CSE488: Ontologies and the Semantic web Project Report

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Contents

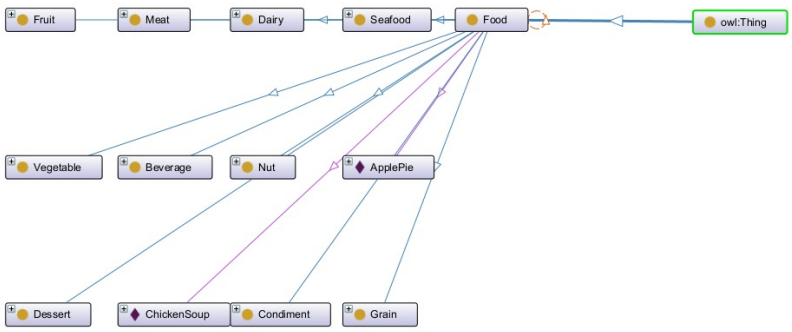
1 Description

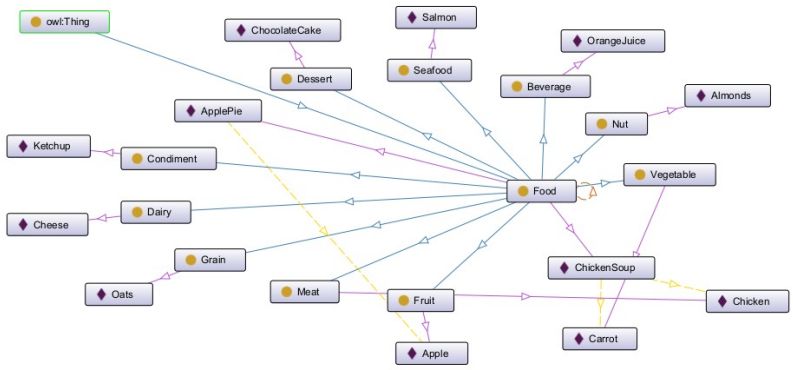
The provided RDF represents a food ontology that describes various food items and their nutritional properties. The ontology defines different classes such as Grain, Seafood, Dessert, Beverage, Condiment, and Nut, which serve as categories for the food items. Each food item is represented as an individual and has specific properties associated with it, such as protein content, sodium content, and calorie count.

The RDF provides a structured representation of the food ontology, allowing for the organization and categorization of food items based on their nutritional characteristics. It enables linking different food items to their respective classes and provides a standardized format for expressing their properties. By using RDF, it becomes possible to query and reason about the nutritional information of food items in a machine-readable manner, facilitating tasks such as dietary analysis, recipe generation, or food recommendation systems.

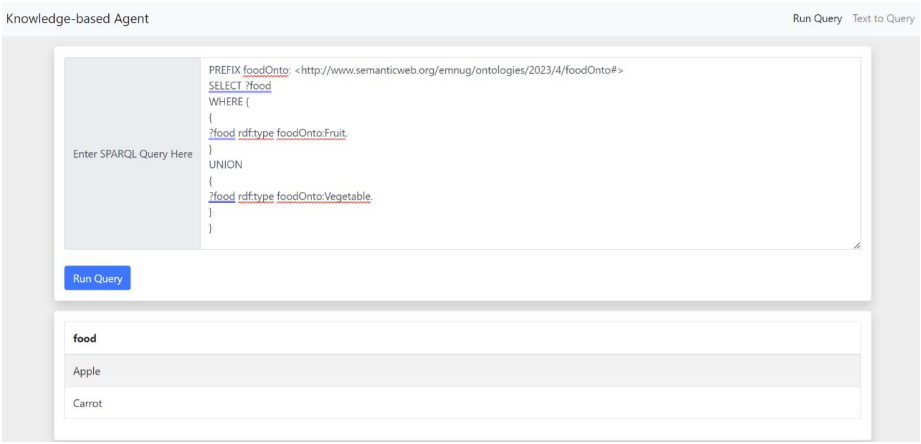
2 Screenshots

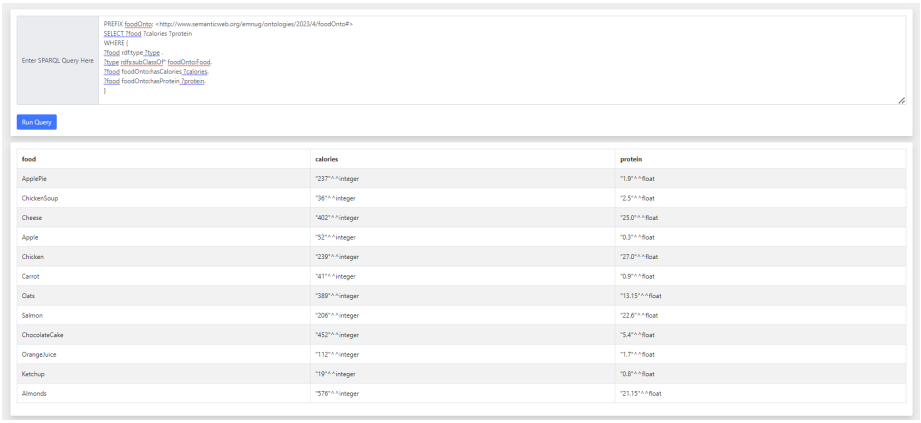
2.1 Protege



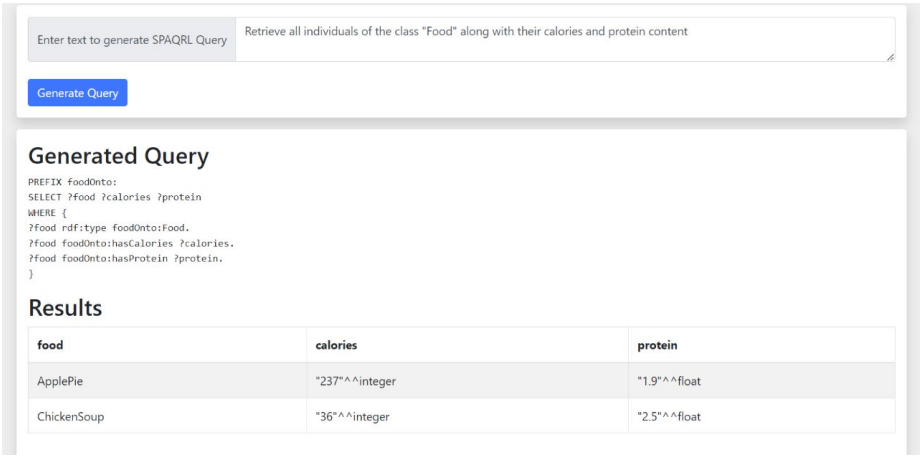

owl:Thing
ChocolateCake
Salmon
OrangeJuice
Dessert
Seafood
Beverage
Almonds
ApplePie
Nut
Ketchup
Condiment
Vegetable
Food
Dairy
Cheese
Grain
ChickenSoup
Oats
Meat
Fruit
Chicken
Carrot
Apple

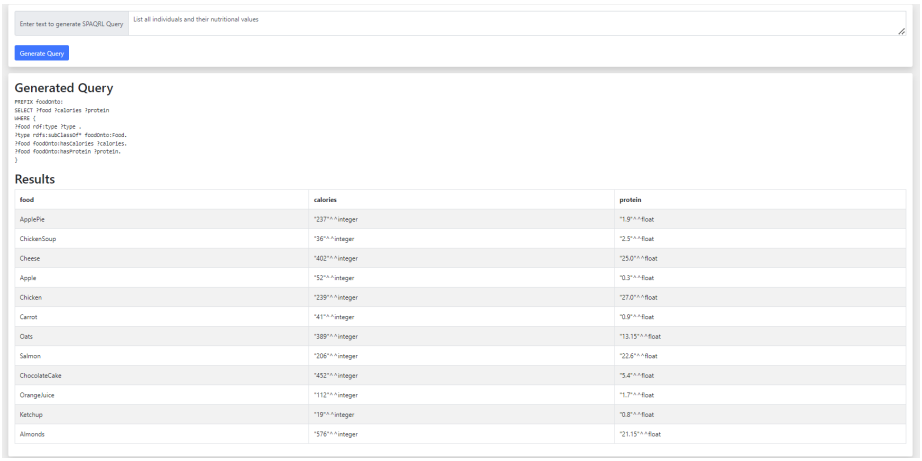
2.2 Web App


Knowledge-based Agent
Run Query
Text to Query
Enter SPARQL Query Here
PREFIX foodOnto: <http://www.semanticweb.org/emnug/ontologies/2023/4/foodOnto#>
SELECT ?food
WHERE {
{
?food rdf:type foodOnto:Fruit.
}
UNION
{
?food rdf:type foodOnto:Vegetable.
}
}
Run Query
food
Apple
Carrot


Enter SPARQL Query Here
Run Query
food
calories
protein
ApplePie
ChickenSoup
Cheese
Apple
Chicken
Carrot
Oats
Salmon
ChocolateCake
OrangeJuice
Ketchup
Almonds

2.3 Extra: Natural Language to SPARQL





3 SPARQL Queries

Note: all outputs where generated using the Web App.

3.1 Query 1

Retrieve all individuals of the class "Food" along with their calories and protein content:

```
PREFIX foodOnto: <http://www.semanticweb.org/emnug/ontologies/2023/4/foodOnto#>
SELECT ?food ?calories ?protein
WHERE {
?food rdf:type foodOnto:Food.
?food foodOnto:hasCalories ?calories.
?food foodOnto:hasProtein ?protein.
}
```

Output:

food	calories	protein
ApplePie	"237" integer	"1.9" float
ChickenSoup	"36" integer	"2.5" float

3.2 Query 2

Get all the ingredients of a specific food individual, along with their calories and protein content:

```
PREFIX foodOnto: <http://www.semanticweb.org/emnug/ontologies/2023/4/foodOnto#>
SELECT ?ingredient ?calories ?protein
WHERE {
foodOnto:ApplePie foodOnto:hasIngredient ?ingredient.
?ingredient foodOnto:hasCalories ?calories.
?ingredient foodOnto:hasProtein ?protein.
}
```

Output:

food	calories	protein
Apple	"52" integer	"0.3" float

3.3 Query 3

Retrieve all subclasses of the class "Food":

```
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX foodOnto: <http://www.semanticweb.org/emnug/ontologies/2023/4/foodOnto#>
SELECT ?subclass
WHERE {
?subclass rdfs:subClassOf foodOnto:Food.
}
```

Output:

subclass
Dairy
Fruit
Meat
Vegetable
Grain
Seafood
Dessert
Beverage
Condiment
Nut

3.4 Query 4

Find the total number of calories for a specific food individual and its ingredients:

```
PREFIX foodOnto: <http://www.semanticweb.org/emnug/ontologies/2023/4/foodOnto#>
SELECT (SUM(?calories) AS ?totalCalories)
WHERE {
{
foodOnto:ApplePie foodOnto:hasCalories ?calories.
}
UNION
{
foodOnto:ApplePie foodOnto:hasIngredient ?ingredient.
?ingredient foodOnto:hasCalories ?calories.
}
}
```

Output:

totalCalories
”289” integer

3.5 Query 5

Find all individuals that are ingredients of a specific food individual, along with their types:

```
PREFIX foodOnto: <http://www.semanticweb.org/emnug/ontologies/2023/4/foodOnto#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
SELECT ?ingredient ?type
WHERE {
foodOnto:ApplePie foodOnto:hasIngredient ?ingredient.
?ingredient rdf:type ?type.
}
```

Output:

ingredient	type
Apple	NamedIndividual
Apple	Fruit

3.6 Query 6

Retrieve all individuals that belong to the classes "Fruit" and "Vegetable":

```
PREFIX foodOnto: <http://www.semanticweb.org/emnug/ontologies/2023/4/foodOnto#>
SELECT ?food
WHERE {
{
?food rdf:type foodOnto:Fruit.
}
UNION
{
?food rdf:type foodOnto:Vegetable.
}
}
```

Output:

food
Apple
Carrot

3.7 Query 7

Find all food individuals that have a protein content greater than 20 grams:

```
PREFIX foodOnto: <http://www.semanticweb.org/emnug/ontologies/2023/4/foodOnto#>
SELECT ?food ?protein
WHERE {
?food rdf:type foodOnto:Food.
?food foodOnto:hasProtein ?protein.
FILTER (?protein > 20)
}
```

Output:

food	protein

3.8 Query 8

Retrieve the average calories and protein content of all food individuals:

```
PREFIX foodOnto: <http://www.semanticweb.org/emnug/ontologies/2023/4/foodOnto#>
SELECT (AVG(?calories) AS ?avgCalories) (AVG(?protein) AS ?avgProtein)
WHERE {
```

```
?food rdf:type foodOnto:Food.
?food foodOnto:hasCalories ?calories.
?food foodOnto:hasProtein ?protein.
}
```

Output:

avgCalories	avgProtein
"136.5" decimal	"2.2" double

3.9 Query 9

Count the total number of ingredients for a specific food individual:

```
PREFIX foodOnto: <http://www.semanticweb.org/emnug/ontologies/2023/4/foodOnto#>
SELECT (COUNT(?ingredient) AS ?ingredientCount)
WHERE {
foodOnto:ApplePie foodOnto:hasIngredient ?ingredient.
}
```

Output:

ingredientCount
"1" integer

3.10 Query 10

Retrieve all food individuals along with their calorie and protein content:

```
PREFIX foodOnto: <http://www.semanticweb.org/emnug/ontologies/2023/4/foodOnto#>
SELECT ?food ?calories ?protein
WHERE {
?food rdf:type foodOnto:Food.
?food foodOnto:hasCalories ?calories.
?food foodOnto:hasProtein ?protein.
}
```

Output:

food	calories	protein
ApplePie	"237" integer	"1.9" float
ChickenSoup	"36" integer	"2.5" float

3.11 Query 11

Find all food individuals that have a specific ingredient:

```
PREFIX foodOnto: <http://www.semanticweb.org/emnug/ontologies/2023/4/foodOnto#>
SELECT ?food
WHERE {
?food rdf:type foodOnto:Food.
?food foodOnto:hasIngredient foodOnto:Apple.
}
```

Output:

food
ApplePie

3.12 Query 12

Get the maximum calorie content among all food individuals:

```
PREFIX foodOnto: <http://www.semanticweb.org/emnug/ontologies/2023/4/foodOnto#>
SELECT (MAX(?calories) AS ?maxCalories)
WHERE {
?food rdf:type foodOnto:Food.
?food foodOnto:hasCalories ?calories.
}
```

Output:

maxCalories
"237" integer