

# Sistemas Baseados em Conhecimento

## Aula 23

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2017

# Exemplos de inferências

Fonte:

Sean Bechofer, University of Manchester

<http://mowl-power.cs.man.ac.uk/2009/07/sssw/>

# Ontologia de Pets

ObjectProperty: hasPet  
Range: Animal  
Inverse: isPetOf

Class: Person

Class: Animal

Class: Cat  
SubClassOf: Animal

Class: Dog  
SubClassOf: Animal

# Cats I

Class: PetOwner

SubClassOf: Person

that hasPet some Cat

1. How many Cats does a PetOwner have?
2. Can a PetOwner have pets which are not Cats?
3. Is owning a Cat enough to recognise a person as a PetOwner?
4. How many Dogs does a PetOwner have?

# Cats I

```
Class: PetOwner  
  SubClassOf: Person  
    that hasPet some Cat
```

1. How many Cats does a PetOwner have? **Pelo menos 1**
2. Can a PetOwner have pets which are not Cats?
3. Is owning a Cat enough to recognise a person as a PetOwner?
4. How many Dogs does a PetOwner have?

# Cats I

Class: PetOwner

SubClassOf: Person

that hasPet some Cat

1. How many Cats does a PetOwner have? Pelo menos 1
2. Can a PetOwner have pets which are not Cats? Não sabemos
3. Is owning a Cat enough to recognise a person as a PetOwner?
4. How many Dogs does a PetOwner have?

# Cats I

Class: PetOwner

SubClassOf: Person

that hasPet some Cat

1. How many Cats does a PetOwner have? Pelo menos 1
2. Can a PetOwner have pets which are not Cats? Não sabemos
3. Is owning a Cat enough to recognise a person as a PetOwner? Não! (subclasse)
4. How many Dogs does a PetOwner have?

# Cats I

Class: PetOwner

SubClassOf: Person

that hasPet some Cat

1. How many Cats does a PetOwner have? Pelo menos 1
2. Can a PetOwner have pets which are not Cats? Não sabemos
3. Is owning a Cat enough to recognise a person as a PetOwner? Não! (subclasse)
4. How many Dogs does a PetOwner have? Não sabemos



## Cats II

Class: PetOwner

EquivalentTo: Person

that hasPet some Cat

1. How many Cats does a PetOwner have?
2. Can a PetOwner have pets which are not Cats?
3. Is owning a Cat enough to recognise a person as a PetOwner?
4. How many Dogs does a PetOwner have?

# Cats II

Class: PetOwner

EquivalentTo: Person

that hasPet some Cat

1. How many Cats does a PetOwner have? Pelo menos 1
2. Can a PetOwner have pets which are not Cats?
3. Is owning a Cat enough to recognise a person as a PetOwner?
4. How many Dogs does a PetOwner have?

## Cats II

Class: PetOwner

EquivalentTo: Person

that hasPet some Cat

1. How many Cats does a PetOwner have? Pelo menos 1
2. Can a PetOwner have pets which are not Cats? Não sabemos
3. Is owning a Cat enough to recognise a person as a PetOwner?
4. How many Dogs does a PetOwner have?

## Cats II

Class: PetOwner

EquivalentTo: Person

that hasPet some Cat

1. How many Cats does a PetOwner have? **Pelo menos 1**
2. Can a PetOwner have pets which are not Cats? **Não sabemos**
3. Is owning a Cat enough to recognise a person as a PetOwner? **Sim! (equivalência)**
4. How many Dogs does a PetOwner have?

## Cats II

Class: PetOwner

EquivalentTo: Person

that hasPet some Cat

1. How many Cats does a PetOwner have? **Pelo menos 1**
2. Can a PetOwner have pets which are not Cats? **Não sabemos**
3. Is owning a Cat enough to recognise a person as a PetOwner? **Sim! (equivalência)**
4. How many Dogs does a PetOwner have? **Não sabemos**

# Fleas I

```
ObjectProperty : hasPet  
    Characteristics: transitive
```

```
Class: Flea  
    SubClassOf: Animal
```

```
Class: PetOwner  
    SubClassOf: Person  
        that hasPet some (Cat that hasPet some Flea)
```

1. How many Cats does a PetOwner have as pets?
2. What animals does a Cat have as pets?
3. What animals does a PetOwner have as pets?

# Fleas I

```
ObjectProperty : hasPet  
    Characteristics: transitive
```

```
Class: Flea  
    SubClassOf: Animal
```

```
Class: PetOwner  
    SubClassOf: Person  
        that hasPet some (Cat that hasPet some Flea)
```

1. How many Cats does a PetOwner have as pets? Pelo menos 1
2. What animals does a Cat have as pets?
3. What animals does a PetOwner have as pets?

# Fleas I

```
ObjectProperty : hasPet  
    Characteristics: transitive
```

```
Class: Flea  
    SubClassOf: Animal
```

```
Class: PetOwner  
    SubClassOf: Person  
        that hasPet some (Cat that hasPet some Flea)
```

1. How many Cats does a PetOwner have as pets? Pelo menos 1
2. What animals does a Cat have as pets? Não sabemos
3. What animals does a PetOwner have as pets?



# Fleas I

```
ObjectProperty : hasPet  
    Characteristics: transitive
```

```
Class: Flea  
    SubClassOf: Animal
```

```
Class: PetOwner  
    SubClassOf: Person  
        that hasPet some (Cat that hasPet some Flea)
```

1. How many Cats does a PetOwner have as pets? **Pelo menos 1**
2. What animals does a Cat have as pets? **Não sabemos**
3. What animals does a PetOwner have as pets? **Pelo menos 2 (transitividade)**

# Fleas I

```
ObjectProperty : hasPet  
    Characteristics: transitive
```

```
Class: Flea  
    SubClassOf: Animal
```

```
Class: PetOwner  
    SubClassOf: Person  
        that hasPet some (Cat that hasPet some Flea)
```

4. What happens if I add the restriction hasPet only Cat to the description of PetOwner?
5. Does every Cat that's a pet have a Flea as a pet?

# Fleas I

```
ObjectProperty : hasPet  
    Characteristics: transitive
```

```
Class: Flea  
    SubClassOf: Animal
```

```
Class: PetOwner  
    SubClassOf: Person  
        that hasPet some (Cat that hasPet some Flea)
```

4. What happens if I add the restriction hasPet only Cat to the description of PetOwner? Nada - porque???
5. Does every Cat that's a pet have a Flea as a pet?

# Fleas I

```
ObjectProperty : hasPet  
    Characteristics: transitive
```

```
Class: Flea  
    SubClassOf: Animal
```

```
Class: PetOwner  
    SubClassOf: Person  
        that hasPet some (Cat that hasPet some Flea)
```

4. What happens if I add the restriction hasPet only Cat to the description of PetOwner? Nada - porque??? Falta dizer que Cats e Fleas são disjuntos!
5. Does every Cat that's a pet have a Flea as a pet?

# Fleas I

```
ObjectProperty : hasPet  
    Characteristics: transitive
```

```
Class: Flea  
    SubClassOf: Animal
```

```
Class: PetOwner  
    SubClassOf: Person  
        that hasPet some (Cat that hasPet some Flea)
```

4. What happens if I add the restriction hasPet only Cat to the description of PetOwner? Nada - porque??? Falta dizer que Cats e Fleas são disjuntos!
5. Does every Cat that's a pet have a Flea as a pet? Não!

# Fleas I

```
ObjectProperty : hasPet  
    Characteristics: transitive
```

```
Class: Flea  
    SubClassOf: Animal
```

```
Class: PetOwner  
    SubClassOf: Person  
        that hasPet some (Cat that hasPet some Flea)
```

4. What happens if I add the restriction hasPet only Cat to the description of PetOwner? Nada - porque??? Falta dizer que Cats e Fleas são disjuntos!
5. Does every Cat that's a pet have a Flea as a pet? Não! Um dos gatos do PetOwner tem pulga...

# Grumpy

ObjectProperty: likes

Characteristics:

Reflexive

Class: Misanthrope

EquivalentTo:

Person

and (likes only (not (Person)))

What do we know about the class Misanthrope, and why?

# Grumpy

ObjectProperty: likes

Characteristics:

Reflexive

Class: Misanthrope

EquivalentTo:

Person

and (likes only (not (Person)))

What do we know about the class Misanthrope, and why?

Insatisfatível



# SPARQL

## SPARQL Protocol and RDF Query Language

- Consultas em **RDF**.

# SPARQL

## SPARQL Protocol and RDF Query Language

- Consultas em **RDF**.
- Não faz inferências.

# SPARQL

## SPARQL Protocol and RDF Query Language

- Consultas em **RDF**.
- Não faz inferências.
- Sintaxe Turtle.

# Ontologia de Pets

ObjectProperty: hasPet  
Range: Animal  
Inverse: isPetOf

Class: Person

Class: Animal

Class: Cat  
SubClassOf: Animal

Class: Dog  
SubClassOf: Animal

# Ontologia de Pets

ObjectProperty: hasPet  
Range: Animal  
Inverse: isPetOf

Class: Person      Quais são as subclasses de Animal?

Class: Animal

Class: Cat  
SubClassOf: Animal

Class: Dog  
SubClassOf: Animal

# Ontologia de Pets

ObjectProperty: hasPet  
Range: Animal  
Inverse: isPetOf

Class: Person      Quais são as subclasses de Animal?

Class: Animal      SELECT ?subject  
                         WHERE {?subject rdfs:subClassOf onto:Animal}

Class: Cat  
SubClassOf: Animal

Class: Dog  
SubClassOf: Animal

# Consulta no Protégé

The screenshot shows the Protégé application window with the title "untitled-ontology-23 (http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23) : [/tmp/pets.turtle.owl]". The interface includes a menu bar (File, Edit, View, Reasoner, Tools, Refactor, Window, Help) and a toolbar with navigation and search icons. Below the toolbar, there are tabs for "Annotation Properties", "Individuals", "OWL Viz", "DL Query", "OntoGraf", "SPARQL Query", "Ontology Differences", "Active Ontology", "Entities", "Classes", "Object Properties", and "Data Properties". The "SPARQL Query" tab is selected, displaying a query editor with the following content:

```
SPARQL query:
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX onto: <http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23#>

SELECT ?subject
WHERE { ?subject rdfs:subClassOf onto:Animal }
```

Below the query editor, there is a table with the heading "subject" containing the results of the query:

subject
Dog
Cat

At the bottom of the window, there is a status bar with the text "To use the reasoner click Reasoner->Start reasoner" and a checked checkbox for "Show Inferences".

# Ontologia de Pets - ABox

The screenshot displays the Protégé ontology editor interface for an ontology named 'untitled-ontology-23'. The main window is divided into several panes:

- Class hierarchy (inferred):** Shows a hierarchy starting with 'Thing' as the root, followed by 'Animal', which has subclasses 'Cat' and 'Dog'. 'Person' is also listed as a class.
- Individuals: John:** Lists three instances: 'John', 'Lulu', and 'Mimi', each represented by a diamond icon.
- Annotations: John:** A pane for adding annotations to the selected individual 'John'.
- Description: John:** A pane for adding types, same/different individual assertions, or different individuals.
- Property assertions: John:** Shows object property assertions for 'hasPet' with instances 'Mimi' and 'Lulu'. It also includes sections for data property assertions, negative object property assertions, and negative data property assertions.

At the bottom of the window, a status bar indicates: 'To use the reasoner click Reasoner->Start reasoner' and a checked checkbox for 'Show Inferences'.



# Ontologia de Pets - ABox

Individual: Mimi  
type: Cat

Individual: Lulu  
type: Dog

Individual: John  
type: Person  
hasPet: Mimi  
hasPet: Lulu

# Ontologia de Pets - ABox

Individual: Mimi  
type: Cat

Que animais John tem?

Individual: Lulu  
type: Dog

Individual: John  
type: Person  
hasPet: Mimi  
hasPet: Lulu

# Ontologia de Pets - ABox

Individual: Mimi  
type: Cat

Que animais John tem?

Individual: Lulu  
type: Dog

```
SELECT ?pet  
WHERE {onto:John onto:hasPet ?pet}
```

Individual: John  
type: Person  
hasPet: Mimi  
hasPet: Lulu

ou

```
SELECT ?pet  
WHERE {?pet onto:isPetOf onto:John}
```

# John hasPets...

untitled-ontology-23 (http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23) : [/tmp/pets.Manchester.owl]

File Edit View Reasoner Tools Refactor Window Help

untitled-ontology-23 (http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23) Search for entity

Annotation Properties Individuals OWLViz DL Query OntoGraf SPARQL Query Ontology Differences

Active Ontology Entities Classes Object Properties Data Properties

SPARQL query:

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX onto: <http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23#>

SELECT ?pet
WHERE { onto:john onto:hasPet ?pet }
```

pet
Lulu
Mimi

# But who is PetOf John?

The screenshot shows a web browser window titled "untitled-ontology-23 (http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23) : [/tmp/pets.turtle.owl]". The browser has a menu bar with File, Edit, View, Reasoner, Tools, Refactor, Window, and Help. Below the menu bar is a search bar with the text "untitled-ontology-23 (http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23)" and a "Search for entity" input field. The main content area has several tabs: Annotation Properties, Individuals, OWL Viz, DL Query, OntoGraf, SPARQL Query, and Ontology Differences. The "SPARQL Query" tab is active, showing a SPARQL query in a text area. The query is:

```
SPARQL query:
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX onto: <http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23#>

SELECT ?pet
  WHERE {?pet onto:isPetOf onto:John}
```

Below the query, there is a table with one row and one column. The column is labeled "pet" and the row contains the value "pet".

# SPARQL não faz inferências!!!

- Ligar o mecanismo de inferência (Reasoner) no Protégé.

# SPARQL não faz inferências!!!

- Ligar o mecanismo de inferência (Reasoner) no Protégé.
- Exportar ontologia inferida: escolher exportar todos os axiomas, incluindo os originais (asserted)

# SPARQL não faz inferências!!!

- Ligar o mecanismo de inferência (Reasoner) no Protégé.
- Exportar ontologia inferida: escolher exportar todos os axiomas, incluindo os originais (asserted)
- Usar a nova ontologia para fazer as consultas.



# Mimi e Lulu arePetsOf John

The screenshot shows the Protégé OWL editor interface. The title bar indicates the file is 'untitled-ontology-23-inferred' with the URL 'http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23-inferred'. The menu bar includes File, Edit, View, Reasoner, Tools, Refactor, Window, and Help. The toolbar shows navigation icons and a search box labeled 'Search for entity'. The main workspace has tabs for Annotation Properties, Individuals, OWL Viz, DL Query, OntoGraf, Ontology Differences, and SPARQL Query. Below these are tabs for Active Ontology, Entities, Classes, Object Properties, and Data Properties. The SPARQL query tab is active, displaying the following query:

```
SPARQL query:
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX onto: <http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23#>

SELECT ?pet
WHERE {?pet onto:isPetOf onto:John}
```

Below the query, the results are displayed in a table with the column header 'pet'. The results are 'Mimi' and 'Lulu'.

pet
Mimi
Lulu

# Consultas Compostas

untitled-ontology-23 (http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23) : [/tmp/pets.turtle.owl]

File Edit View Reasoner Tools Refactor Window Help

untitled-ontology-23 (http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23) Search for entity

Annotation Properties Individuals OWLViz DL Query OntoGraf SPARQL Query Ontology Differences

Active Ontology Entities Classes Object Properties Data Properties

SPARQL query:

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX onto: <http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23#>

SELECT ?pet
WHERE {
  ?pet onto:isPetOf ?x.
  ?x onto:hasPet ?pet1.
  ?pet1 a onto:Cat.
}
```

a = rdf:type

pet

# Consultas Compostas

The screenshot shows a web browser window with the title "untitled-ontology-23-inferred (http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23-inferred) : [/home/ren...". The browser's address bar shows the URL. The page has a menu bar with "File", "Edit", "View", "Reasoner", "Tools", "Refactor", "Window", and "Help". Below the menu bar is a toolbar with a search icon and a text input field containing "untitled-ontology-23-inferred (http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23-inferred)".

The main content area has a tabbed interface with the following tabs: "Annotation Properties", "Individuals", "OWL Viz", "DL Query", "OntoGraf", "Ontology Differences", "SPARQL Query", "Active Ontology", "Entities", "Classes", "Object Properties", and "Data Properties". The "SPARQL Query" tab is selected.

The SPARQL query editor contains the following query:

```
SPARQL query:
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX onto: <http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23#>

SELECT ?pet
WHERE {
  ?pet onto:isPetOf ?x.
  ?x onto:hasPet ?pet1.
  ?pet1 a onto:Cat.
}
```

The results table shows the following data:

pet
Mimi
Lulu

# Filtros

The screenshot shows the Protégé application interface. The title bar reads "untitled-ontology-23-inferred (http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23-inferred) : [/ho". The menu bar includes File, Edit, View, Reasoner, Tools, Refactor, Window, and Help. Below the menu is a toolbar with navigation icons and a search bar labeled "Search for entity". The main workspace has several tabs: Annotation Properties, Individuals, OWL Viz, DL Query, OntoGraf, Ontology Differences, and SPARQL Query. The "SPARQL Query" tab is active, showing a query in a text area. Below the query area is a table with one row containing the result "pet".

untitled-ontology-23-inferred

File Edit View Reasoner Tools Refactor Window Help

Search for entity

Annotation Properties Individuals OWL Viz DL Query OntoGraf Ontology Differences SPARQL Query

Active Ontology Entities Classes Object Properties Data Properties

SPARQL query:

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX onto: <http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23#>

SELECT ?pet
WHERE {
  ?pet onto:isPetOf ?x.
  ?x onto:hasPet ?pet1.
  ?pet1 a onto:Cat.
  FILTER (?pet1 != ?pet)
}
```

pet
Lulu

# Consultas Compostas ;

The screenshot shows the Protégé application window titled "untitled-ontology-23". The interface includes a menu bar (File, Edit, View, Reasoner, Tools, Refactor, Window, Help) and a toolbar with navigation and search icons. Below the toolbar is a tabbed interface with the following tabs: Annotation Properties, Individuals, OWLViz, DL Query, OntoGraf, Ontology Differences, SPARQL Query, Active Ontology, Entities, Classes, Object Properties, and Data Properties. The "SPARQL Query" tab is active, displaying a query editor with the following content:

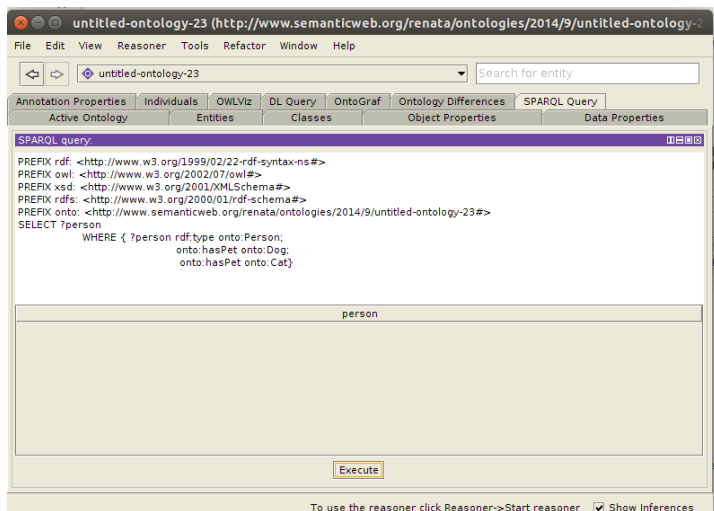
```
SPARQL query:
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX onto: <http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23#>
SELECT ?person
WHERE {
  ?person rdf:type onto:Person;
  onto:hasPet onto:Lulu;
  onto:hasPet onto:Mimi}
```

Below the query editor, the results are displayed in a table with the following structure:

person
John

At the bottom of the window, there is a status bar with the text "To use the reasoner click Reasoner->Start reasoner" and a checked checkbox labeled "Show Inferences".

# Por que não funciona?



# SPARQL não faz inferências!!!

The screenshot shows the Protégé application window titled "untitled-ontology-23". The interface includes a menu bar (File, Edit, View, Reasoner, Tools, Refactor, Window, Help) and a toolbar with navigation icons. Below the toolbar is a search bar labeled "Search for entity". The main workspace is divided into two tabs: "Active Ontology" and "SPARQL Query". The "SPARQL Query" tab is active, displaying the following query:

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX onto: <http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23#>
SELECT ?person
WHERE {
  ?person rdf:type onto:Person;
          onto:hasPet ?dog;
          onto:hasPet ?cat.
  ?dog rdf:type onto:Dog.
  ?cat rdf:type onto:Cat.
}
```

Below the query editor, there is a table with the header "person" and one row containing the value "John". At the bottom of the window, a status bar indicates "To use the reasoner click Reasoner->Start reasoner" and a checkbox labeled "Show Inferences" is checked.

# Mais de uma variável

The screenshot shows the Protégé application window titled "untitled-ontology-23". The interface includes a menu bar (File, Edit, View, Reasoner, Tools, Refactor, Window, Help) and a toolbar with navigation icons. The main workspace is divided into tabs: Annotation Properties, Individuals, OWL Viz, DL Query, OntoGraf, Ontology Differences, and SPARQL Query. The SPARQL Query tab is active, displaying a query with multiple variables.

SPARQL query:

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX onto: <http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23#>
SELECT ?person ?dog ?cat
WHERE {
  ?person rdf:type onto:Person;
    onto:hasPet ?dog;
    onto:hasPet ?cat.
  ?dog rdf:type onto:Dog.
  ?cat rdf:type onto:Cat }
```

The results are displayed in a table with four columns: person, dog, and cat. The first row shows the results for the query:

person	dog	cat
John	Lulu	Mimi

At the bottom of the window, there is a status bar with the text "To use the reasoner click Reasoner->Start reasoner" and a checkbox labeled "Show Inferences" which is checked.



# Por que não funciona?

The screenshot shows the Protégé application window titled "untitled-ontology-23". The interface includes a menu bar (File, Edit, View, Reasoner, Tools, Refactor, Window, Help), a toolbar with navigation icons, and a search bar labeled "Search for entity". Below these are tabs for "Annotation Properties", "Individuals", "OWLviz", "DL Query", "OntoGraf", "Ontology Differences", and "SPARQL Query". Under the "SPARQL Query" tab, there are sub-tabs for "Active Ontology", "Entities", "Classes", "Object Properties", and "Data Properties".

The SPARQL query editor contains the following query:

```
SPARQL query:
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX onto: <http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23#>
SELECT ?person ?pet
WHERE {
  ?person rdf:type onto:Person;
         onto:hasPet ?pet.
  ?pet rdf:type onto:Animal}
```

Below the query editor, there is a table with two columns: "person" and "pet". The table is currently empty. At the bottom of the query editor is an "Execute" button. At the very bottom of the window, a status bar reads: "To use the reasoner click Reasoner->Start reasoner" and "Show Inferences" (checked).

:-)

The screenshot shows the Protégé application window titled "untitled-ontology-23-inferred". The "Reasoner" menu is highlighted, and the "untitled-ontology-23-inferred" dropdown is circled in red. The "SPARQL Query" tab is active, displaying the following query:

```
SPARQL query:
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX onto: <http://www.semanticweb.org/renata/ontologies/2014/9/untitled-ontology-23#>
SELECT ?person ?pet
WHERE {
  ?person rdf:type onto:Person;
  onto:hasPet ?pet.
  ?pet rdf:type onto:Animal}
```

Below the query, the results are displayed in a table with two columns: "person" and "pet".

person	pet
John	Mimi
John	Lulu

At the bottom of the window, there is an "Execute" button and a status bar that reads: "To use the reasoner click Reasoner->Start reasoner" and "Show Inferences" (checked).