>1</value><unit></unit></quantity><name>Maraschino cherry</name></ingredient>
        </ingredients>
        <preparation>stir</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
    <cocktail>
        <title>Manhattan De Luxe</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>Cinzano Italian Vermouth</name></ingredient>
            <ingredient><quantity><value>5</value><unit>parts</unit></quantity><name>Bonded Whisky</name></ingredient>
            <ingredient><quantity><value>1</value><unit>dash</unit></quantity><name>Angostura</name></ingredient>
            <ingredient><quantity><value>1</value><unit></unit></quantity><name>Maraschino cherry</name></ingredient>
        </ingredients>
        <preparation>stir</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
    <cocktail>
        <title>Manhattan Cocktail (No. 1)</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>wineglass</unit></quantity><name>Vermouth</name></ingredient>
            <ingredient><quantity><value>1</value><unit>pony</unit></quantity><name>rye</name></ingredient>
            <ingredient><quantity><value>1</value><unit>dash</unit></quantity><name>Maraschino</name></ingredient>
            <ingredient><quantity><value>1</value><unit>dash</unit></quantity><name>Angostura Bitters</name></ingredient>
        </ingredients>
        <preparation>stir</preparation>
        <glass>claret glass</glass>
        <book><title>Savoy Cocktail Book</title><author>Harry Craddock</author><published>1930</published></book>
    </cocktail>
</cocktails>
```

B.14. daiquiri.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
    <cocktail>
        <title>Daiquiri No.1</title>
        <ingredients>
            <ingredient><quantity><value>8</value><unit>parts</unit></quantity><name>white rum</name></ingredient>
            <ingredient><quantity><value>2</value><unit>parts</unit></quantity><name>lime juice</name></ingredient>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>sugar syrup</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
    <cocktail>
        <title>Daiquiri No.2</title>
        <ingredients>
            <ingredient><quantity><value>8</value><unit>parts</unit></quantity><name>white rum</name></ingredient>
            <ingredient><quantity><value>2</value><unit>parts</unit></quantity><name>lime juice</name></ingredient>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>sugar syrup</name></ingredient>
            <ingredient><quantity><value>1</value><unit>dash</unit></quantity><name>orange juice</name></ingredient>
            <ingredient><quantity><value>3</value><unit>dashes</unit></quantity><name>orange curacao</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
    <cocktail>
        <title>Daiquiri No.3</title>
        <ingredients>
            <ingredient><quantity><value>8</value><unit>parts</unit></quantity><name>white rum</name></ingredient>
            <ingredient><quantity><value>2</value><unit>parts</unit></quantity><name>lime juice</name></ingredient>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>sugar syrup</name></ingredient>
            <ingredient><quantity><value>1</value><unit>dash</unit></quantity><name>grapefruit juice</name></ingredient>
            <ingredient><quantity><value>1</value><unit>teaspoonful</unit></quantity><name>maraschino</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
    <cocktail>
        <title>Pink Daiquiri</title>
        <ingredients>
            <ingredient><quantity><value>8</value><unit>parts</unit></quantity><name>white rum</name></ingredient>
            <ingredient><quantity><value>2</value><unit>parts</unit></quantity><name>lime juice</name></ingredient>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>sugar syrup</name></ingredient>
            <ingredient><quantity><value>1</value><unit>teaspoonful</unit></quantity><name>grenadine</name></ingredient>
            <ingredient><quantity><value>1</value><unit>teaspoonful</unit></quantity><name>maraschino</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
    <cocktail>
        <title>Golden Glove</title>
        <ingredients>
            <ingredient><quantity><value>8</value><unit>parts</unit></quantity><name>white rum</name></ingredient>
            <ingredient><quantity><value>2</value><unit>parts</unit></quantity><name>lime juice</name></ingredient>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>sugar syrup</name></ingredient>
            <ingredient><quantity><value>1</value><unit>teaspoonful</unit></quantity><name>Cointreau</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
    <cocktail>
        <title>Ramoncita Lopez Special</title>
        <ingredients>
```

```
            <ingredient><quantity><value>8</value><unit>parts</unit></quantity><name>white rum</name></ingredient>
            <ingredient><quantity><value>2</value><unit>parts</unit></quantity><name>lime juice</name></ingredient>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>sugar syrup</name></ingredient>
            <ingredient><quantity><value>0.5</value><unit></unit></quantity><name>egg</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
    <cocktail>
        <title>Pineapple Bacardi</title>
        <ingredients>
            <ingredient><quantity><value>8</value><unit>parts</unit></quantity><name>white rum</name></ingredient>
            <ingredient><quantity><value>2</value><unit>parts</unit></quantity><name>lime juice</name></ingredient>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>pineapple juice</name></ingredient>
            <ingredient><quantity><value>0.5</value><unit>parts</unit></quantity><name>sugar syrup</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
    <cocktail>
        <title>Havana Beach</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>white rum</name></ingredient>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>pineapple juice</name></ingredient>
            <ingredient><quantity><value>0.5</value><unit>teaspoonful</unit></quantity><name>sugar syrup</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
    <cocktail>
        <title>Nacional</title>
        <ingredients>
            <ingredient><quantity><value>8</value><unit>parts</unit></quantity><name>white rum</name></ingredient>
            <ingredient><quantity><value>8</value><unit>parts</unit></quantity><name>apricot brandy</name></ingredient>
            <ingredient><quantity><value>2</value><unit>parts</unit></quantity><name>lime juice</name></ingredient>
            <ingredient><quantity><value>1</value><unit>teaspoonful</unit></quantity><name>sugar syrup</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
</cocktails>
```

B.15. japanesecocktail.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
    <cocktail>
        <title>Japanese Cocktail</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>Orgeat</name></ingredient>
            <ingredient><quantity><value>8</value><unit>parts</unit></quantity><name>cognac</name></ingredient>
            <ingredient><quantity><value>1</value><unit>dash</unit></quantity><name>Angostura</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
    <cocktail>
        <title>Japanese Cocktail #2</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>tablespoon</unit></quantity><name>orgeat syrup</name></ingredient>
            <ingredient><quantity><value>1.5</value><unit>piece</unit></quantity><name>lemon peel</name></ingredient>
            <ingredient><quantity><value>1.5</value><unit>teaspoon</unit></quantity><name>bitters</name></ingredient>
            <ingredient><quantity><value>1</value><unit>wineglass</unit></quantity><name>brandy</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>How to mix Drinks</title><author>Jerry Thomas</author><published>1862</published></book>
    </cocktail>
</cocktails>
```

B.16. jackrose.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
    <cocktail>
        <title>Jack Rose</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>Grenadine</name></ingredient>
            <ingredient><quantity><value>2</value><unit>parts</unit></quantity><name>lemon juice</name></ingredient>
            <ingredient><quantity><value>8</value><unit>parts</unit></quantity><name>Apple Brandy</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
    <cocktail>
        <title>Apple Jack (Special) Cocktail</title>
        <ingredients>
            <ingredient><quantity><value>0.66</value><unit>part</unit></quantity><name>Apple Jack</name></ingredient>
            <ingredient><quantity><value>0.16</value><unit>parts</unit></quantity><name>lemon juice</name></ingredient>
            <ingredient><quantity><value>0.16</value><unit>parts</unit></quantity><name>Grenadine</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Savoy Cocktail Book</title><author>Harry Craddock</author><published>1930</published></book>
    </cocktail>
</cocktails>
```

B.17. ginfizz.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
```

```
    <cocktail>
        <title>Gin Fiz</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>teaspoon</unit></quantity><name>powdered sugar</name></ingredient>
            <ingredient><quantity><value>1</value><unit>wineglass</unit></quantity><name>Holland gin</name></ingredient>
            <ingredient><quantity><value>3</value><unit>dashes</unit></quantity><name>lemon juice</name></ingredient>
            <ingredient><quantity><value>1</value><unit>pinch</unit></quantity><name>nutmeg</name></ingredient>
            <ingredient><quantity><value>0.5</value><unit>wineglass</unit></quantity><name>soda</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>medium bar glass</glass>
        <book><title>How to mix Drinks</title><author>Jerry Thomas</author><published>1862</published></book>
    </cocktail>
    <cocktail>
        <title>Albemarle Fizz</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>teaspoon</unit></quantity><name>powdered sugar</name></ingredient>
            <ingredient><quantity><value>1</value><unit>teaspoon</unit></quantity><name>raspberry syrup</name></ingredient>
            <ingredient><quantity><value>2</value><unit>oz</unit></quantity><name>dry gin</name></ingredient>
            <ingredient><quantity><value>1</value><unit>oz</unit></quantity><name>lemon juice</name></ingredient>
            <ingredient><quantity><value>0.5</value><unit>wineglass</unit></quantity><name>soda</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>medium size glass</glass>
        <book><title>Savoy Cocktail Book</title><author>Harry Craddock</author><published>1930</published></book>
    </cocktail>
</cocktails>
```

B.18. cloverclub.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
    <cocktail>
        <title>Clover Club</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>Raspberry syrup</name></ingredient>
            <ingredient><quantity><value>2</value><unit>parts</unit></quantity><name>lemon juice</name></ingredient>
            <ingredient><quantity><value>0.5</value><unit></unit></quantity><name>egg</name></ingredient>
            <ingredient><quantity><value>8</value><unit>parts</unit></quantity><name>Gin</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
    <cocktail>
        <title>Grand Royal Clover Club Cocktail</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>tablespoon</unit></quantity><name>grenadine</name></ingredient>
            <ingredient><quantity><value>0.75</value><unit>oz</unit></quantity><name>lemon juice</name></ingredient>
            <ingredient><quantity><value>1</value><unit></unit></quantity><name>egg</name></ingredient>
            <ingredient><quantity><value>2</value><unit>oz</unit></quantity><name>Gin</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Savoy Cocktail Book</title><author>Harry Craddock</author><published>1930</published></book>
    </cocktail>
    <cocktail>
        <title>Clover Club Cocktail</title>
        <ingredients>
            <ingredient><quantity><value>2</value><unit>parts</unit></quantity><name>gin</name></ingredient>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>lemon juice</name></ingredient>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>orange juice</name></ingredient>
            <ingredient><quantity><value>1</value><unit>oz</unit></quantity><name>egg</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Shake em up!</title><author>Virginia Elliott and Phil D. Stong</author><published>1930</published></book>
    </cocktail>

</cocktails>
```

B.19. sidecar.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<cocktails>
    <cocktail>
        <title>Side car de luxe</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>Cointreau</name></ingredient>
            <ingredient><quantity><value>2</value><unit>parts</unit></quantity><name>lemon juice</name></ingredient>
            <ingredient><quantity><value>3</value><unit>parts</unit></quantity><name>cognac</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
    <cocktail>
        <title>Side car de luxe No.2</title>
        <ingredients>
            <ingredient><quantity><value>1</value><unit>part</unit></quantity><name>Cointreau</name></ingredient>
            <ingredient><quantity><value>2</value><unit>parts</unit></quantity><name>lemon juice</name></ingredient>
            <ingredient><quantity><value>3</value><unit>parts</unit></quantity><name>amagnac</name></ingredient>
        </ingredients>
        <preparation>shake</preparation>
        <glass>cocktail glass</glass>
        <book><title>Fine Art of Mixing Drinks</title><author>David A. Embury</author><published>1948</published></book>
    </cocktail>
</cocktails>
```

C.
XML-RDF of ontology

```
<?xml version="1.0"?>

<rdf:RDF
xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
xmlns:c="http://www.myclassicbar.com/rdf#">
    <!-- Classes -->
    <rdfs:Class rdf:about="cocktail://ingredient">
        <rdfs:label>ingredient</rdfs:label>
    </rdfs:Class>
    <rdfs:Class rdf:about="cocktail://ingredient/superordinate">
      <rdfs:label>superordinate ingredient</rdfs:label>
     </rdfs:Class>
    <rdfs:Class rdf:about="cocktail://ingredient/basic">
      <rdfs:label>basic category of ingredient</rdfs:label>
      <rdfs:subClassOf>cocktail://ingredient</rdfs:subClassOf>
    </rdfs:Class>
    <rdfs:Class rdf:about="cocktail://ingredient/subordinate">
      <rdfs:label>subordinate ingredient</rdfs:label>
      <rdfs:subClassOf>cocktail://ingredient</rdfs:subClassOf>
    </rdfs:Class>
    <rdfs:Class rdf:about="cocktail://preparation">
        <rdfs:label>preparation</rdfs:label>
    </rdfs:Class>
    <rdfs:Class rdf:about="cocktail://source">
        <rdfs:label>source</rdfs:label>
    </rdfs:Class>
    <rdfs:Class rdf:about="cocktail://origin">
        <rdfs:label>origin</rdfs:label>
    </rdfs:Class>
    <rdfs:Class rdf:about="cocktail://cocktail/preparation">
        <rdfs:label>cocktail preparation</rdfs:label>
    </rdfs:Class>
    <rdfs:Class rdf:about="cocktail://glassware">
        <rdfs:label>glassware</rdfs:label>
    </rdfs:Class>
    <rdfs:Class rdf:about="cocktail://drinking/glass">
        <rdfs:label>drinking glass</rdfs:label>
        <rdfs:subClassOf>cocktail://glassware</rdfs:subClassOf>
    </rdfs:Class>
    <rdfs:Class rdf:about="cocktail://bottle">
        <rdfs:label>bottle</rdfs:label>
        <rdfs:subClassOf>cocktail://glassware</rdfs:subClassOf>
    </rdfs:Class>
    <rdfs:Class rdf:about="cocktail://unit">
        <rdfs:label>unit</rdfs:label>
    </rdfs:Class>
    <rdfs:Class rdf:about="cocktail://unit/quantitative">
        <rdfs:label>quantitative unit</rdfs:label>
        <rdfs:subClassOf>cocktail://unit</rdfs:subClassOf>
    </rdfs:Class>
    <rdfs:Class rdf:about="cocktail://unit/qualitative">
        <rdfs:label>qualitative unit</rdfs:label>
        <rdfs:subClassOf>cocktail://unit</rdfs:subClassOf>
    </rdfs:Class>

    <!-- Ingredients -->
    <rdf:Property rdf:type="cocktail://ingredient/superordinate" rdf:about="cocktail://ingredient/spirit" rdfs:Literal="spirit" c:alcohol="0.4" c:water="0.6" />
    <rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/gin" rdfs:Literal="gin" c:alcohol="0.47" c:water="0.53" />

    <rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/citadelle" rdfs:Literal="gin citadelle" >
        <c:kindof rdf:resource="cocktail://ingredient/gin" />
    </rdf:Property>
    <rdf:Property rdf:type="cocktail://ingredient/superordinate" rdf:about="cocktail://ingredient/wine" rdfs:Literal="wine"
            c:alcohol="0.12" c:sweet="0.04" c:sour="0.04" c:water="0.8" />
    <rdf:Property rdf:type="cocktail://ingredient/superordinate" rdf:about="cocktail://ingredient/wine/aperitive" rdfs:Literal="wine aperitive"
            c:alcohol="0.18" c:water="0.74"  c:sweet="0.2" >
        <c:kindof rdf:resource="cocktail://ingredient/wine" />
    </rdf:Property>
    <rdf:Property rdf:type="cocktail://ingredient/superordinate" rdf:about="cocktail://ingredient/vermouth" rdfs:Literal="vermouth" c:sweet="0.2">
        <c:kindof rdf:resource="cocktail://ingredient/wine/aperitive" />
        <c:default rdf:resource="cocktail://ingredient/vermouth/red" />
    </rdf:Property>
    <rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/vermouth/red" rdfs:Literal="Vermouth" />
    <rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/vermouth/red" rdfs:Literal="Italian vermouth" />
    <rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/vermouth/red" rdfs:Literal="red vermouth">
        <c:kindof rdf:resource="cocktail://ingredient/vermouth" />
    </rdf:Property>
    <rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/vermouth/dry" rdfs:Literal="French vermouth" />
    <rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/vermouth/dry" rdfs:Literal="vermouth blanc" />
    <rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/vermouth/dry" rdfs:Literal="dry vermouth" >
        <c:kindof rdf:resource="cocktail://ingredient/vermouth" />
    </rdf:Property>
    <rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/puntemes" rdfs:Literal="Punt e mes" c:sweet="0.15">
        <c:kindof rdf:resource="cocktail://ingredient/vermouth/red" />
    </rdf:Property>
    <rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/carpano/anticaformula" rdfs:Literal="Carpano Antica Formula"  c:sweet="0.25">
        <c:kindof rdf:resource="cocktail://ingredient/vermouth/red" />
    </rdf:Property>
    <rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/cinzano/italian/vermouth" rdfs:Literal="Cinzano Italian Vermouth">
        <c:kindof rdf:resource="cocktail://ingredient/vermouth/red" />
    </rdf:Property>
    <rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/port" rdfs:Literal="port wine" />
    <rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/port" rdfs:Literal="port" >
        <c:kindof rdf:resource="cocktail://ingredient/wine/aperitive" />
    </rdf:Property>
    <rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/sherry" rdfs:Literal="sherry wine" />
    <rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/sherry" rdfs:Literal="sherry">
        <c:kindof rdf:resource="cocktail://ingredient/wine/aperitive" />
    </rdf:Property>
    <rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/madeira" rdfs:Literal="Madeira" />
    <rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/madeira" rdfs:Literal="Madeira wine">
        <c:kindof rdf:resource="cocktail://ingredient/wine/aperitive" />
    </rdf:Property>
```

```
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/carpano/lillet/blanc" rdfs:Literal="Lillet" />
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/carpano/lillet/blanc" rdfs:Literal="Lillet Blanc">
    <c:kindof rdf:resource="cocktail://ingredient/wine/aperitive" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/carpano/lillet/rouge" rdfs:Literal="Lillet Rouge">
    <c:kindof rdf:resource="cocktail://ingredient/wine/aperitive" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/carpano/dubonnet/red" rdfs:Literal="Dubonnet" />
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/carpano/dubonnet/red" rdfs:Literal="Dubonnet red">
    <c:kindof rdf:resource="cocktail://ingredient/wine/aperitive" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/wine/sparkling" rdfs:Literal="sparkling wine" >
    <c:kindof rdf:resource="cocktail://ingredient/wine" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/champagne" rdfs:Literal="champagne" >
    <c:kindof rdf:resource="cocktail://ingredient/wine/sparkling" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/cremant" rdfs:Literal="cremant" >
    <c:kindof rdf:resource="cocktail://ingredient/wine/sparkling" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/brandywine" rdfs:Literal="brandy wine" >
    <c:kindof rdf:resource="cocktail://ingredient/spirit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/cognac" rdfs:Literal="cognac" >
    <c:kindof rdf:resource="cocktail://ingredient/brandywine" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/amagnac" rdfs:Literal="amagnac" >
    <c:kindof rdf:resource="cocktail://ingredient/brandywine" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/brandy/jerez" rdfs:Literal="brandy" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/brandy/jerez" rdfs:Literal="brandy de jerez" >
    <c:kindof rdf:resource="cocktail://ingredient/brandywine" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/brandy/german" rdfs:Literal="weinbrand" >
    <c:kindof rdf:resource="cocktail://ingredient/brandywine" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/pisco" rdfs:Literal="pisco" >
    <c:kindof rdf:resource="cocktail://ingredient/spirit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/rum/white" rdfs:Literal="white rum" >
    <c:kindof rdf:resource="cocktail://ingredient/rum" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/rum/jamaica" rdfs:Literal="jamaica rum" >
    <c:kindof rdf:resource="cocktail://ingredient/rum" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/rum/santa/cruz" rdfs:Literal="santa cruz rum" >
    <c:kindof rdf:resource="cocktail://ingredient/rum" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/rum" rdfs:Literal="dark rum" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/rum" rdfs:Literal="rum">
    <c:kindof rdf:resource="cocktail://ingredient/spirit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/rhum/agricole" rdfs:Literal="rum agricole" >
    <c:kindof rdf:resource="cocktail://ingredient/spirit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/cachaca" rdfs:Literal="cachaca" >
    <c:kindof rdf:resource="cocktail://ingredient/spirit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/whiskey" rdfs:Literal="bonded whisky" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/whiskey" rdfs:Literal="bonded whiskey" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/whiskey" rdfs:Literal="whisky" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/whiskey" rdfs:Literal="whiskey" >
    <c:kindof rdf:resource="cocktail://ingredient/spirit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/rye" rdfs:Literal="rye whiskey" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/rye" rdfs:Literal="rye" >
    <c:kindof rdf:resource="cocktail://ingredient/whiskey" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bourbon" rdfs:Literal="bourbon" >
    <c:kindof rdf:resource="cocktail://ingredient/whiskey" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/scotch" rdfs:Literal="scotch" >
    <c:kindof rdf:resource="cocktail://ingredient/whiskey" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/japanese/whiskey" rdfs:Literal="japanase whiskey" >
    <c:kindof rdf:resource="cocktail://ingredient/whiskey" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/singlemalt" rdfs:Literal="single malt" >
    <c:kindof rdf:resource="cocktail://ingredient/whiskey" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/singlegrain" rdfs:Literal="single grain" >
    <c:kindof rdf:resource="cocktail://ingredient/whiskey" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/rittenhouse/bib" rdfs:Literal="Rittenhouse Bib" />
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/rittenhouse/bib" rdfs:Literal="Rittenhouse bottled in bond">
    <c:kindof rdf:resource="cocktail://ingredient/rye" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/gin" rdfs:Literal="london dry gin" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/gin" rdfs:Literal="dry gin" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/gin" rdfs:Literal="gin" >
    <c:kindof rdf:resource="cocktail://ingredient/juniper/spirit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/plymouth" rdfs:Literal="Plymouth">
    <c:kindof rdf:resource="cocktail://ingredient/gin" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/gin/oldtom" rdfs:Literal="old tom" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/gin/oldtom" rdfs:Literal="tom gin" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/gin/oldtom" rdfs:Literal="old tom gin" >
    <c:kindof rdf:resource="cocktail://ingredient/juniper/spirit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/juniper/spirit" rdfs:Literal="juniper spirit" />

<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/genever" rdfs:Literal="holland gin" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/genever" rdfs:Literal="genever" >
    <c:kindof rdf:resource="cocktail://ingredient/juniper/spirit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/absinth" rdfs:Literal="absinthe" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/absinth" rdfs:Literal="absinth" >
```

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    <c:kindof rdf:resource="cocktail://ingredient/spirit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/tequila" rdfs:Literal="tequila" >
    <c:kindof rdf:resource="cocktail://ingredient/spirit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/tequila/blanco" rdfs:Literal="blanco tequila" >
    <c:kindof rdf:resource="cocktail://ingredient/tequila" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/tequila/reposado" rdfs:Literal="reposado tequila" >
    <c:kindof rdf:resource="cocktail://ingredient/tequila" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/tequila/anjeo" rdfs:Literal="anejo tequila" >
    <c:kindof rdf:resource="cocktail://ingredient/tequila" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/mezcal" rdfs:Literal="mezcal" >
    <c:kindof rdf:resource="cocktail://ingredient/spirit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/tlacuache/silver/leyenda" rdfs:Literal="Tlacuache silver Leyenda" >
    <c:kindof rdf:resource="cocktail://ingredient/mezcal" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/brandy/fruit" rdfs:Literal="fruit brandy" >
    <c:kindof rdf:resource="cocktail://ingredient/spirit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/brandy/apple" rdfs:Literal="apple brandy" >
    <c:kindof rdf:resource="cocktail://ingredient/brandy/fruit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/calvados" rdfs:Literal="calvados" >
    <c:kindof rdf:resource="cocktail://ingredient/brandy/apple" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/brandy/apple/american" rdfs:Literal="apple jack" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/brandy/apple/american" rdfs:Literal="american apple brandy" >
    <c:kindof rdf:resource="cocktail://ingredient/brandy/apple" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/brandy/nut" rdfs:Literal="nut brandy" >
    <c:kindof rdf:resource="cocktail://ingredient/brandy/fruit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/kirschwasser" rdfs:Literal="kirschwaser" >
    <c:kindof rdf:resource="cocktail://ingredient/brandy/fruit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/kummel" rdfs:Literal="kummel" >
    <c:kindof rdf:resource="cocktail://ingredient/spirit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/brandy/chocolate" rdfs:Literal="chocolate brandy" >
    <c:kindof rdf:resource="cocktail://ingredient/brandy/fruit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/brandy/raspberry" rdfs:Literal="raspberry brandy" >
    <c:kindof rdf:resource="cocktail://ingredient/brandy/fruit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/brandy/peach" rdfs:Literal="peach brandy" >
    <c:kindof rdf:resource="cocktail://ingredient/brandy/fruit" />
</rdf:Property>

<rdf:Property rdf:type="cocktail://ingredient/superordinate" rdf:about="cocktail://ingredient/liqueur" rdfs:Literal="cordial"  />
<rdf:Property rdf:type="cocktail://ingredient/superordinate" rdf:about="cocktail://ingredient/liqueur" rdfs:Literal="liqueur"
        c:alcohol="0.2" c:sweet="0.2" c:water="0.6" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/liqueur/bitter" rdfs:Literal="bitter liqueur" c:sweet="0.2" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/amer/picon" rdfs:Literal="Amer Picon" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur/bitter" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/campari" rdfs:Literal="Campari" c:alcohol="0.25" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur/bitter" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/granclassico" rdfs:Literal="Gran Classico" c:alcohol="0.28">
    <c:kindof rdf:resource="cocktail://ingredient/liqueur/bitter" />
</rdf:Property>

<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/liqueur/creme/de/violette" rdfs:Literal="Creme de Violette" c:sweet="0.75" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/liqueur/herb" rdfs:Literal="herb liqueur" c:alcohol="0.35" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/anisette" rdfs:Literal="Anisette" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur/herb" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/liqueur/chartreuse" rdfs:Literal="herb liqueur" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur/herb" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/liqueur/orange" rdfs:Literal="orange liqueur" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/triple sec" rdfs:Literal="triple sec" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur/orange" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/cointrau" rdfs:Literal="Cointreau" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur/orange" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/orange/curacao" rdfs:Literal="curacao" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/orange/curacao" rdfs:Literal="orange curacao" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur/orange" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/brizard/orange/curacao"
        rdfs:Literal="Marie Brizard Orange Curacao" c:alcohol="0.3" >
    <c:kindof rdf:resource="cocktail://ingredient/orange/curacao" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/grandmarnier" rdfs:Literal="Grand Marnier" c:alcohol="0.4" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur/orange" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/liqueur/apricot" rdfs:Literal="apricot brandy" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/liqueur/apricot" rdfs:Literal="apricot liqueur" >
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/brizard/orange/apry" rdfs:Literal="Marie Brizard Apry" c:alcohol="0.205" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur/apricot" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/liqueur/berry" rdfs:Literal="berry liqueur" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur" />
```

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</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/liqueur/cherry" rdfs:Literal="cherry liqueur" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur/berry" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/boudier/guignolet" rdfs:Literal="Guignolet de Dijon" c:alcohol="0.18" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur/cherry" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/liqueur/blackberry" rdfs:Literal="blackberry liqueur" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur/berry" />
</rdf:Property>

<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/liqueur/sloe" rdfs:Literal="sloe gin" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/falernum" rdfs:Literal="falernum" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/creme/cacao" rdfs:Literal="creme de cocoa" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/creme/cacao" rdfs:Literal="creme de cacao" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/maraschino" rdfs:Literal="Maraschino" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/luxardo/maraschino" rdfs:Literal="Luxardo Maraschino" c:alcohol="0.32" >
    <c:kindof rdf:resource="cocktail://ingredient/maraschino" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/drambuie" rdfs:Literal="Drambuie" c:alcohol="0.4" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/liqueur/elderflower" rdfs:Literal="elder flower liqueur" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/stgermain" rdfs:Literal="St. Germain" c:alcohol="0.2" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur/elderflower" />
</rdf:Property>

<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/chatreuse/verte" rdfs:Literal="green Chatreuse" c:alcohol="0.55" />
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/chatreuse/verte" rdfs:Literal="Chatreuse" />
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/chatreuse/verte" rdfs:Literal="Chatreuse Verte" >
    <c:kindof rdf:resource="cocktail://ingredient/liqueur/herb" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/chatreuse/jaune" rdfs:Literal="yellow Chatreuse" />
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/chatreuse/jaune" rdfs:Literal="Chatreuse Jaune" c:alcohol="0.4">
    <c:kindof rdf:resource="cocktail://ingredient/liqueur/herb" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bitter" rdfs:Literal="bitters" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bitter" rdfs:Literal="bitter" c:alcohol="0.5" >
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bitter/aromatic" rdfs:Literal="aromatic bitter" >
    <c:kindof rdf:resource="cocktail://ingredient/bitter" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/angustura" rdfs:Literal="Angostura bitters" c:alcohol="0.44" />
<rdf:Property rdf:type="cocktail://ingredient/subordinate" rdf:about="cocktail://ingredient/angustura" rdfs:Literal="Angostura" >
    <c:kindof rdf:resource="cocktail://ingredient/bitter" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bitter/orange" rdfs:Literal="orange bitters" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bitter/orange" rdfs:Literal="orange bitter" >
    <c:kindof rdf:resource="cocktail://ingredient/bitter" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bitter/celery" rdfs:Literal="celery bitters" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bitter/celery" rdfs:Literal="celery bitter" >
    <c:kindof rdf:resource="cocktail://ingredient/bitter" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bitter/lemon" rdfs:Literal="lemon bitter" >
    <c:kindof rdf:resource="cocktail://ingredient/bitter" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bitter/cherry" rdfs:Literal="cherry bitters" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bitter/cherry" rdfs:Literal="cherry bitter" >
    <c:kindof rdf:resource="cocktail://ingredient/bitter" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bitter/peach" rdfs:Literal="peach bitter" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bitter/peach" rdfs:Literal="peach bitter" >
    <c:kindof rdf:resource="cocktail://ingredient/bitter" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bitter/bokers" rdfs:Literal="Boker's" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bitter/bokers" rdfs:Literal="Boker's bitters" >
    <c:kindof rdf:resource="cocktail://ingredient/bitter" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bitter/Peychaud's" rdfs:Literal="Peychana bitters" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bitter/Peychaud's" rdfs:Literal="Peychana" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bitter/Peychaud's" rdfs:Literal="Peychaud's bitters" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/bitter/Peychaud's" rdfs:Literal="Peychaud's" c:alcohol="0.38" >
    <c:kindof rdf:resource="cocktail://ingredient/bitter" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/superordinate" rdf:about="cocktail://ingredient/syrup" rdfs:Literal="syrup" c:sweet="0.7" c:water="0.3" >
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/sugar" rdfs:Literal="powdered sugar" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/sugar" rdfs:Literal="white pulverized sugar" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/sugar" rdfs:Literal="white powdered sugar" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/sugar" rdfs:Literal="fine sugar" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/sugar" rdfs:Literal="sugar" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/sugar" rdfs:Literal="white sugar" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/sugar" rdfs:Literal="gum" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/sugar" rdfs:Literal="gum syrup" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/sugar" rdfs:Literal="simple syrup" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/sugar" rdfs:Literal="syrup" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/sugar" rdfs:Literal="sugar syrup" >
    <c:kindof rdf:resource="cocktail://ingredient/syrup" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/ginger" rdfs:Literal="ginger syrup" >
    <c:kindof rdf:resource="cocktail://ingredient/syrup" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/tonic" rdfs:Literal="tonic syrup" >
    <c:kindof rdf:resource="cocktail://ingredient/syrup" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/raspberry" rdfs:Literal="raspberry syrup" >
    <c:kindof rdf:resource="cocktail://ingredient/syrup" />
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</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/agave" rdfs:Literal="agave syrup" >
    <c:kindof rdf:resource="cocktail://ingredient/syrup" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/pomegranate" rdfs:Literal="grenadine" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/pomegranate" rdfs:Literal="pomegranate syrup" >
    <c:kindof rdf:resource="cocktail://ingredient/syrup" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/orgeat" rdfs:Literal="orgeat" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/syrup/orgeat" rdfs:Literal="orgeat syrup" >
    <c:kindof rdf:resource="cocktail://ingredient/syrup" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/orchard/syrup" rdfs:Literal="orchard syrup" >
    <c:kindof rdf:resource="cocktail://ingredient/syrup" />
</rdf:Property>

<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/juice" rdfs:Literal="juice">
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/juice/lemon" rdfs:Literal="lemon juice" c:sour="1" c:water="1">
    <c:kindof rdf:resource="cocktail://ingredient/juice" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/juice/lime" rdfs:Literal="lime juice" c:sour="1" c:water="1"  >
    <c:kindof rdf:resource="cocktail://ingredient/juice" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/juice/grapefruit" rdfs:Literal="grapefruit juice"
        c:sour="0.5" c:water="1" c:sweet="0.1">
    <c:kindof rdf:resource="cocktail://ingredient/juice" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/juice/orange" rdfs:Literal="orange juice"
        c:sour="0.3" c:water="1" c:sweet="0.2">
    <c:kindof rdf:resource="cocktail://ingredient/juice" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/juice/pineapple" rdfs:Literal="pineapple juice"
        c:sour="0.1" c:water="1" c:sweet="0.3">
    <c:kindof rdf:resource="cocktail://ingredient/juice" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/orange/flower/water" rdfs:Literal="orange flower water" c:water="1" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/rose/water" rdfs:Literal="rose water" c:water="1" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/herb" rdfs:Literal="herb" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/herb/mint" rdfs:Literal="mint" >
    <c:kindof rdf:resource="cocktail://ingredient/herb" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/basil" rdfs:Literal="basil" >
    <c:kindof rdf:resource="cocktail://ingredient/herb" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/rosemary" rdfs:Literal="rosemary" >
    <c:kindof rdf:resource="cocktail://ingredient/herb" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/milk" rdfs:Literal="milk" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/milk" rdfs:Literal="rich milk" />

<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/cream" rdfs:Literal="sweet cream" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/cream" rdfs:Literal="thick sweet cream" />

<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/cream" rdfs:Literal="cream" c:water="1" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/egg" rdfs:Literal="egg" c:water="1" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/egg/yolk" rdfs:Literal="egg yellow" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/egg/yolk" rdfs:Literal="egg yolk" c:water="1" >
    <c:kindof rdf:resource="cocktail://ingredient/egg" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/egg/white" rdfs:Literal="egg white" c:water="1" >
    <c:kindof rdf:resource="cocktail://ingredient/egg" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/zest" rdfs:Literal="zest" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/zest/lemon" rdfs:Literal="orange slice" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/zest/orange" rdfs:Literal="orange twist" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/zest/orange" rdfs:Literal="orange peel" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/zest/orange" rdfs:Literal="orange zest" >
    <c:kindof rdf:resource="cocktail://ingredient/zest" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/zest/lemon" rdfs:Literal="lemon slice" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/zest/lemon" rdfs:Literal="lemon twist" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/zest/lemon" rdfs:Literal="lemon peel" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/zest/lemon" rdfs:Literal="lemon zest" >
<c:kindof rdf:resource="cocktail://ingredient/zest" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/maraschino/cherry" rdfs:Literal="Maraschino cherry" c:alcohol="0.5" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/fruit" rdfs:Literal="fruit" c:sweet="0.2" c:sour="0.2" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/fruit" rdfs:Literal="fruit in season"  />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/fruit" rdfs:Literal="fruits in season"  />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/fruit" rdfs:Literal="fruits"  />

<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/berries" rdfs:Literal="berries" >
    <c:kindof rdf:resource="cocktail://ingredient/fruit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/orange" rdfs:Literal="orange" >
    <c:kindof rdf:resource="cocktail://ingredient/fruit" />
</rdf:Property>
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/pineapple" rdfs:Literal="pineapple" >
    <c:kindof rdf:resource="cocktail://ingredient/fruit" />
</rdf:Property>

<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/water" rdfs:Literal="water" c:water="1" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/soda" rdfs:Literal="soda" c:water="1" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/soda" rdfs:Literal="soda water" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/soda" rdfs:Literal="selters" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/soda" rdfs:Literal="seltzer water" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/soda" rdfs:Literal="mineral water" />
<rdf:Property rdf:type="cocktail://ingredient/basic" rdf:about="cocktail://ingredient/nutmeg" rdfs:Literal="nutmeg" />

<!-- Preperation -->
<rdf:Property rdf:type="cocktail://cocktail/preparation" rdf:about="cocktail://preparation/stir" rdfs:Literal="stir" />
<rdf:Property rdf:type="cocktail://cocktail/preparation" rdf:about="cocktail://preparation/stir" rdfs:Literal="build" />
<rdf:Property rdf:type="cocktail://cocktail/preparation" rdf:about="cocktail://preparation/swizzle" rdfs:Literal="swizzle" />
<rdf:Property rdf:type="cocktail://cocktail/preparation" rdf:about="cocktail://preparation/shake" rdfs:Literal="shake" />

<!-- Glassware -->
<!-- whiskey tumbler -->
```

```
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/tumbler" rdfs:Literal="tumbler" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/whiskeytumbler" rdfs:Literal="" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/whiskeytumbler" rdfs:Literal="brim of" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/whiskeytumbler" rdfs:Literal="whiskey tumbler" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/whiskeytumbler" rdfs:Literal="old fashioned" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/whiskeytumbler" rdfs:Literal="old fashioned whiskey" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/whiskeytumbler" rdfs:Literal="whiskey">
    <c:kindof rdf:resource="cocktail://glassware/tumbler" />
</rdf:Property>

<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/silver/cup" rdfs:Literal="julep cup" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/silver/cup" rdfs:Literal="silver cup" >
    <c:kindof rdf:resource="cocktail://glassware/whiskeytumbler" />
</rdf:Property>

<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/stem" rdfs:Literal="stem glass" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/high" rdfs:Literal="high glass" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/high" rdfs:Literal="large bar" />

<!-- big tumbler -->
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/high" rdfs:Literal="Collins" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/high" rdfs:Literal="lemonade" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/high" rdfs:Literal="seltzer water" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/high" rdfs:Literal="long tumbler" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/high" rdfs:Literal="soda" >
    <c:kindof rdf:resource="cocktail://glassware/tumbler"  />
</rdf:Property>

<!-- high, but small tumbler -->
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/highball" rdfs:Literal="highball" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/highball" rdfs:Literal="champagne tumbler" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/highball" rdfs:Literal="water tumbler" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/highball" rdfs:Literal="medium bar" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/highball" rdfs:Literal="medium size" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/highball" rdfs:Literal="medium" />

<!-- oval high glass -->
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/high/oval" rdfs:Literal="Cafe parfait" >
    <c:kindof rdf:resource="cocktail://glassware/high"  />
</rdf:Property>
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/high/oval" rdfs:Literal="egg glass" />

<!-- cocktail glass, small -->
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/cocktail" rdfs:Literal="cocktail" >
    <c:kindof rdf:resource="cocktail://glassware/stem"  />
</rdf:Property>
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/cocktail" rdfs:Literal="cut stem cocktail" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/cocktail" rdfs:Literal="California cocktail" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/cocktail" rdfs:Literal="hot whiskey" />

<!-- cocktail glass, big -->
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/cocktail" rdfs:Literal="goblet" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/cocktail" rdfs:Literal="tall brandy" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/cocktail" rdfs:Literal="saucer champagne" />

<!-- sparkling wine glass -->
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/cocktail" rdfs:Literal="champagne" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/cocktail" rdfs:Literal="tall champagne" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/champagne" rdfs:Literal="champagne tulip" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/champagne" rdfs:Literal="champagne flute" >
    <c:kindof rdf:resource="cocktail://glassware/stem"  />
</rdf:Property>

<!-- big ballons -->
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/ballons" rdfs:Literal="water goblet" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/ballons" rdfs:Literal="beer goblet" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/ballons" rdfs:Literal="claret" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/ballons" rdfs:Literal="Ritz champagne" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/ballons" rdfs:Literal="wine" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/ballons" rdfs:Literal="wine" >
    <c:kindof rdf:resource="cocktail://glassware/stem"  />
</rdf:Property>

<!-- small ballons -->
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/ballons" rdfs:Literal="pony brandy" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/ballons" rdfs:Literal="pousse cafe" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/ballons" rdfs:Literal="creme de menthe" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/ballons" rdfs:Literal="hollow stem champagne" />
<rdf:Property rdf:type="cocktail://drinking/glass" rdf:about="cocktail://glassware/ballons" rdfs:Literal="sherry" >
    <c:kindof rdf:resource="cocktail://glassware/stem"  />
</rdf:Property>

<!-- bottles -->
<rdf:Property rdf:type="cocktail://bottles" rdf:about="cocktail://glassware/decanter" rdfs:Literal="decanter" />
<rdf:Property rdf:type="cocktail://bottles" rdf:about="cocktail://glassware/bitter/bottle" rdfs:Literal="bitter bottle" />
<rdf:Property rdf:type="cocktail://bottles" rdf:about="cocktail://glassware/bitter/bottle" rdfs:Literal="bitter bottle" />
<rdf:Property rdf:type="cocktail://bottles" rdf:about="cocktail://glassware/oilbottle" rdfs:Literal="oil bottle" />

<!-- Units -->
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/cl" rdfs:Literal="cl" c:factor="1" />
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/ml" rdfs:Literal="ml" c:factor="0.1"  />
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/l" rdfs:Literal="l" c:factor="100" />
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/ounce" rdfs:Literal="ounce" c:factor="3" />
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/ounce" rdfs:Literal="ounces" />
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/cup" rdfs:Literal="cup" c:factor="25" />
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/cup" rdfs:Literal="cups" />
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/quart" rdfs:Literal="quart" c:factor="120"  />
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/quart" rdfs:Literal="quarters"  />
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/bottle" rdfs:Literal="bottle" c:factor="72"  />
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/bottle" rdfs:Literal="bottles" />
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/gill" rdfs:Literal="gill" c:factor="15"  />
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/gill" rdfs:Literal="gills" />
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/pint" rdfs:Literal="pint" c:factor="60" />
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/pint" rdfs:Literal="pints" />
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/jigger" rdfs:Literal="jigger" c:factor="6" />
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/jigger" rdfs:Literal="jiggers" />
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/wineglass" rdfs:Literal="wineglass" c:factor="6" />
<rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/wineglass" rdfs:Literal="wineglasses" />
```

```
    <rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/pony" rdfs:Literal="pony" c:factor="3" />
    <rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/pony" rdfs:Literal="ponies" />
    <rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/pony" rdfs:Literal="pony glass" />
    <rdf:Property rdf:type="cocktail://unit/quantitative" rdf:about="cocktail://unit/pony" rdfs:Literal="pony glasses" />

    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/drop" rdfs:Literal="drop" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/drop" rdfs:Literal="drops" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/squirt" rdfs:Literal="squirts" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/squirt" rdfs:Literal="squirt" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/dash" rdfs:Literal="dash" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/dash" rdfs:Literal="dashes" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/tablespoon" rdfs:Literal="tablespoon" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/tablespoon" rdfs:Literal="tablespoons" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/teaspoon" rdfs:Literal="teaspoon" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/teaspoon" rdfs:Literal="teaspoons" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/piece" rdfs:Literal="piece" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/piece" rdfs:Literal="pieces" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/piece" rdfs:Literal="" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/slice" rdfs:Literal="slice" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/slice" rdfs:Literal="slices" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/leaf" rdfs:Literal="leaf" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/leaf" rdfs:Literal="leafs" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/leaf" rdfs:Literal="sprig" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/leaf" rdfs:Literal="sprigs" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/pinch" rdfs:Literal="pinch" />
    <rdf:Property rdf:type="cocktail://unit/qualitative" rdf:about="cocktail://unit/pinch" rdfs:Literal="pinches" />

</rdf:RDF>
```