The University of Texas at El Paso
Dr. Villuanueva
Assignment 2
Team 11 - Pied Piper
Meats & Plants

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Introduction

In our world there are a huge amount of sources of contamination and when it seems we found a solution for one, somehow we find a new way to contaminate even more. Amongst some of the most overlooked sources of contamination we have the production of meat, which comes with a lot of down grades when it comes to producing all the meat that we consume as a necessity of survival of the human body. Since our bodies need a certain percentage of protein, other alternatives were found to replace the meat consumption as we know it and replace it with a more eco-friendly solution.

As we study these alternatives, we seek to gather data to compare the differences between the meat production and the plant-based products developed to replace the emissions that these produce. We as a team think it is important to let the people know the effects the consumption of meat produce and provide data to compare viable solutions, such as plant-based products, that could lead to a better environment.

Some of the main issues we encounter with the sources could be traced to being incomplete information, since not many people know that the production of animal meat is harming our planet in different ways. Luckly, plan-based products are a growing industry and keep providing information that will help us create awareness. Another challenge we encounter with our collection of data from our sources is the lack of knowledge on the industry of meat. This is a challenge because we don’t know where to pull data from since we don’t know if we can trust the sites we find. Although we

encounter some challenges that may slow our progress, we dedicate time to learn more about both industries so that we can trust the data obtained.

Statistical Perspective

- Will allow the development of models which will help us analyze the data obtained of the emission that the production of meat produce and verify the veracity of it
- Some measurable examples can be the observation of the changing emissions in the world (through numbers) and how the increase or decrease of cattle growth influenced

Human Perspective

- Decide the data appropriate to analyze pertaining to the pollution
- Analyze the appropriate models to analyze the data of emissions produced by meat production
- Exploring and visualizing the data we will work with
- Always communicate the results of the analyses

Computational Perspective

- Models being implemented to see how the data pertaining to Animal Meat and Plant-based Meat affects the environment.

Statistical - Computational Perspective

- It's necessary to have an understanding of the statistical models to implement these computational algorithms of the statistical methods to understand the creation of emissions through the production of the meat

Statistical - Human Perspective

- Visualize all the statistical data so that we can observe where we're aiming to work, such as food chains and the production of meat, independently of the type.

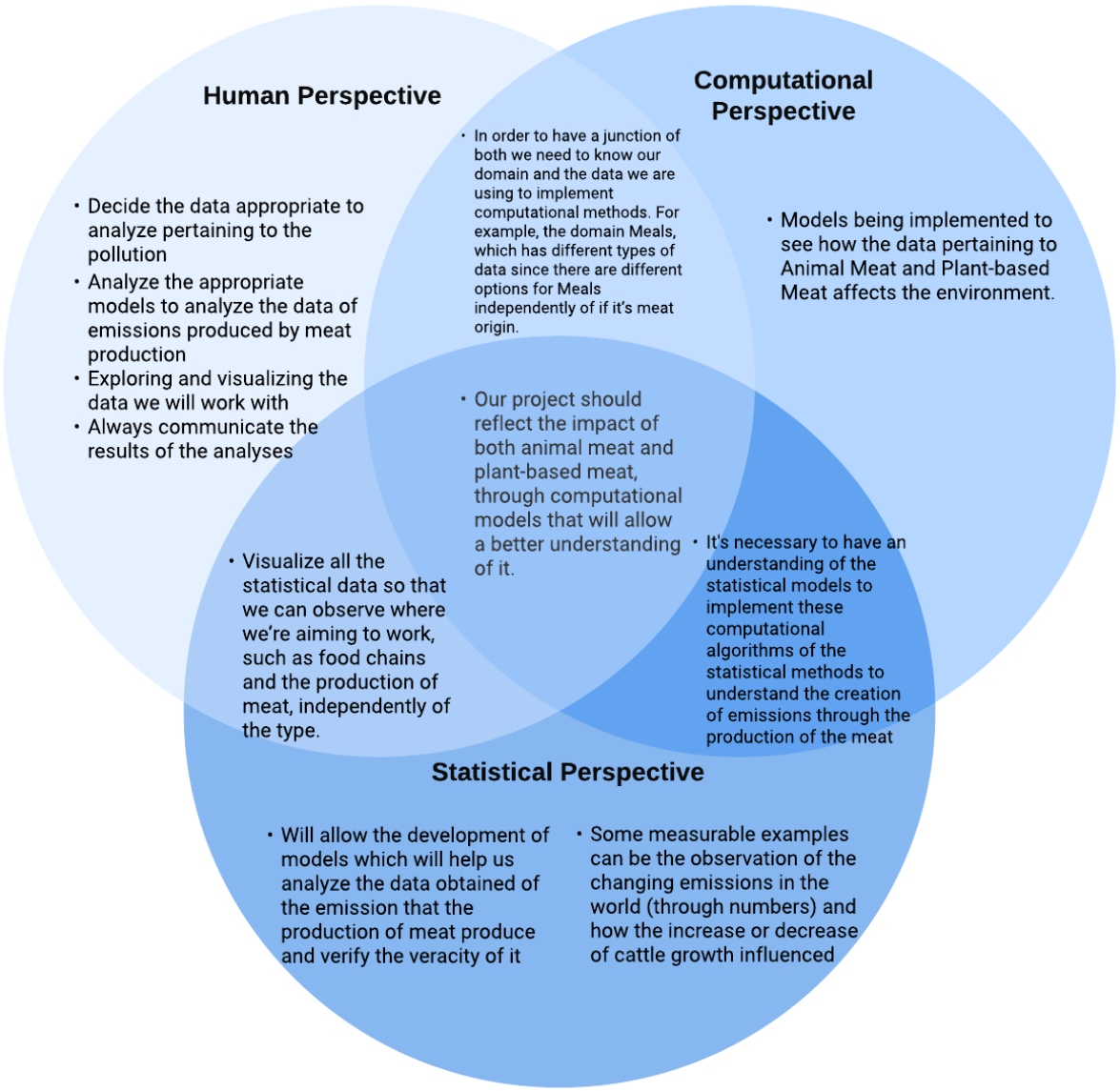
Computational - Human Perspective

- In order to have a junction of both we need to know our domain and the data we are using to implement computational methods. For example, the domain Meals, which has different types of data since there are different options for Meals independently of if it's meat origin.

Statistical - Computational - Human Perspective

- Our project should reflect the impact of both animal meat and plant-based meat, through computational models that will allow a better understanding of it.

Alex Avila–Betza Avalos–Eduardo Garcia



FAIR PRINCIPLES

Findable

- In order to reuse the data we need to make it easy to be found. Since we as humans sometimes will look into it to interpret the data or to analyze the metadata, these resources shouldn't only be accessible by a computer, but it is important to make it readable for the machines so that it is easier to be found.

Accessible

- The data should always be able to be accessed by anyone. They should always know that this data or metadata (in case we don't have data any longer) can be accessed, which in some cases might need authentication or authorization from the owner of these datasets.

Interoperable

- Although data or metadata is focused in a certain field, it should always be able to interact with other datasets in order to make it applicable when analysis comes.

Reusable

- The goal of data is not to stay within a analysis or a conducted research, but it should be able to be gathered and used again so when the time comes to use it in a different setting it doesn't need to be regathered.

Project Scope

Determine the difference in plant based foods pollution vs meat based foods pollution based on the production industry and the benefits that they both have.

a. The purpose of your project, including who will use it, etc
    - Our project has the objective of analyzing as much data as there is on the network pertaining to the emissions of the production of both Animal Meat and Plant-based Meat. It will be used as a way of making awareness of the impact we do as a society when consuming Animal Meat and with an effort of reaching people that could make a change in some way or another.
b. The domain you will describe, e.g., the "mini-world" modeled by your projects.
    - Our project will show data that describes the impact of a regular patty compared to a plant-based patty. We will show how big of an impact food chains, such as Whataburger, can have in our daily life regardless of our consumption.
c. The key data, models, and tools used in your project.

- Key Data: Food, Meat, Vegan, CO2perGram
- Models: RDFS, OWL (for the moment)
- Tools: Protégé, SPARQL, DBpedia

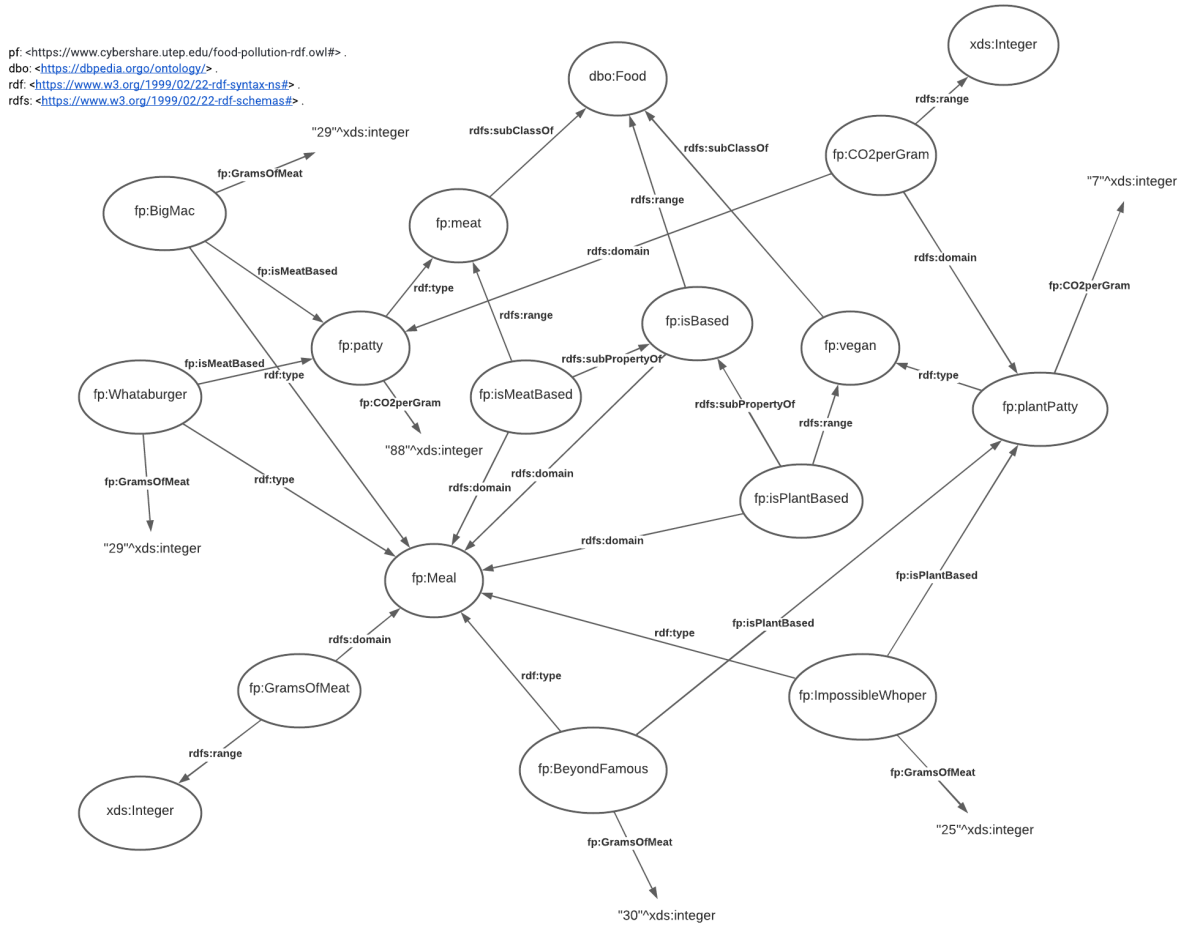
d. If applicable, information that will be out of scope of your project.
   - Some information we could be looking at are the prices that each of these products are ranging. Also we will be looking at the nutritional benefits that these products have to see the impact it does directly to us.

Competency Questions

1. What is the amount of CO2 that certain types of meat based foods produce?
2. What is the amount of CO2 that certain types of plant based foods produce?
3. Which meals produce 50 CO2 per gram?
4. How many meals pollute at a high level(>=1000 CO2perMeal)?
5. How many meals pollute at a low level(<1000 CO2perMeal)?
6. Which meat-based meals pollute at the low level(<1000 CO2perMeal)?
7. What are the vegan food options that are made of meat meals?
8. What are the meal food options that are made of meat meals?
9. What foods contain less than a certain amount of grams (e.g. 30 grams) of ‘meat’?
10. What is the average pollution of plant based meals?

Concept Map

Our information for the instances in the following food places were gather from [4] and the information about pollution was gather from [3]
[Insert Lucid Chart document here]



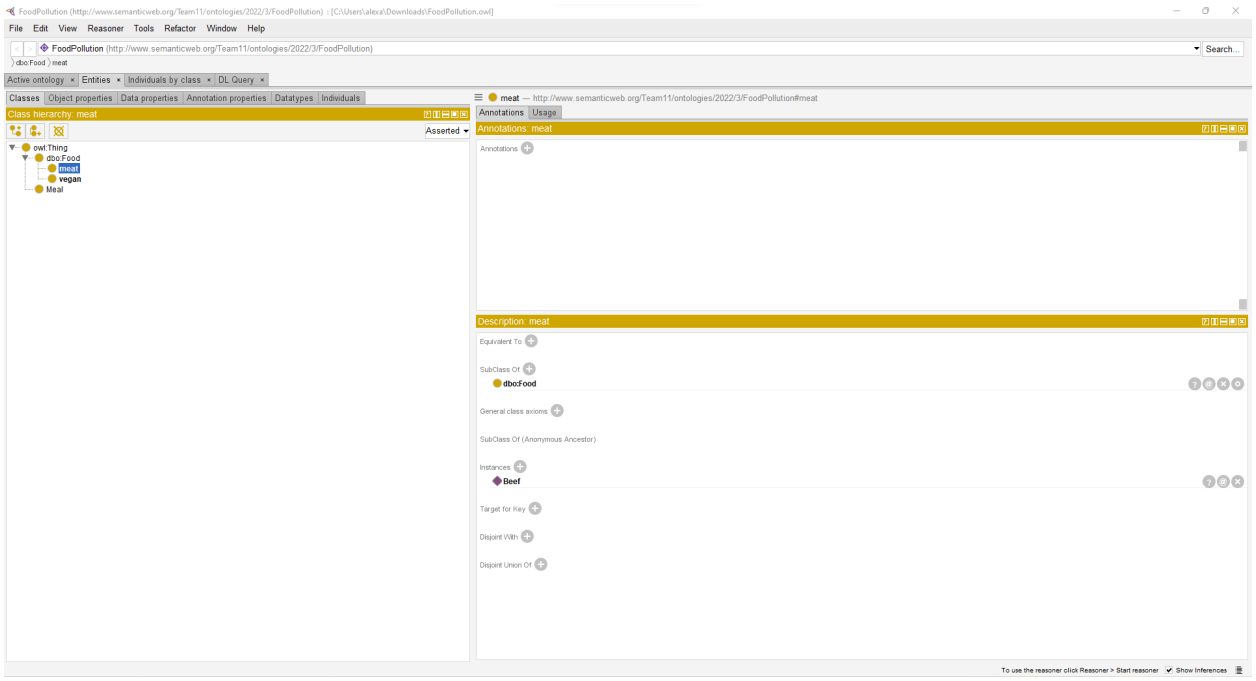
RDF

```
@base <https://www.cybershare.utep.edu/food-pollution-rdf.owl> .
@prefix fp: <https://www.cybershare.utep.edu/food-pollution-rdf.owl#> .
@prefix dbo: <https://dbpedia.orgo/ontology/> .
@prefix rdf: <https://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <https://www.w3.org/1999/02/22-rdf-schemas#> .

fp:meat rdfs:isSubClassOf dbo:Food .
fp:vegan rdfs:isSubClassOf dbo:Food .

fp::meal rdf:type rdfs:Class .

fp:CO2perGram rdf:type rdf:Property .
fp:CO2perGram rdfs:domain fp:patty .
```

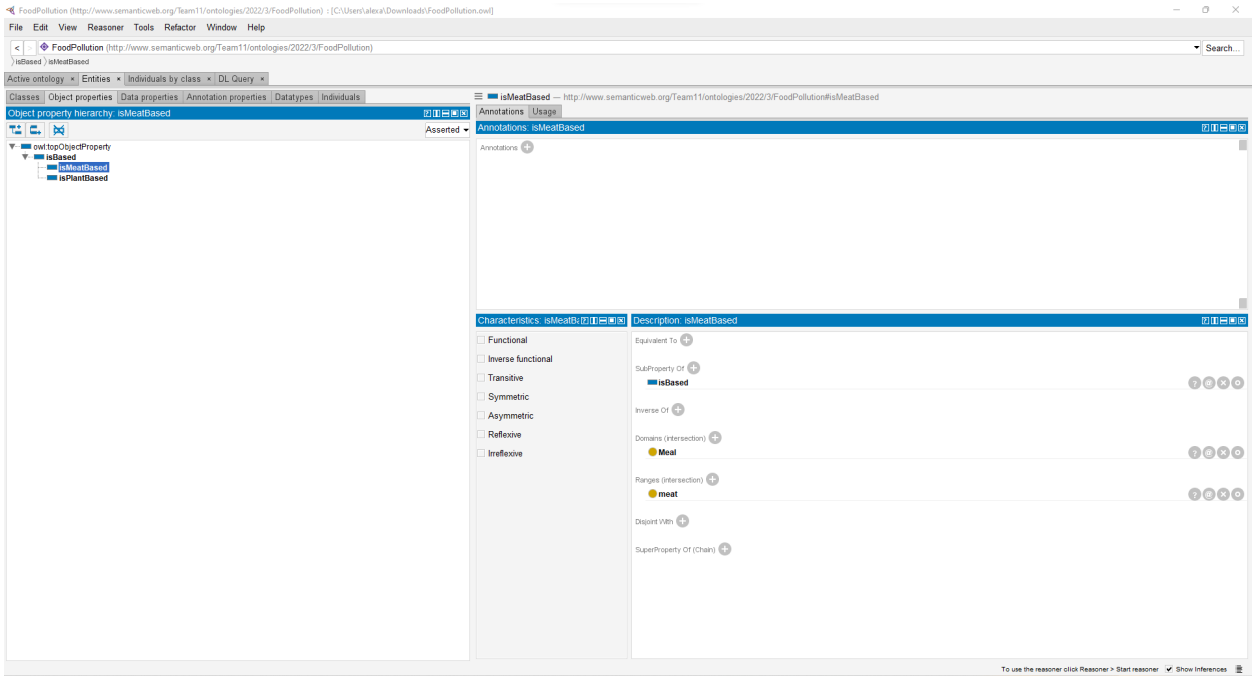
```
fp:CO2perGram rdfs:domain fp:plantPatty .
fp:CO2perGram rdfs:range xds:integer .

fp:isBased rdf:type rdf:Property .
fp:isPlantBased rdfs:range dbo:Food .
fp:isPlantBased rdfs:domain fp:Meal .

fp:isPlantBased rdf:type rdf:Property .
fp:isPlantbased rdfs:subPropertyOf fp:isBased .
fp:isPlantBased rdfs:range fp:meal .
fp:isPlantBased rdfs:domain dbo:vegan .

fp:isMeatBased rdf:type rdf:Property .
fp:isMeatBased rdfs:subPropertyOf fp:isBased .
fp:isMeatBased rdfs:range fp:meal .
fp:isMeatBased rdfs:domain dbo:meat .

fp:GramsOfMeat rdf:type rdf:Property .

fp:patty rdfs:type dbo:meat .
fp:patty fp:CO2perGram "88"^xds:integer .

fp:plantPatty rdfs:type dbo:meat .
fp:plantPatty fp:CO2perGram "7"^xds:integer .

fp:impossibleBurger rdf:type dbo:vegan .

fp:ImpossibleWhopper rdf:type fp:meal .
fp:ImpossibleWhopper fp:isPlantBased fp:plantPatty .
fp:ImpossibleWhopper fp:GramsOfMeat "25"^xds:integer .

fp:BeyondFamous rdf:type fp:meal .
fp:BeyondFamous fp:isPlantBased fp:plantPatty .
fp:BeyondFamous fp:GramsOfMeat "30"^xds:integer .

fp:BigMac rdf:type fp:meal .
fp:BigMac fp:isPlantBased fp:patty .
fp:BigMac fp:GramsOfMeat "29"^xds:integer .

fp:Whataburger rdf:type fp:meal .
fp:Whataburger fp:isMeatBased fp:patty .
fp:Whataburger fp:GramsOfMeat "29"^xds:integer .
```

OWL

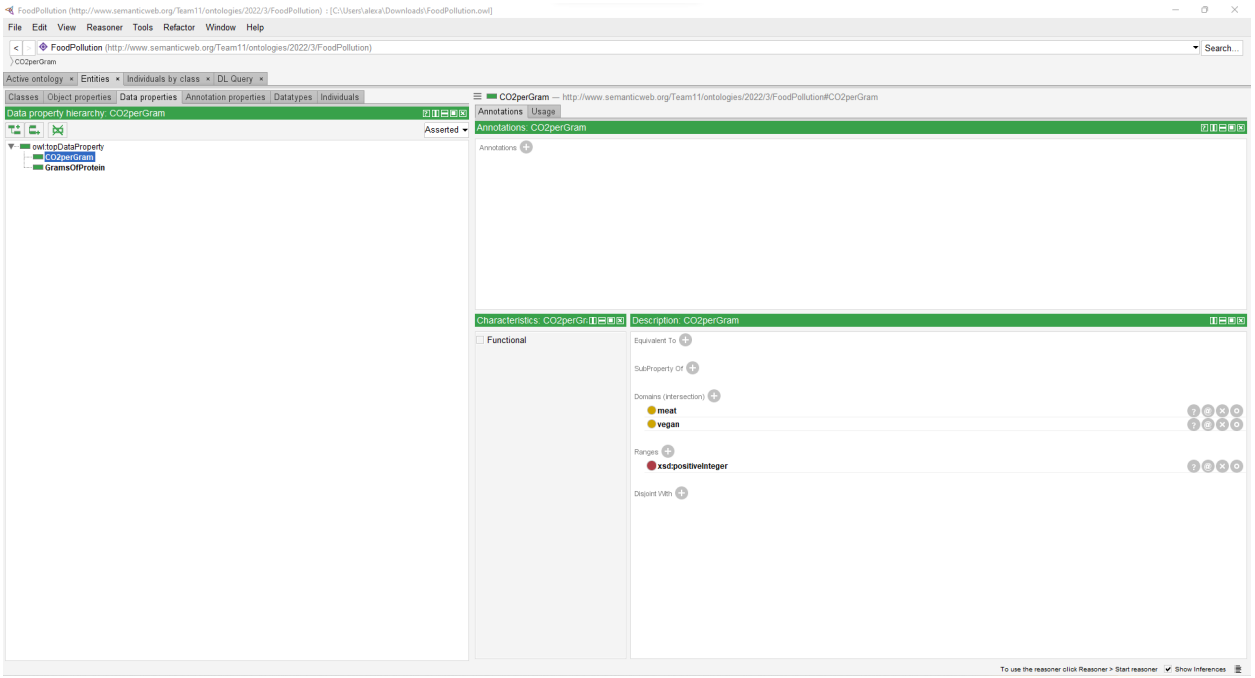
Classes



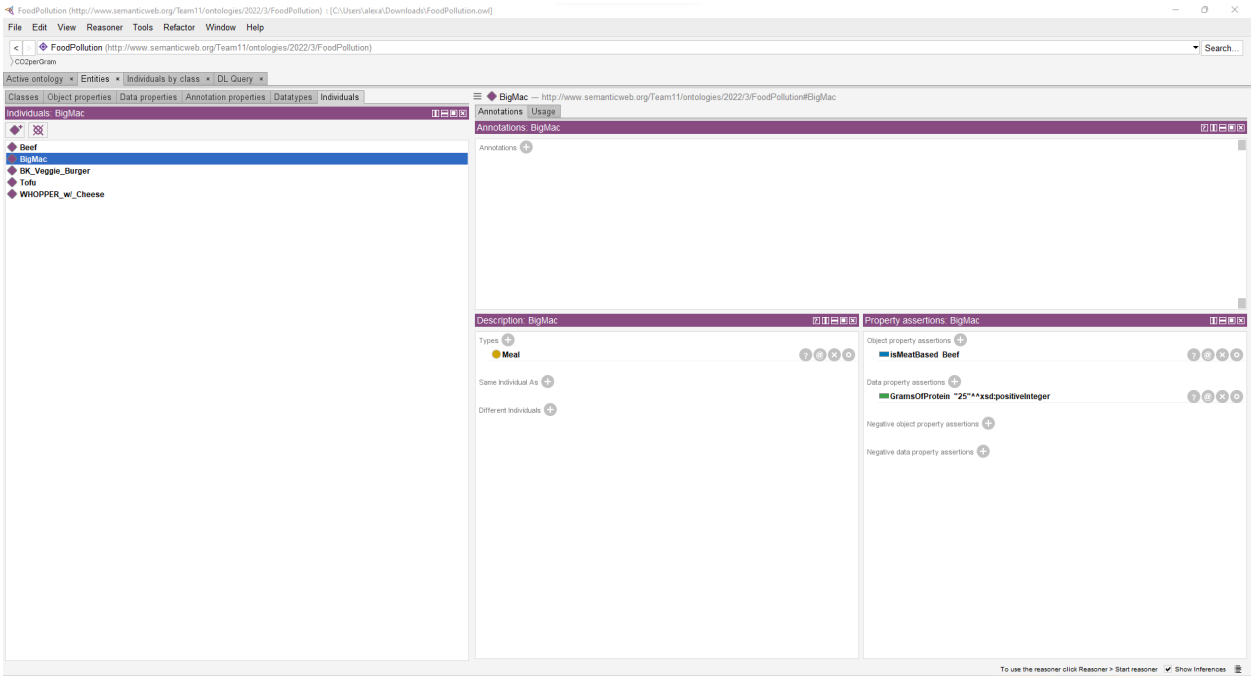
Object Properties



Data Properties



Individuals



Question Answering

1. What is the amount of CO2 that certain types of meat based foods produce?

```
SELECT ?pollution
WHERE
{
fp:patty fp:CO2perGram ?pollution
}
```

Result

pollution
88

2. What is the amount of CO2 that certain types of plant based foods produce?

```
SELECT ?pollution
WHERE
{
fp:plantBased fp:CO2perGram ?pollution
}
```

Result

pollution
7

3. What are the most contaminating meals?

```
SELECT ?food ?grams*?co2 as ?pollution
WHERE
{
?food fp:GramsOfMeat ?grams
?food fp:isBased ?typeOfmeat
?typeOfmeat CO2perGram ?co2
```

}ORDER BY DESC(?pollution)

Result

food	**pollution**
fp:BigMac	2552
fp:Whataburger	2552
fp:BeyondFfamous	210
fp:ImpossibleWhopper	175

4. How much CO2 do you contaminate by eating meat based foods?

```
SELECT ?food ?grams*?co2 as ?pollution
WHERE
{
?food fp:GramsOfMeat ?grams
?food fp:isMeatBased ?typeOfmeat
?typeOfmeat CO2perGram ?co2
}
```

Result

food	**pollution**
fp:BigMac	2552
fp:Whataburger	2552

5. How much CO2 do you contaminate by eating plant based foods?

```
SELECT ?food ?grams*?co2 as ?pollution
WHERE
{
?food fp:GramsOfMeat ?grams
?food fp:isPlantBased ?typeOfmeat
?typeOfmeat CO2perGram ?co2
```

}

Result

food	**pollution**
fp:ImpossibleWhopper	175
fp:BeyondFamous	210

6. How many grams of CO2 does each meal contaminate?

```
SELECT ?food ?grams*?co2 as ?pollution
WHERE
{
?food fp:GramsOfMeat ?grams
?food fp:isBased ?typeOfmeat
?typeOfmeat CO2perGram ?co2
}
```

Result

food	**pollution**
fp:BigMac	2552
fp:Whataburger	2552
fp:ImpossibleWhopper	175
fp:BeyondFamous	210

7. What are the vegan food options that are made of meat meals?

```
SELECT ?food
WHERE
{
?food fp:isPlantBased fp:vegan
}
```

Result

food
fp:BigMac
fp:Whataburger
fp:ImpossibleWhopper
fp:BeyondFamous

8. What are the meal food options that are made of meat meals?

```
SELECT ?food
WHERE
{
?food fp:isMeatBased fp:meat
}
```

Result

food
fp:BigMac
fp:Whataburger

9. What foods contain less than a certain amount of grams (e.g. 30 grams) of ‘meat’?

```
SELECT ?food ?grams
WHERE
{
?food fp:GramsOfMeat ?grams
FILTER(?grams < 30)
}
```

food	grams
fp:BigMac	29
fp:Whataburger	29
fp:ImpossibleWhopper	25

10. What is the average pollution of plant based meals?

```
SELECT AVG(?pollution) as ?average_pollution
WHERE
{
?food fp:GramsOfMeat ?grams
?food fp:isPlantBased ?typeOfmeat
?typeOfmeat CO2perGram ?co2
}
```

average_pollution
192.5

Reasoning

For this RDF we need to use information from many different places in order to make it useful information and that we can gather something from it. For example we use rule rdfs5 when using the property of pf:IsMade it has the meaning that a food is made of something either vegan food or meat food or in other words fp:Meal fp:isBased dbo:Food, then this property has another two properties that are subproperties of this one fp:isMeatBased and fp:isPlantBased, both of these are made to be kind of disjoint attributes if a meal is meat based it was to point to a meat food while if it is plant based

it has to point to a vegan food but either way we know that both of these are fp:isBased and that is helpful to make queries that query all types of food.

There are many examples of these rules like the sub classes and types like patty being of type meat and meat being of subClass Food infers that patty is of type food by rule rdfs9 and there many others that makes the query of these classes way easier otherwise we would have to define everything ourselves.

RDF Rules

Rule 9 is defined as:

If x rdfs:subClassOf y
and z rdf:type x
then z is rdf:type y .

y=Food
x=meat
z=patty
z is of type Meat
z is of type Food

Another rule our RDF uses is rule 7. With the isBased property and the isMeatBased property.

If a rdfs:subPropertyOf b
and x a y.
then x b y .

b=isBased
a=isMeatBased
x=whataburger
y=patty

We can say whataburger isBased patty.

Automatically Populating your Ontology

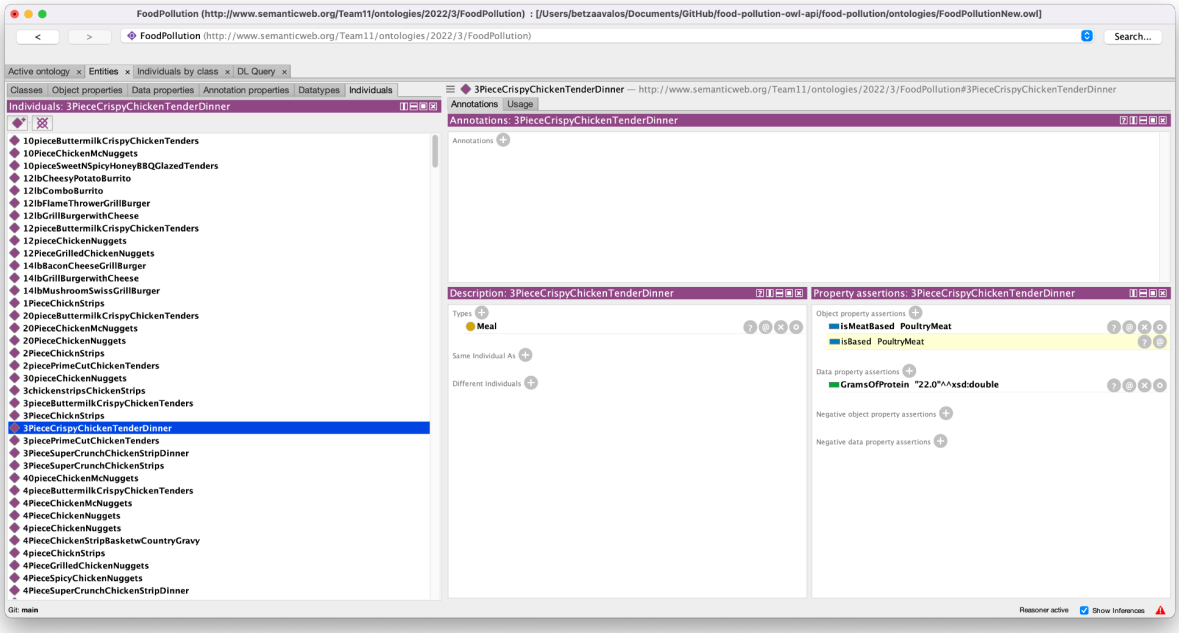


Figure 1.1

restaurant	item	calories	cal_fat	total_fat	sat_fat	trans_fat	cholesterol	sodium	total_carb	fiber	sugar	protein	vit_a	vit_c	calcium	salad
Sonic	Veggie Burger W/ Ketchup	450	130	14	4	0	10	1410	67	5	11	15	6	8	25	Other
Sonic	Veggie Burger With Mustard	450	130	14	4	0	10	1350	64	5	8	15	6	8	27	Other
Sonic	Veggie Burger W/ Mustard	450	130	14	4	0	10	1300	64	5	8	15	6	8	25	Other
Sonic	Grilled Asiago Caesar Chicken Club Sandwich	610	270	30	7	0	110	1570	44	3	8	40	11	20	16	Other
Sonic	Crispy Asiago Caesar Chicken Club Sandwich	680	350	39	9	0	80	1120	53	4	7	31	11	7	16	Other
Sonic	Grilled Chicken Sandwich	430	180	20	4	0	80	940	33	2	6	28	6	8	10	Other
Sonic	Crispy Chicken Sandwich	570	300	33	5	0	45	1060	47	4	6	23	6	8	10	Other
Sonic	Chicken Strip Sandwich	450	220	24	4	0	35	740	43	1	4	19	0	0	4	Other
Sonic	3 Piece Crispy Chicken Tender Dinner	280	130	14	2.5	0	0	800	16	0	0	22	NA	NA	NA	Other
Sonic	5 Piece Crispy Chicken Tender Dinner	470	220	24	4.5	0	0	1340	26	0	0	37	NA	NA	NA	Other
Sonic	Deluxe Ultimate Chicken Sandwich	740	350	39	8	0	90	1550	63	4	12	33	10	8	15	Other
Sonic	Buffalo Dunked Ultimate Chicken Sandwich	1000	550	61	12	0.5	125	4520	70	5	12	23	NA	NA	NA	Other
Sonic	Garlic Parmesan Dunked Ultimate Chicken Sandwich	1350	900	100	17	0	190	2180	69	4	10	23	NA	NA	NA	Other
Sonic	Small Jumbo Popcorn Chicken	380	190	22	4	0	45	1250	27	3	1	18	0	0	2	Other
Sonic	Large Jumbo Popcorn Chicken	560	290	32	6	1	65	1890	41	5	2	27	0	0	4	Other
Sonic	Small Spicy Jumbo Popcorn Chicken	350	150	17	3	0	45	860	30	2	0	21	10	0	2	Other
Sonic	Large Spicy Jumbo Popcorn Chicken	610	270	30	5	0	80	1500	51	3	0	36	17	0	3	Other
Sonic	3 Piece Super Crunch Chicken Strip Dinner	970	410	46	8	1	55	2160	109	7	9	30	1	6	13	Other
Sonic	4 Piece Super Crunch Chicken Strip Dinner	1080	460	51	9	1	75	2390	118	8	9	37	1	7	13	Other

Figure 1.2

food_produc	land_use_ch	animal_feed	farm	processing	transport	packging	retail
Wheat & Rye	0.1	0	0.8	0.2	0.1	0.1	0.1
Maize (Meal	0.3	0	0.5	0.1	0.1	0.1	0
Barley (Beer	0	0	0.2	0.1	0	0.5	0.3
Oatmeal	0	0	1.4	0	0.1	0.1	0
Rice	0	0	3.6	0.1	0.1	0.1	0.1
Potatoes	0	0	0.2	0	0.1	0	0
Cassava	0.6	0	0.2	0	0.1	0	0
Cane Sugar	1.2	0	0.5	0	0.8	0.1	0
Beet Sugar	0	0	0.5	0.2	0.6	0.1	0
Other Pulses	0	0	1.1	0	0.1	0.4	0
Peas	0	0	0.7	0	0.1	0	0
Nuts	-2.1	0	2.1	0	0.1	0.1	0
Groundnuts	0.4	0	1.4	0.4	0.1	0.1	0
Soymilk	0.2	0	0.1	0.2	0.1	0.1	0.3
Tofu	1	0	0.5	0.8	0.2	0.2	0.3
Soybean Oil	3.1	0	1.5	0.3	0.3	0.8	0
Palm Oil	3.1	0	2.1	1.3	0.2	0.9	0
Sunflower O	0.1	0	2.1	0.2	0.2	0.9	0
Rapeseed Oi	0.2	0	2.3	0.2	0.2	0.8	0
Olive Oil	-0.4	0	4.3	0.7	0.5	0.9	0
Tomatoes	0.4	0	0.7	0	0.2	0.1	0
Onions & Lee	0	0	0.2	0	0.1	0	0
Root Vegeta	0	0	0.2	0	0.1	0	0
Brassicas	0	0	0.3	0	0.1	0	0

Figure 1.3

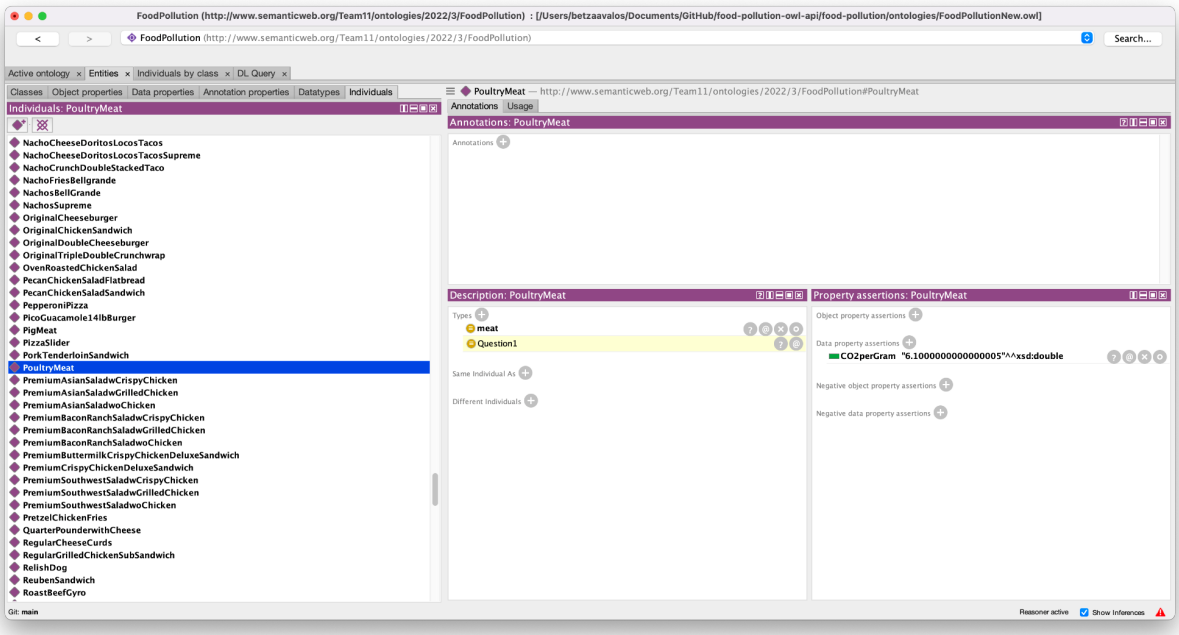


Figure 1.4

We started by mapping the instances of our datasets to the *item* column (fastfood.csv) and the *food_product* column (ghg_emissions_by_life… .csv). As shown above in Figure 1.2 the yellow highlighted entry where we have the name “3 Piece Crispy Chicken Tender Dinner”, so on our ontology (Figure 1.1) we have it added as “3PieceCrispyChickenTenderDinner”. Now for our project purposes we only need another column from *fastfood.csv* so that we know the

amount of meat or plant based products used in grams to know how much pollution is being created from these. In our dataset we have the column *protein* which we pulled and mapped to our data property “GramsOfProtein” which translates to a double for now, and as we can see on our previous example the “22” value was translated to “GramsOfProtein “22.0”^^xsd:double”. After that we had to map the *food_product* column to create instances of each product that contained words related to our project, such as Tofu, Beef, Poultry(Chicken), etc. Then for those meals we added up all the values of each instance to see how much “CO2perGram” was generated. We mapped this addition by assigning it as a data property. Finally we had a couple of object properties which were assigned based on the type of words that the instances contained in their names, for example, on Figure 1.1 we see that it has been assigned an object property isMeatBased to the instance “PoultryMeat”, which we can see in Figure 1.4.

Interface

The interface for our project will be a catalog of foods that the users will be able to see information about each Meal from the fast food restaurants that we found information about. Each Meal will be store in a card and the catalog will include the functionality to filter and sort by its different attributes allowing the users to easily navigate through the catalog.

The data from our catalog uses CSV information that we got from [3] and [4].

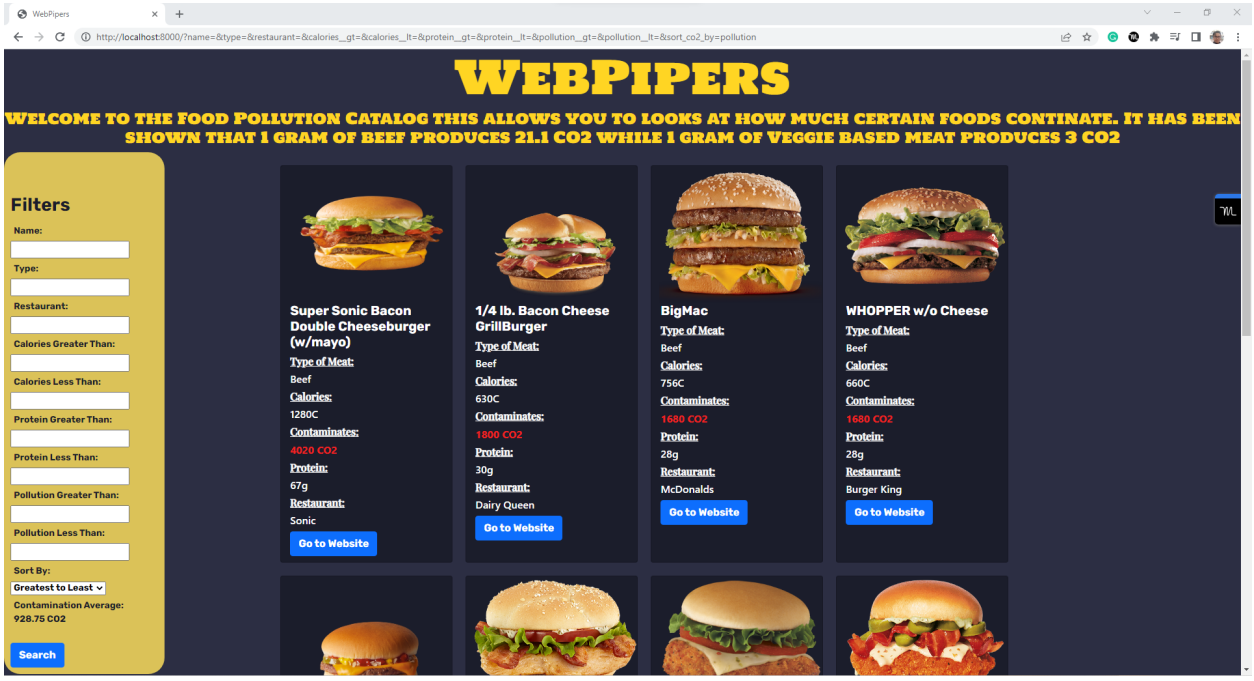
We decided to use a website that will hosted in: http://foodpollution.pythonanywhere.com/
Github: https://github.com/Web-Pipers/food-pollution

Our interface will answer the competency questions as follows:

1. What is the amount of CO2 that certain types of meat based foods produce?
   Our description of the website gives an inside of how much CO2 meat based foods produce[3]

2. What is the amount of CO2 that certain types of plant based foods produce?
   Our description of the website gives an inside of how much CO2 plant based foods produce[3]

3. What are the most contaminating meals?
   The user can sort pollution from greatest to least to see the most contamination meals at the top



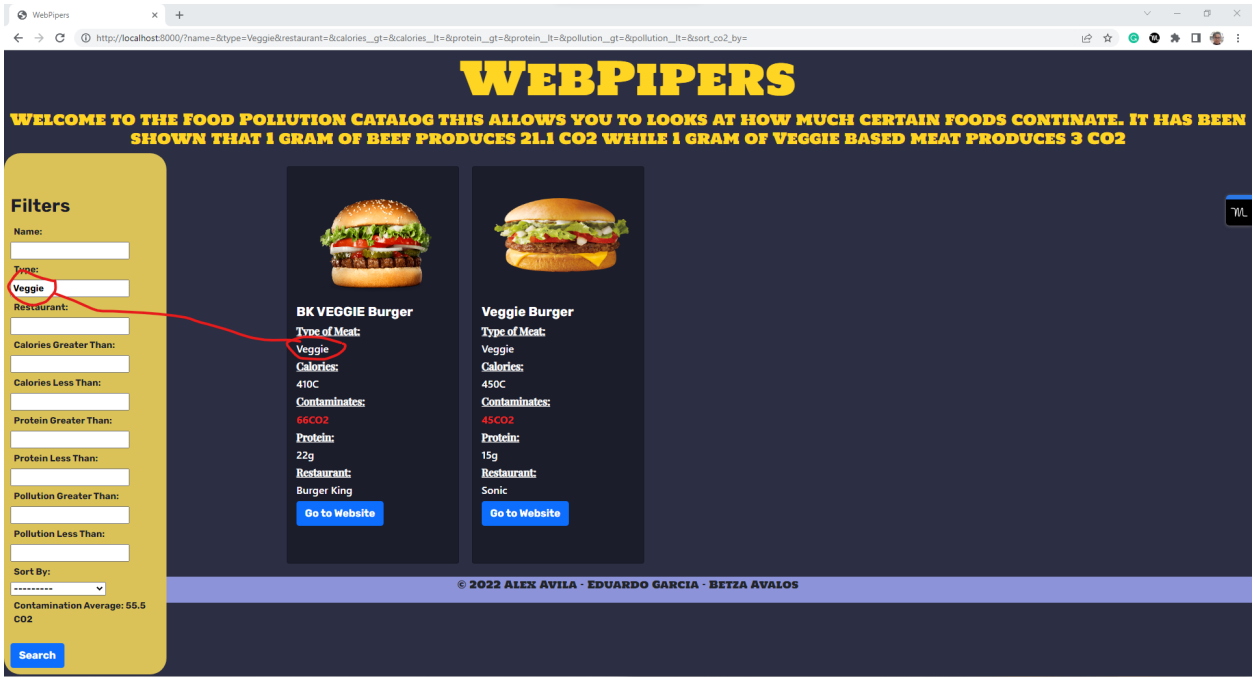
4. How much CO2 do you contaminate by eating meat based foods?

The user can check how much they contaminate by looking at the contaminate property and type of the meal

5. How much CO2 do you contaminate by eating plant based foods?
   The user can check how much they contaminate by looking at the contaminate property and type of the meal

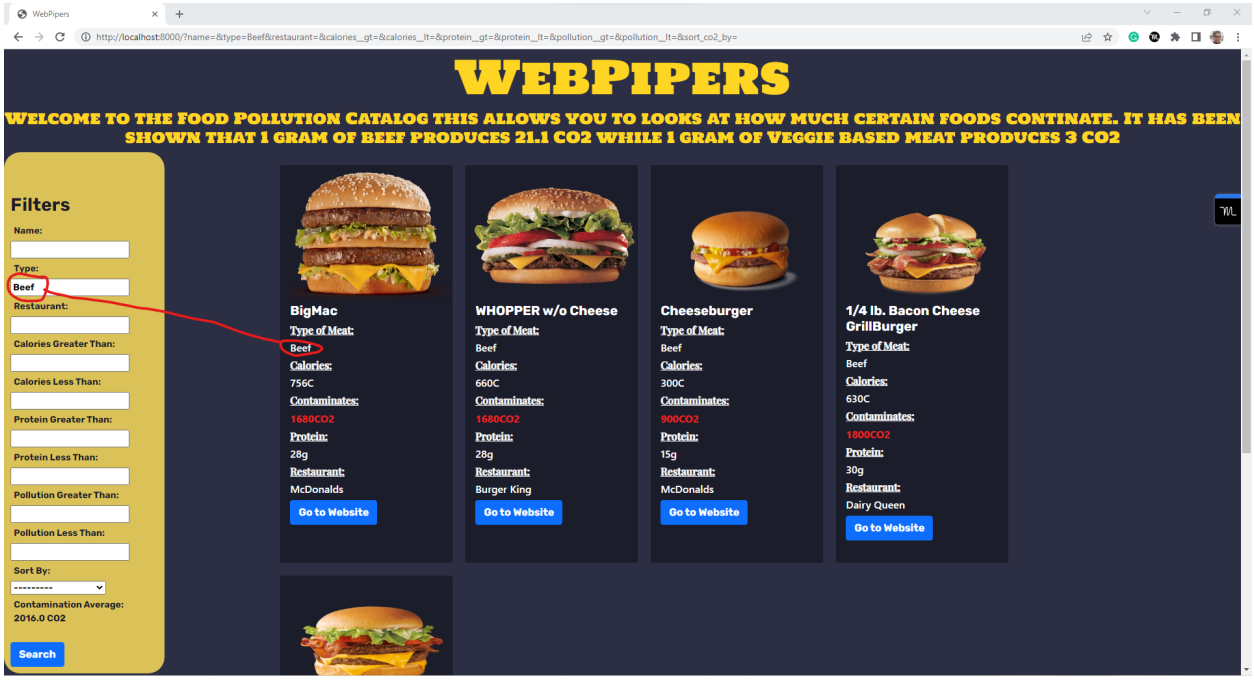
6. How many grams of CO2 does each meal produce?
   The user can see any meal to see how much CO2 they produce

7. What are the vegan food options that are made of meat meals?
   Filtering by veggie shows the different plant based burgers

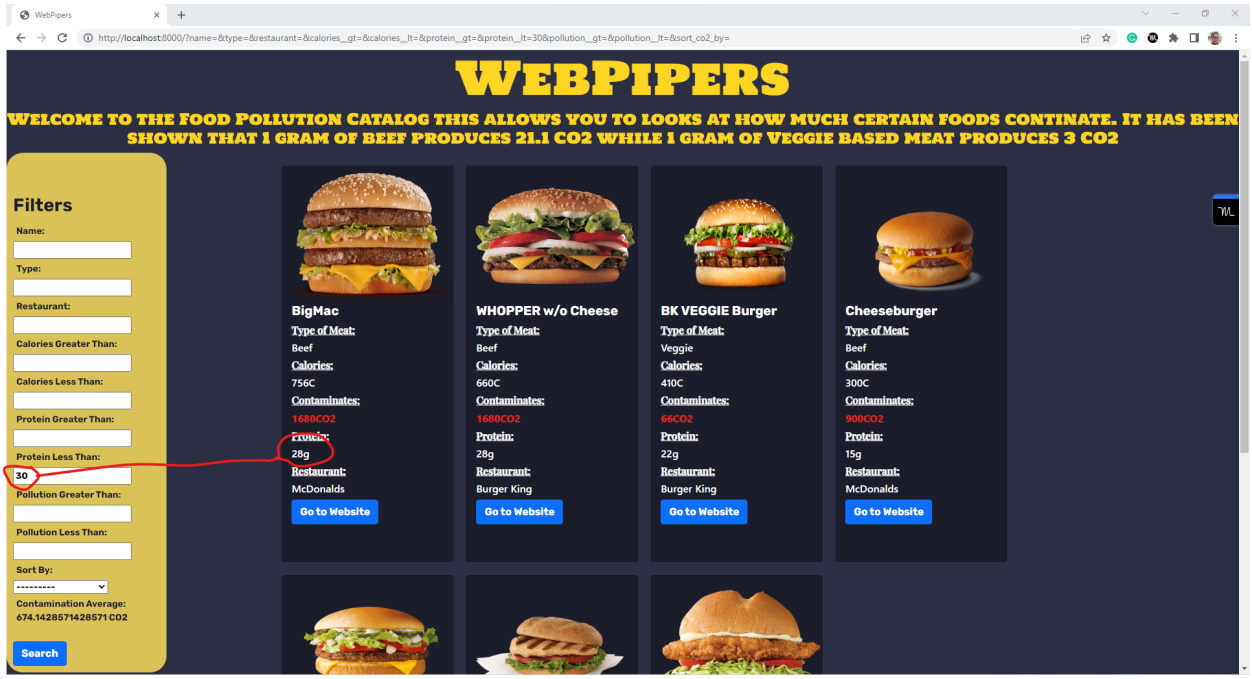


8. What are the meal food options that are made of meat meals?

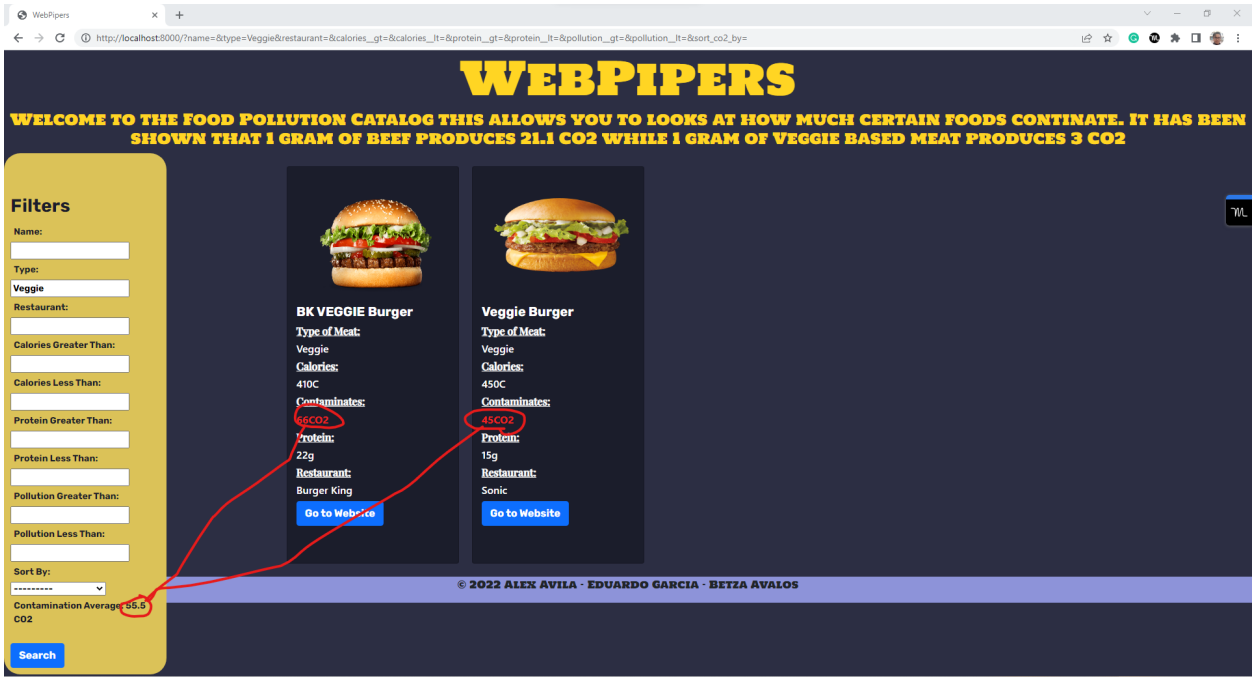
Filtering by beef shows the different meat based burgers



9. What foods contain less than a certain amount of grams (e.g. 30 grams) of ‘meat’?
   Protein by less than shows the burgers with less than a certain amount of grams.



10. What is the average pollution of plant based meals?
    Every time the user does filtering the filter bar shows the average of pollution of each meal that is currently show



Reference

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Attribution

Alex Avila
- Make card and information about the meals
- Answer competency questions with the interface
- Deploy Interface
- Populate fastfood.csv

Betza Avalos
- Make CSS design
- Make Header and Footer
- Add data to interface
- Make function to read double properties
- Populate emissions data

Eduardo Garcia
- Make filtering sidebar
- Make filtering logic by:
    - Name, Type Restaurant, Calories, Protein, and Pollution
- Read csv files
- Populate emissions data