

Ontologies & the Semantic Web Project

Sports Ontology

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Classes

- Sports (Main Class)
- Athletes
- Coaches
- Teams
- Venues
- Competitions

The screenshot displays a Semantic Web editor interface with the following components:

- Top Bar:** Active ontology × Entities × Individuals by class × DL Query ×
- Left Panel (Class Hierarchy):**
 - owl:Thing
 - Sports
 - Athletes** (highlighted)
 - Coach
 - Competitions
 - Teams
 - Venues
- Right Panel (Class Details for 'Athletes'):**
 - Annotations Usage
 - Annotations: Athletes
 - Description: Athletes
 - Equivalent To: belongs_to exactly 1 Teams
 - SubClass Of: Sports
 - General class axioms
 - SubClass Of (Anonymous Ancestor)
 - Instances:
 - Azpilicueta
 - DeBruyne
 - Firmino
 - Haaland
 - Kante
 - Odegaard
 - Ramsdale
 - Ronaldo
 - Rooney

Classes (Cont.)

Active ontology x Entities x Individuals by class x DL Query x

Datatypes Individuals

Data properties Annotation properties

Classes Object properties

Class hierarchy: Competitions

owl:Thing

- Sports
 - Athletes
 - Coach
 - Competitions**
 - Teams
 - Venues

Annotations: Competitions

Usage

Description: Competitions

Equivalent To +

- takes_place_at min 1 Venues

SubClass Of +

- Sports

General class axioms +

SubClass Of (Anonymous Ancestor)

Instances +

- ChampionsLeague
- PremierLeague

Active ontology x Entities x Individuals by class x DL Query x

Datatypes Individuals

Data properties Annotation properties

Classes Object properties

Class hierarchy: Teams

owl:Thing

- Sports
 - Athletes
 - Coach
 - Competitions
 - Teams**
 - Venues

Annotations: Teams

Usage

Description: Teams

Equivalent To +

- has_home_venue exactly 1 Venues
- participates_in max 7 Competitions
- participates_in min 1 Competitions
- defeated_by max 20 Teams
- coached_by exactly 1 Coach

SubClass Of +

- Sports

General class axioms +

SubClass Of (Anonymous Ancestor)

Instances +

- Arsenal
- Chelsea
- Liverpool
- ManCity
- ManUtd

Object Properties

- participates_in
- belongs_to
- takes_place_at
- coached_by
- defeated_by
- has_home_venue

The screenshot displays a web interface for configuring an object property. The top navigation bar includes 'Data properties' and 'Annotation properties'. The left sidebar shows a hierarchy under 'owl:topObjectProperty' with the following properties: **belongs_to**, coached_by, defeated_by, has_home_venue, participates_in, and takes_place_at. The main content area is divided into three sections:

- Annotations: belongs_to**: Contains an 'Annotations' section with a '+' icon.
- Characteristics: belongs_to**: A list of checkboxes for property characteristics:
 - ☐ Functional
 - ☐ Inverse functional
 - ☐ Transitive
 - ☐ Symmetric
 - ☐ Asymmetric
 - ☐ Reflexive
 - ☐ Irreflexive
- Description: belongs_to**: A list of relationships with '+' icons:
 - Equivalent To
 - SubProperty Of: owl:topObjectProperty
 - Inverse Of
 - Domains (intersection): Athletes
 - Ranges (intersection): Teams

Object Properties (Cont.)

Active ontology * Entities * Individuals by class * DL Query *

Datatypes Individuals

Data properties Annotation properties

Classes Object properties

Object property hierarchy: has [?] [I] [E] [Q] [X]

Annotations Usage

Annotations: has_home_venue

Annotations +

owl:topObjectProperty

- belongs_to
- coached_by
- defeated_by
- has_home_venue
- participates_in
- takes_place_at

Characteristics: has_ [?] [I] [E] [Q] [X] Description: has_home_venue

☐ Functional

☐ Inverse functional

☐ Transitive

☐ Symmetric

☐ Asymmetric

☐ Reflexive

☐ Irreflexive

Equivalent To +

SubProperty Of +

owl:topObjectProperty

Inverse Of +

Domains (intersection) +

Teams

Ranges (intersection) +

Venues

Data properties Annotation properties

Classes Object properties

Object property hierarchy: tak [?] [I] [E] [Q] [X]

Annotations Usage

Annotations: takes_place_at

Annotations +

owl:topObjectProperty

- belongs_to
- coached_by
- defeated_by
- has_home_venue
- participates_in
- takes_place_at

Characteristics: takes [?] [I] [E] [Q] [X] Description: takes_place_at

☐ Functional

☐ Inverse functional

☐ Transitive

☐ Symmetric

☐ Asymmetric

☐ Reflexive

☐ Irreflexive

Equivalent To +

SubProperty Of +

owl:topObjectProperty

Inverse Of +

Domains (intersection) +

Competitions

Ranges (intersection) +

Venues

Data Properties

- Address
- Athlete_Age
- Athlete_Name
- Athlete_Nationality
- Athlete_Salary
- Budget
- Capacity
- Coach_Age
- Coach_Name
- Coach_Nationality
- Coach_Salary
- Competition_Name
- Governing_body
- Height
- Number_of_participants
- Number_of_players
- Prize_money
- Team_Name
- Venue_Name

The screenshot displays the Protégé interface for configuring the 'Athlete_Salary' property. The left pane shows the 'Data property hierarchy' with 'Athlete_Salary' selected. The right pane shows the 'Annotations' tab for 'Athlete_Salary', which is currently empty. Below the annotations, the 'Characteristics' section shows 'Functional' is checked. The 'Description' section shows 'Equivalent To' is empty, 'SubProperty Of' is 'owl:topDataProperty', 'Domains (intersection)' includes 'Athletes' and 'Athlete_Salary some xsd:float[> 10000.0f, <= 5.0E8f]', and 'Ranges' is 'xsd:float'.

Data Properties (Cont.)

Data property hierarchy: Gove [Icons] [X]

Annotations +

Asserted ▾

- owl:topDataProperty
 - Address
 - Athlete_Age
 - Athlete_Name
 - Athlete_Nationality
 - Athlete_Salary
 - Budget
 - Capacity
 - Coach_Age
 - Coach_Name
 - Coach_Nationality
 - Coach_Salary
 - Competition_Name
 - Governing_body**
 - Height
 - Number_of_participants
 - Number_of_players
 - Prize_money
 - Team_Name
 - Venue_Name

Characteristics: Govern [Icons] [X]

Description: Governing_body

☐ Functional

Equivalent To +

SubProperty Of +

- owl:topDataProperty

Domains (intersection) +

- (Governing_body value "AFC") or (Governing_body value "CAF") or (Governing_body value "CONMEBOL") or (Governing_body value "LIBERTADORES") or (Governing_body value "UEFA")
- Competitions

Ranges +

- xsd:string

Individuals

Individuals

Annotation properties Datatypes

Data properties

Classes Object properties

Individuals: Anfield

Anfield

- Arsenal
- Azpilicueta
- ChampionsLeague
- Chelsea
- CoachArteta
- CoachGuardiola
- CoachKlopp
- CoachMourinho
- CoachTuchel
- DeBruyne
- Emirates
- Etihad
- Firmino
- Haaland
- Kante
- Liverpool
- ManCity
- ManUtd
- Odegaard
- OldTrafford
- PremierLeague
- Ramsdale

Annotations

Usage

Annotations: Anfield

Annotations

Description: Anfield

Types

- Venues

Same Individual As

Different Individuals

Property assertions: Anfield

Object property assertions

Data property assertions

- Venue_Name "Anfield"
- Address "Liverpool"
- Capacity 50000

Negative object property assertions

Negative data property assertions

Azpilicueta

ChampionsLeague

Chelsea

CoachArteta

CoachGuardiola

CoachKlopp

CoachMourinho

CoachTuchel

DeBruyne

Emirates

Etihad

Firmino

Haaland

Kante

Liverpool

ManCity

ManUtd

Odegaard

Description: Chelsea

Types

Teams

Same Individual As

Different Individuals

Property assertions: Chelsea

Object property assertions

- defeated_by Liverpool
- defeated_by Arsenal
- has_home_venue StamfordBridge
- participates_in ChampionsLeague
- coached_by CoachTuchel
- defeated_by ManCity
- participates_in PremierLeague

Data property assertions

- Budget 6.0E8f
- Number_of_players 55
- Team_Name "Chelsea"

Individuals (Cont.)

- ChampionsLeague
- Chelsea
- CoachArteta**
- CoachGuardiola
- CoachKlopp
- CoachMourinho
- CoachTuchel
- DeBruyne
- Emirates
- Etihad

Description: CoachArteta

Types +

- Coach

Same Individual As +

Different Individuals +

Property assertions: CoachArteta

Object property assertions +

Data property assertions +

- Coach_Salary 6000000.0f
- Coach_Age 45
- Coach_Nationality "Spanish"
- Coach_Name "CoachArteta"

- CoachKlopp
- CoachMourinho
- CoachTuchel
- DeBruyne
- Emirates
- Etihad
- Firmino
- Haaland
- Kante
- Liverpool
- ManCity
- ManUtd
- Odegaard
- OldTrafford
- PremierLeague**
- Ramsdale

Description: PremierLeague

Types +

- Competitions

Same Individual As +

Different Individuals +

Property assertions: PremierLeague

Object property assertions +

- takes_place_at Emirates
- takes_place_at Etihad
- takes_place_at StamfordBridge
- takes_place_at OldTrafford
- takes_place_at Anfield

Data property assertions +

- Competition_Name "PremierLeague"
- Governing_body "UEFA"
- Prize_money 9.0E8f
- Number_of_participants 20

Individuals (Cont.)

Individuals: Azpilicueta

- Anfield
- Arsenal
- Azpilicueta**
- ChampionsLeague
- Chelsea
- CoachArteta
- CoachGuardiola
- CoachKlopp
- CoachMourinho
- CoachTuchel
- DeBruyne
- Emirates

Description: Azpilicuet

Types

- Athletes

Same Individual As

Different Individuals

Property assertions: Azpilicueta

Object property assertions

- belongs_to Chelsea

Data property assertions

- Athlete_Name "Azpilicueta"
- Athlete_Nationality "Spanish"
- Athlete_Salary 1.2E7f
- Athlete_Age 32

Etihad

Firmino

Haaland

Kante

Liverpool

ManCity

ManUtd

Odegaard

OldTrafford

PremierLeague

Ramsdale

Ronaldo

Rooney

Salah

Description: Salah

Types

- Athletes

Same Individual As

Different Individuals

Property assertions: Salah

Object property assertions

- belongs_to Liverpool

Data property assertions

- Athlete_Salary 3.1E7f
- Height 1.75f
- Athlete_Name "Salah"
- Athlete_Age 31
- Athlete_Nationality "Egyptian"

SPARQL Query 1

- Returns athletes & their coaches & their ages, then orders results by age.

Snap SPARQL Query:

```
PREFIX uri:<http://www.semanticweb.org/salma/ontologies/2023/4/untitled-ontology-46#>
SELECT (str(?x) as ?label0) (str(?y) as ?label1) (str(?z) as ?label2)
where {
?athlete a uri:Athletes.
?team a uri:Teams.
?coach a uri:Coach.
?athlete uri:belongs_to ?team.
?athlete uri:Athlete_Name ?x.
?athlete uri:Athlete_Age ?z.
?team uri:coached_by ?coach.
?coach uri:Coach_Name ?y.
}
Order BY ?z
```

```
PREFIX uri:<http://www.semanticweb.org/salma/ontologies/2023/4/untitled-ontology-46#>
SELECT (str(?x) as ?label0) (str(?y) as ?label1) (str(?z) as ?label2)
where {
?athlete a uri:Athletes.
?team a uri:Teams.
?coach a uri:Coach.
?athlete uri:belongs_to ?team.
?athlete uri:Athlete_Name ?x.
?athlete uri:Athlete_Age ?z.
}
```

Display Result

javax.swing.table.TableColumn...	javax.swing.table.TableColumn...	javax.swing.table.TableColumn...
Haaland	CoachGuardiola	21
Odegaard	CoachArteta	23
Ramsdale	CoachArteta	24
DeBruyne	CoachGuardiola	31
Salah	CoachKlopp	31
Azpilicueta	CoachTuchel	32
Kante	CoachTuchel	32
Firmino	CoachKlopp	33
Ronaldo	CoachMourinho	38
Rooney	CoachMourinho	40

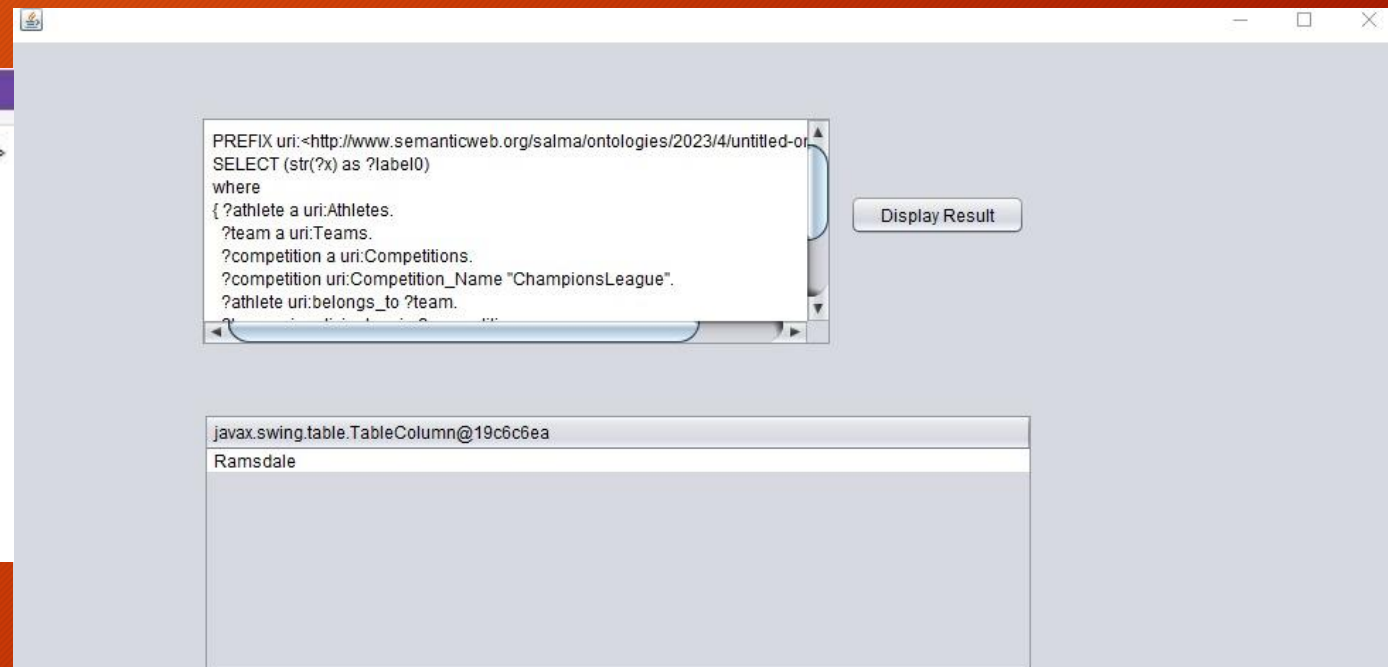
SPARQL Query 2

- Returns athletes that play for a team participating in Champions League and has a name starting with the letter 'R'.

Snap SPARQL Query:

```
PREFIX uri: <http://www.semanticweb.org/salma/ontologies/2023/4/untitled-ontology-46#>
SELECT (str(?x) as ?label0)
where
{ ?athlete a uri:Athletes.
  ?team a uri:Teams.
  ?competition a uri:Competitions.
  ?competition uri:Competition_Name "ChampionsLeague".
  ?athlete uri:belongs_to ?team.
  ?team uri:participates_in ?competition.
  ?athlete uri:Athlete_Name ?x.
  FILTER REGEX(?x, "^R", "i").
}
```

Order BY ?x



The screenshot shows a web-based SPARQL query interface. The query is entered in a text area and is identical to the one in the previous block. To the right of the text area is a 'Display Result' button. Below the text area, the results are displayed in a table. The table has a single row with the value 'Ramsdale'.

label0
Ramsdale

SPARQL Query 3

- Returns athletes that play for Arsenal or Liverpool or Manchester City, and optionally returns each player's height.

Snap SPARQL Query:

```
PREFIX uri: <http://www.semanticweb.org/salma/ontologies/2023/4/untitled-ontology-46#>
SELECT (str(?x) as ?label0) (str(?y) as ?label1) (str(?z) as ?label2)
where {
  ?athlete a uri:Athletes.
  ?team a uri:Teams.
  ?athlete uri:belongs_to ?team.
  {?team uri:Team_Name "Arsenal".}
  UNION
  {?team uri:Team_Name "Liverpool".}
  UNION
  {?team uri:Team_Name "ManCity".}
  ?athlete uri:Athlete_Name ?x.
  ?team uri:Team_Name ?y.
  OPTIONAL {?athlete uri:Height ?z.}
}
Order BY ?x
```

```
PREFIX uri: <http://www.semanticweb.org/salma/ontologies/2023/4/untitled-ontology-46#>
SELECT (str(?x) as ?label0) (str(?y) as ?label1) (str(?z) as ?label2)
where {
  ?athlete a uri:Athletes.
  ?team a uri:Teams.
  ?athlete uri:belongs_to ?team.
  {?team uri:Team_Name "Arsenal".}
  UNION
  {?team uri:Team_Name "Liverpool".}
  UNION
  {?team uri:Team_Name "ManCity".}
  ?athlete uri:Athlete_Name ?x.
  ?team uri:Team_Name ?y.
  OPTIONAL {?athlete uri:Height ?z.}
}
Order BY ?x
```

Display Result

javax.swing.table.TableColumn...	javax.swing.table.TableColumn...	javax.swing.table.TableColumn...
DeBruyne	ManCity	
Firmino	Liverpool	
Haaland	ManCity	1.94
Odegaard	Arsenal	
Ramsdale	Arsenal	
Salah	Liverpool	1.75

SPARQL Query 4

- Returns teams & their athletes & their coach that does not participate in Champions League.

Snap SPARQL Query:

```
PREFIX uri:<http://www.semanticweb.org/salma/ontologies/2023/4/untitled-ontology-46#>
SELECT (str(?x) as ?label0) (str(?y) as ?label1) (str(?z) as ?label2)
where {
  ?athlete a uri:Athletes.
  ?team a uri:Teams.
  ?coach a uri:Coach.
  ?competition a uri:Competitions.
  OPTIONAL {?team uri:participates_in ?competition.
  ?competition_name uri:Competition_Name "ChampionsLeague".}
  FILTER (!BOUND(?competition_name))
  ?athlete uri:belongs_to ?team.
  ?team uri:coached_by ?coach.
  ?team uri:Team_Name ?x.
  ?athlete uri:Athlete_Name ?y.
  ?coach uri:Coach_Name ?z.
}
Order BY ?x
```

```
PREFIX uri:<http://www.semanticweb.org/salma/ontologies/2023/4/untitled-ontology-46#>
SELECT (str(?x) as ?label0) (str(?y) as ?label1) (str(?z) as ?label2)
where {
  ?athlete a uri:Athletes.
  ?team a uri:Teams.
  ?coach a uri:Coach.
  ?competition a uri:Competitions.
  OPTIONAL {?team uri:participates_in ?competition.
  ?competition_name uri:Competition_Name "ChampionsLeague".}
  FILTER (!BOUND(?competition_name))
  ?athlete uri:belongs_to ?team.
  ?team uri:coached_by ?coach.
  ?team uri:Team_Name ?x.
  ?athlete uri:Athlete_Name ?y.
  ?coach uri:Coach_Name ?z.
}
Order BY ?x
```

Display Result

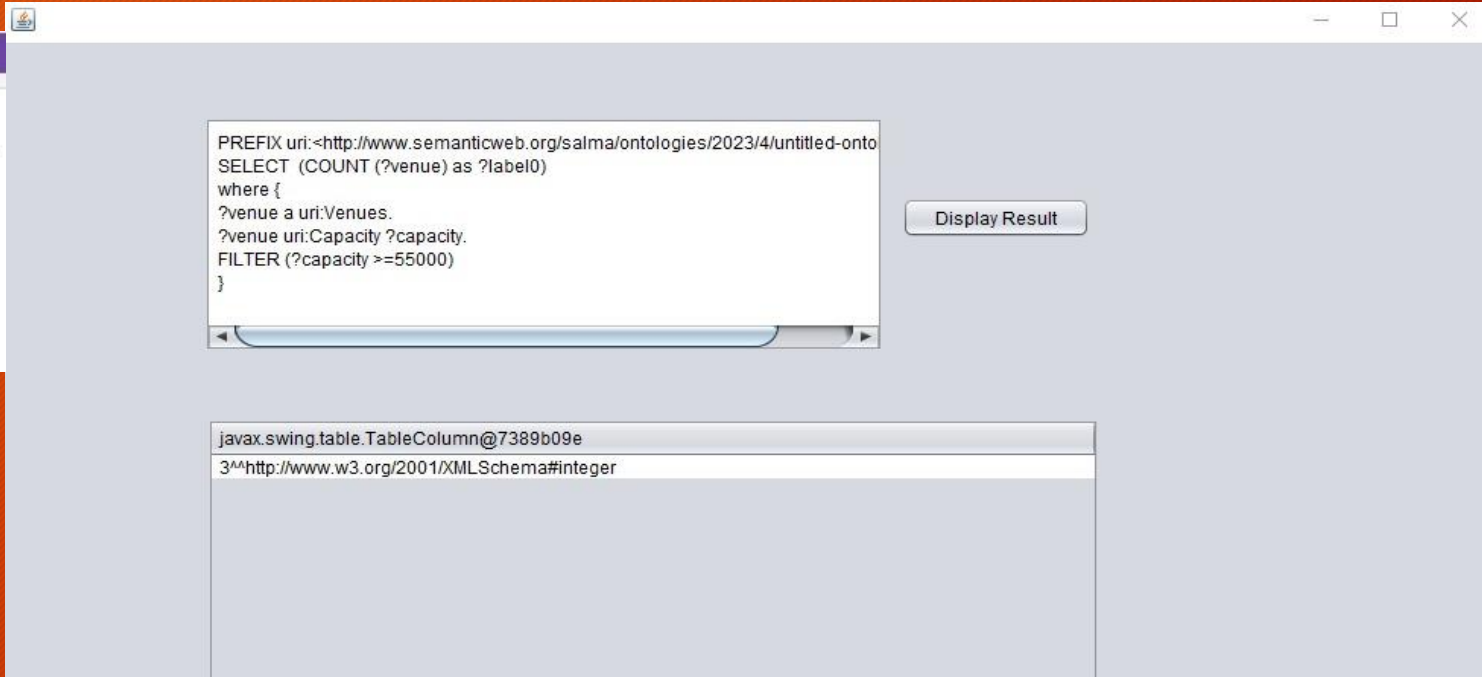
javax.swing.table.TableColumn...	javax.swing.table.TableColumn...	javax.swing.table.TableColumn...
ManUtd	Ronaldo	CoachMourinho
ManUtd	Rooney	CoachMourinho

SPARQL Query 5

- Returns the number of venues that has more than 55,000 seats or equal.

Snap SPARQL Query:

```
PREFIX uri:<http://www.semanticweb.org/salma/ontologies/2023/4/untitled-ontology-46#>
SELECT ( COUNT (?venue) as ?label0)
where {
?venue a uri:Venues.
?venue uri:Capacity?capacity.
FILTER (?capacity >=55000)
}
```



The screenshot shows a web-based SPARQL query execution interface. It features a text area for the query, a 'Display Result' button, and a table displaying the results. The query is identical to the one in the previous block. The result table has two columns: a Java table column identifier and the query result value.

javax.swing.table.TableColumn@7389b09e
3^^http://www.w3.org/2001/XMLSchema#integer

SPARQL Query 6

- Returns the average salary per nationality, ordered in an ascending order.

Snap SPARQL Query:

```
PREFIX uri:<http://www.semanticweb.org/salma/ontologies/2023/4/untitled-ontology-46#>
SELECT ?nationality (AVG(?athlete_salary) as ?label1)
where {
?athlete a uri:Athletes.
?athlete uri:Athlete_Salary ?athlete_salary.
?athlete uri:Athlete_Nationality ?nationality.
}
GROUP BY ?nationality
ORDER BY ?label1
```

```
PREFIX uri:<http://www.semanticweb.org/salma/ontologies/2023/4/untitled-ontology-46#>
SELECT ?label0 (AVG(?athlete_salary) as ?label1)
where {
?athlete a uri:Athletes.
?athlete uri:Athlete_Salary ?athlete_salary.
?athlete uri:Athlete_Nationality ?label0.
}
GROUP BY ?label0
ORDER BY ?label1
```

Display Result

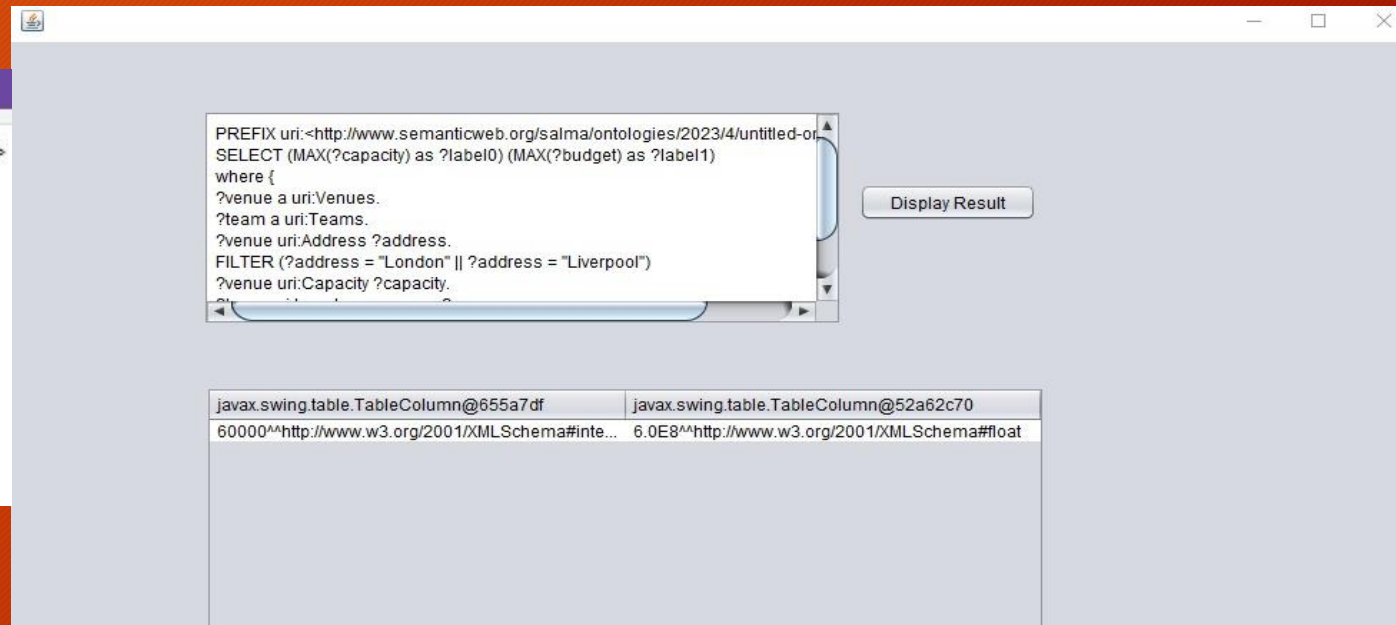
javax.swing.table.TableColumn@64de46ec	javax.swing.table.TableColumn@69e7c7f7
British	1.1E7^^http://www.w3.org/2001/XMLSchema#float
Spanish	1.2E7^^http://www.w3.org/2001/XMLSchema#float
Brazilian	1.5E7^^http://www.w3.org/2001/XMLSchema#float
French	2.5E7^^http://www.w3.org/2001/XMLSchema#float
Norwegian	2.65E7^^http://www.w3.org/2001/XMLSchema#float
Belgian	3.0E7^^http://www.w3.org/2001/XMLSchema#float
Egyptian	3.1E7^^http://www.w3.org/2001/XMLSchema#float
Portuguese	1.0E8^^http://www.w3.org/2001/XMLSchema#float

SPARQL Query 7

- Returns the biggest stadium in the city of London or the city of Liverpool, and returns the highest budget found in the teams of the city of London or the city of Liverpool.

Snap SPARQL Query:

```
PREFIX uri: <http://www.semanticweb.org/salma/ontologies/2023/4/untitled-ontology-46#>
SELECT (MAX(?capacity) as ?label0) (MAX(?budget) as ?label1)
where {
?venue a uri:Venues.
?team a uri:Teams.
?venue uri:Address ?address.
FILTER (?address = "London" || ?address = "Liverpool")
?venue uri:Capacity ?capacity.
?team uri:has_home_venue ?venue.
?team uri:Budget ?budget.
}
```



The screenshot shows a SPARQL query interface. The query is displayed in a text area, and a "Display Result" button is visible. Below the query, the results are shown in a table format.

javax.swing.table.TableColumn@655a7df	javax.swing.table.TableColumn@52a62c70
60000^^http://www.w3.org/2001/XMLSchema#inte...	6.0E8^^http://www.w3.org/2001/XMLSchema#float

SPARQL Query 8

- Returns teams that play in Champions League, that has not been defeated by Liverpool, other than Liverpool itself.

Snap SPARQL Query:

```
PREFIX uri: <http://www.semanticweb.org/salma/ontologies/2023/4/untitled-ontology-46#>
SELECT (str(?team_name) as ?label0)
where {
?team a uri:Teams.
?competition a uri:Competitions.
?competition uri:Competition_Name "ChampionsLeague".
?team uri:participates_in ?competition.
MINUS{?team uri:defeated_by ?winner_team.
?winner_team uri:Team_Name "Liverpool".}
MINUS{?team uri:Team_Name "Liverpool".}
?team uri:Team_Name ?team_name.
}
Order BY ?team_name
```

```
PREFIX uri: <http://www.semanticweb.org/salma/ontologies/2023/4/untitled-ontology-46#>
SELECT (str(?team_name) as ?label0)
where {
?team a uri:Teams.
?competition a uri:Competitions.
?competition uri:Competition_Name "ChampionsLeague".
?team uri:participates_in ?competition.
MINUS{?team uri:defeated_by ?winner_team.
?winner_team uri:Team_Name "Liverpool".}
MINUS{?team uri:Team_Name "Liverpool".}
?team uri:Team_Name ?team_name.
}
Order BY ?team_name
```

Display Result

javax.swing.table.TableColumn@745c44f3
Arsenal