Project Submission

Program: CESS

Course Code: CSE 488

Course Name: Ontologies and the Semantic Web

Submitted to

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1. Ontology Topic

Our chosen topic for the ontology creation revolves around the renowned music band, Metallica. Formed in 1981, Metallica has gained worldwide recognition for their contributions to the heavy metal genre. The band currently consists of four talented members: James Hetfield, who serves as the rhythm guitarist and vocalist; Kirk Hammett, the lead guitarist; Lars Ulrich, the drummer; and Robert Trujillo, the bassist. Over the years, Metallica has released numerous studio albums, showcasing their musical prowess. In addition to the studio recordings, the band has also performed live versions of their songs, which have sparked debates among fans about their superiority compared to the original studio tracks.

We were drawn to this particular topic of Metallica for our ontology due to our deep appreciation for the heavy metal genre as a whole, and our admiration for the unique contributions and artistry of this band. Metallica's rich discography and their ability to captivate audiences through their energetic performances make them an ideal subject for our ontological exploration.

2. Ontology Details

In the following section, we'll discuss the details of our ontology, including the classes, object properties, data properties, instances, and cardinality.

i. Classes

We have a total of 3 classes in our ontology: Band, MusicAlbum, and Person. The instances of each are:

Band:

- Metallica

MusicAlbum:

- Ride The Lightning
- Master Of Puppets
- And Justice For All

Person:

- James Hetfield
- Kirk Hammett
- Lars Ulrich
- Robert Trujillo

ii. Object Properties

Regarding the object properties, we have a total of 2.

hasAlbum

Describes what albums does the band have

- **Domain:** Band
- **Range:** MusicAlbum
- **Cardinality: Band** has a minimum of 1 **MusicAlbum**

hasMember

Describes which members does the band have

- **Domain:** Band
- **Range:** Person
- **Cardinality: Band** has a minimum of 2 **Person**

iii. Data Properties

We have a total of 4 data properties:

hasRole

Describes the role of each member

- **Domain:** Person
- **Range:** xsd:string
- **Values:** Bassist, Drummer, Lead Guitarist, Rhythm Guitarist, Vocalist

hasSong

Describes the songs of each album

- **Domain:** MusicAlbum
- **Range:** xsd:string

placeFormedIn

Describes the place in which the band was formed in

- **Domain:** Band
- **Range:** xsd:string

timeFormedIn

Describes the time in which the band was formed in

- **Domain:** Band
- **Range:** xsd:int

3. RDF Graphs

In this subsection, we discuss the RDF (Resource Description Framework) graph that we have created as part of our report. The RDF graph serves as a structured representation of our data, allowing us to model and interconnect various entities and their relationships.

We conducted two iterations of creating the RDF graph, each with a specific focus. The first iteration involved constructing the RDF graph without incorporating the individuals, solely emphasizing the schema and ontology. This initial step allowed us to define the classes, properties, and relationships that form the foundation of our data model. By establishing a clear structure, we laid the groundwork for organizing and categorizing our information effectively.

In the second iteration, we enhanced the RDF graph by incorporating the individuals, which represent specific instances or examples within our data domain. By including these individuals, we added real-world context to our RDF graph, making it more representative of the actual data we are working with. This step further enriches our understanding of the relationships and connections between entities, enabling us to derive meaningful insights and draw conclusions.

Throughout this subsection, we will delve into the details of both iterations of the RDF graph creation process, examining the structure, elements, and interdependencies of the graph. By exploring both the schema-focused and instance-focused representations, we aim to provide a comprehensive overview of our data model, facilitating a deeper understanding of the information and its underlying structure.

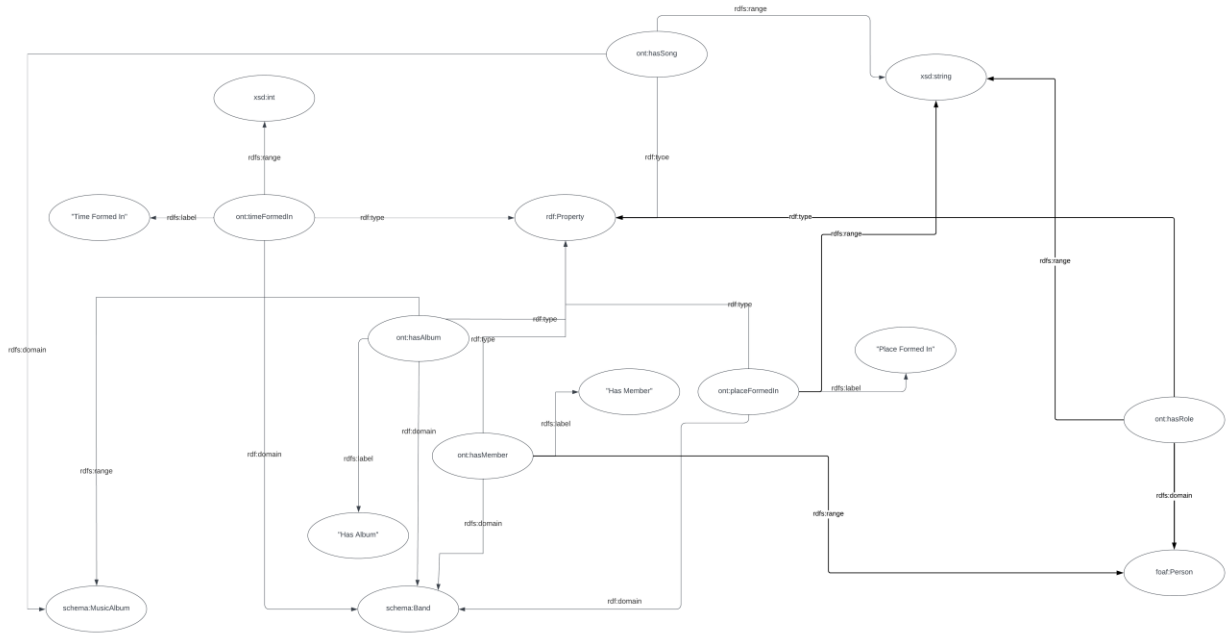


Figure 1 The RDF Graph Showing only the Classes and the Properties.

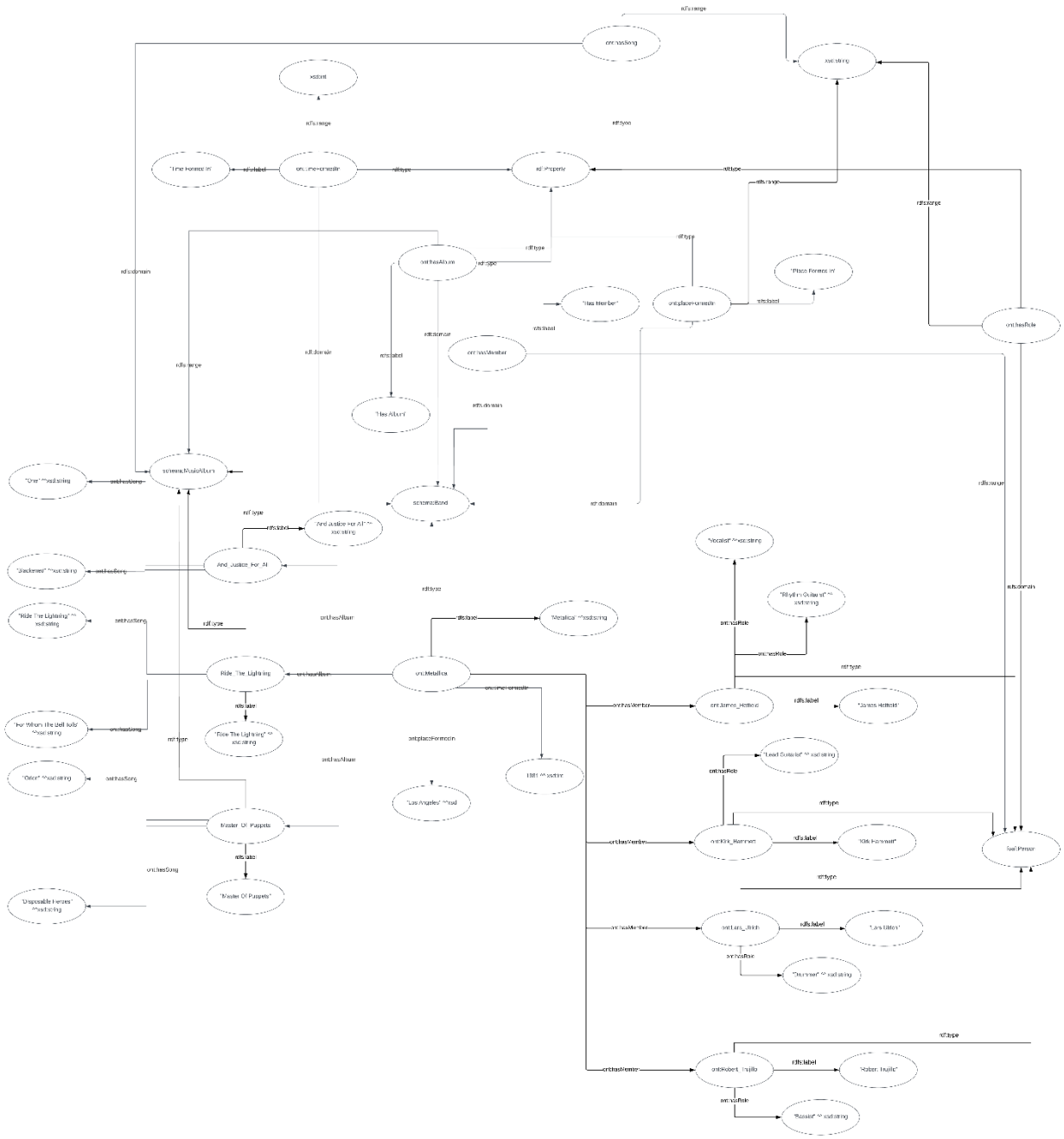


Figure 2 The Final RDF Graph showing the Classes, Properties, and Individuals.

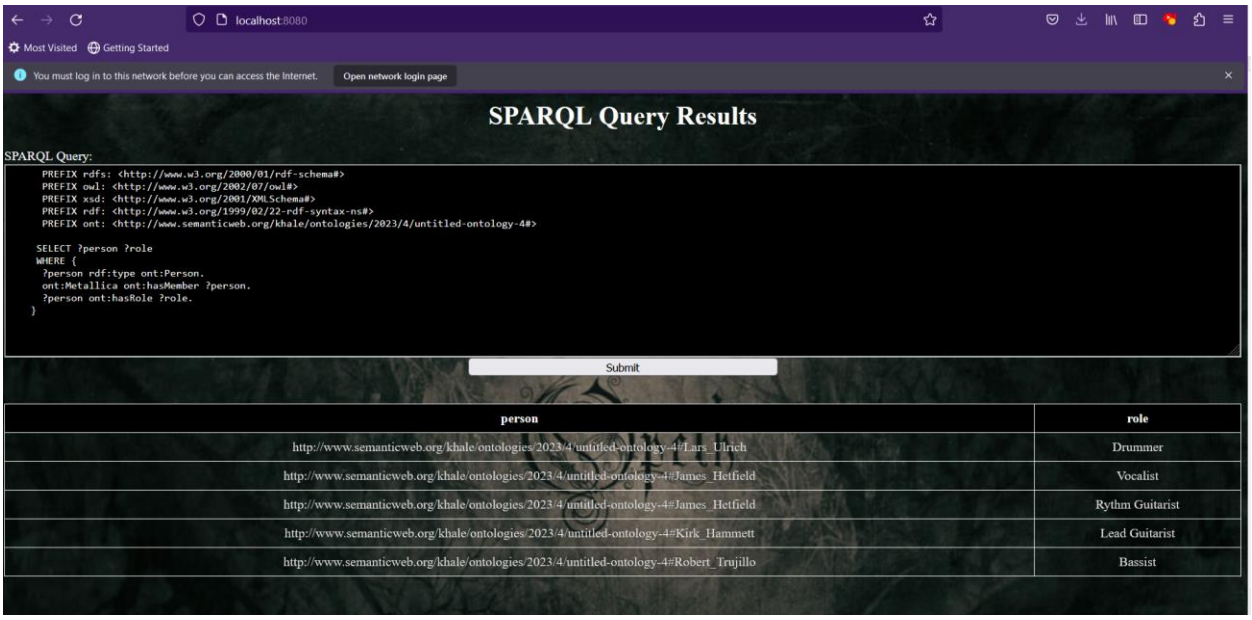
4. Website Input and Output

SPARQL Query:

```
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX ont: <http://www.semanticweb.org/khale/ontologies/2023/4/untitled-ontology-4#>

SELECT ?person ?role
WHERE {
 ?person rdf:type ont:Person.
 ont:Metallica ont:hasMember ?person.
 ?person ont:hasRole ?role.
}
```

Figure 3 Query 1



person	role
http://www.semanticweb.org/khale/ontologies/2023/4/untitled-ontology-4#Lars_Ulrich	Drummer
http://www.semanticweb.org/khale/ontologies/2023/4/untitled-ontology-4#James_Hetfield	Vocalist
http://www.semanticweb.org/khale/ontologies/2023/4/untitled-ontology-4#James_Hetfield	Rythm Guitarist
http://www.semanticweb.org/khale/ontologies/2023/4/untitled-ontology-4#Kirk_Hammett	Lead Guitarist
http://www.semanticweb.org/khale/ontologies/2023/4/untitled-ontology-4#Robert_Trujillo	Bassist

Figure 4 Query 1 output

SPARQL Query:

```
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX ont: <http://www.semanticweb.org/khale/ontologies/2023/4/untitled-ontology-4#>

SELECT ?albumL ?song
WHERE {
  ont:Metallica ont:hasAlbum ?album.
  ?album rdfs:label ?albumL.
  ?album ont:hasSong ?song
}
```

Figure 5 Query 2

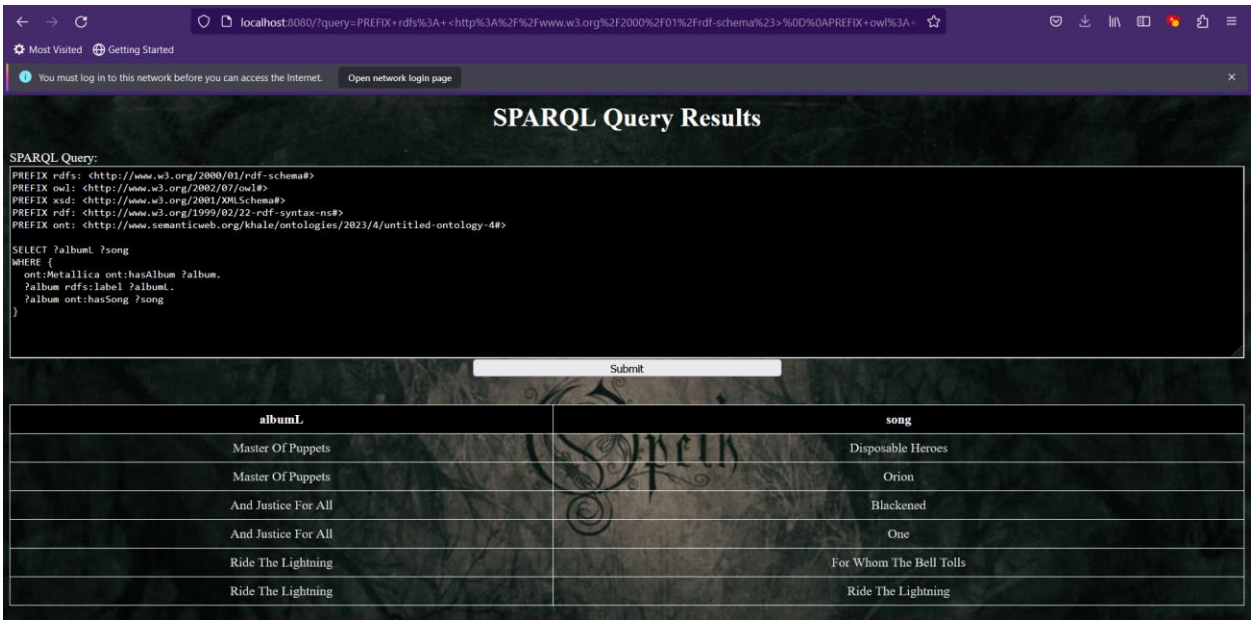


Figure 6 Query 2 output

SPARQL Query:

```
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX ont: <http://www.semanticweb.org/khale/ontologies/2023/4/untitled-ontology-4#>

SELECT ?personL
WHERE {
  ont:Metallica ont:hasMember ?person.
  ?person ont:hasRole ?role.
  ?person rdfs:label ?personL.
  FILTER REGEX( ?role , "Guitarist$", "i").
}
```

Figure 7 Query 3

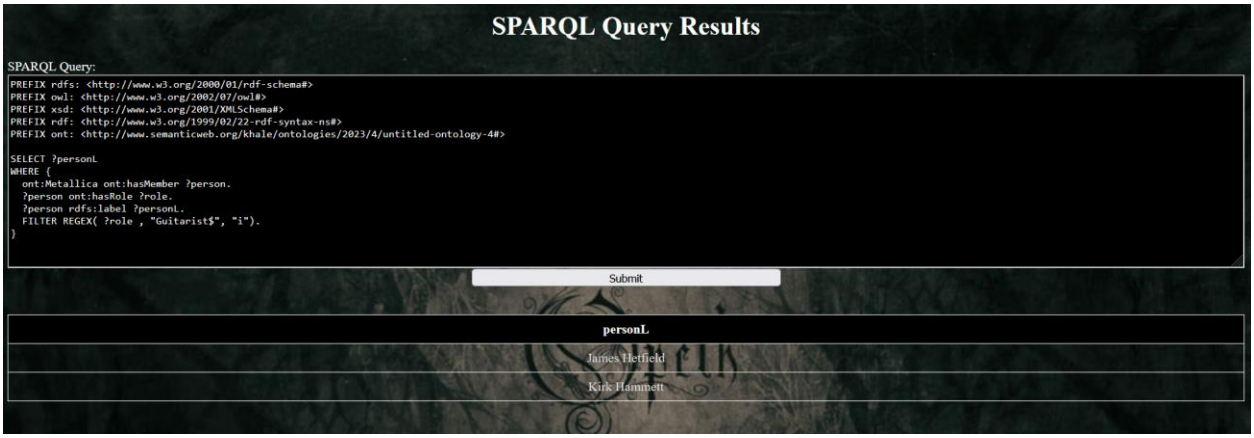


Figure 8 Query 3 output

SPARQL Query:

```
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX ont: <http://www.semanticweb.org/khale/ontologies/2023/4/untitled-ontology-4#>

SELECT ?bandL ?placeFormedIn ?timeFormedIn
WHERE {
  ?band rdf:type ont:Band.
  ?band rdfs:label ?bandL.
  ?band ont:placeFormedIn  ?placeFormedIn.
  ?band ont:timeFormedIn ?timeFormedIn.
}
```

Figure 9 Query 4

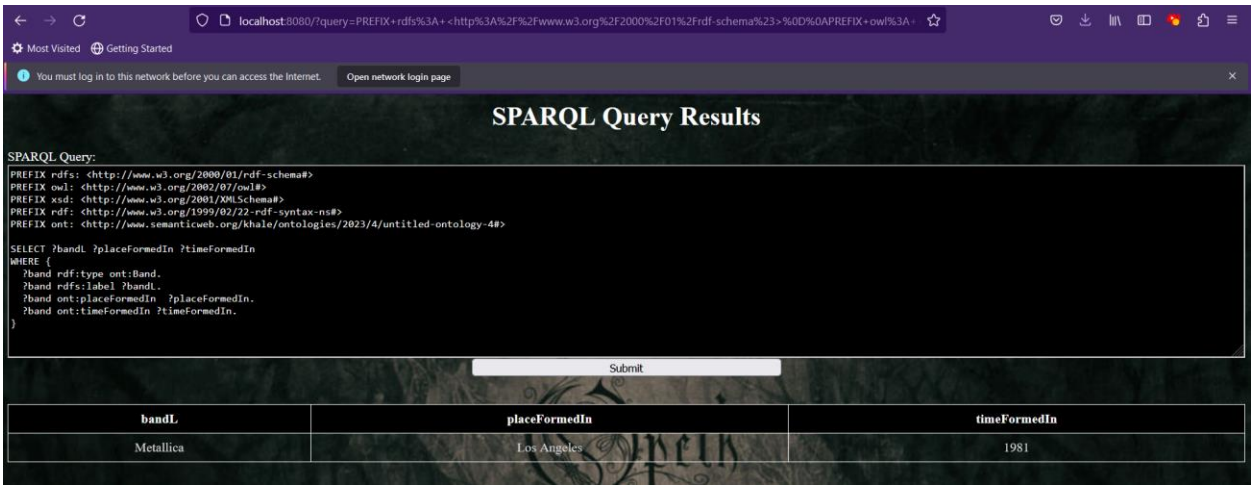


Figure 10 Query 4 output

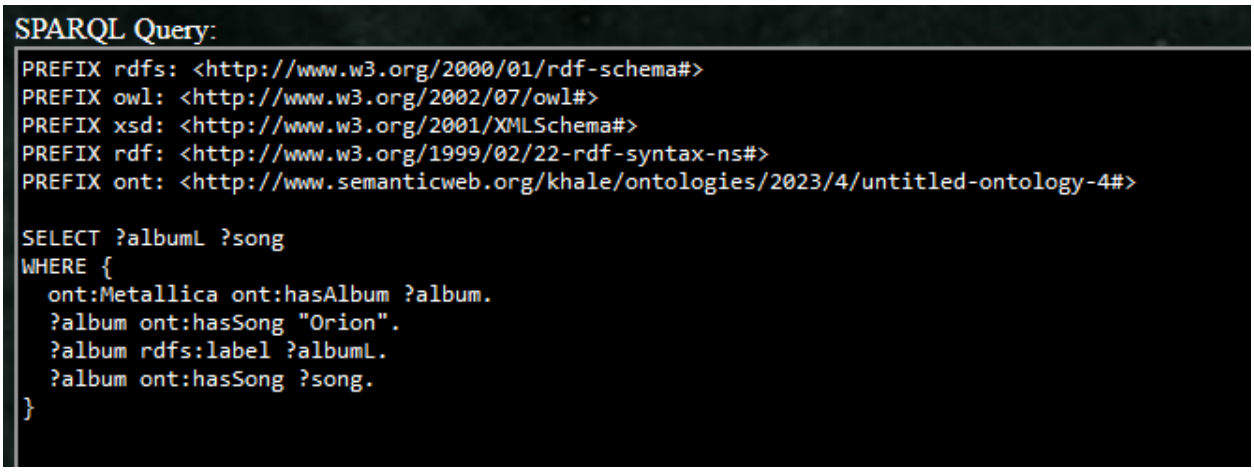


Figure 11 Query 5

Figure 12 Query 5 output