



Music Ontology

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Ontologies and the Semantic Web

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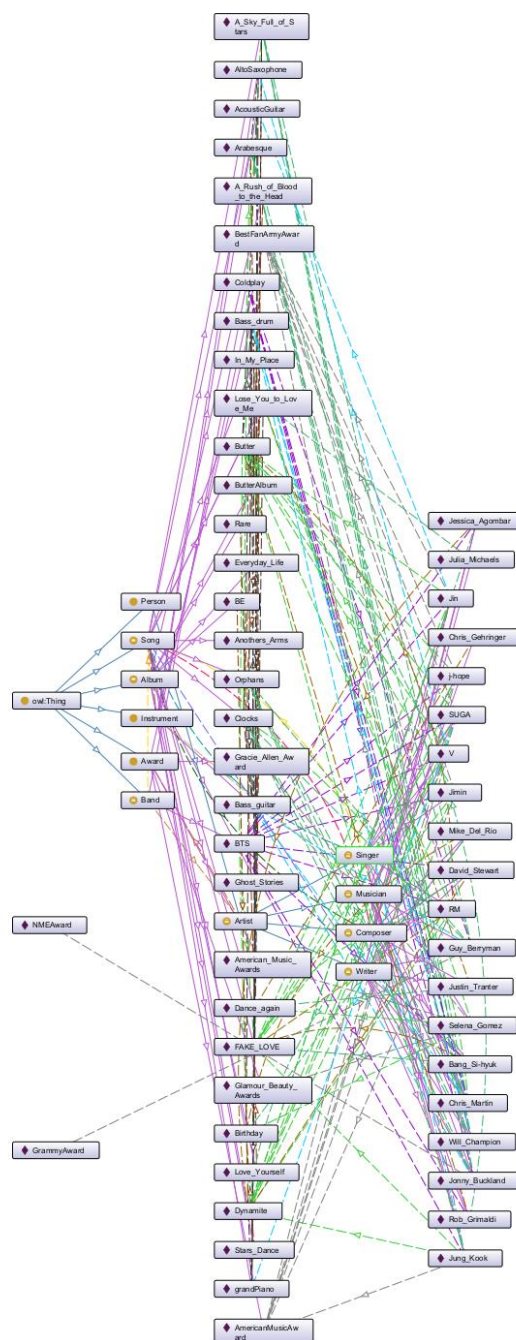
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1. INTRODUCTION

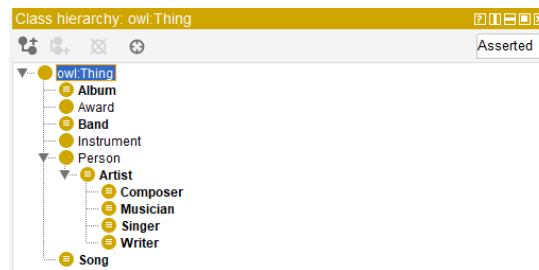
Our project is based on a Music Ontology that contains songs, their artists, including the singer singing, the musician playing the background music, the writer that wrote the lyrics and the composer. Our ontology also includes the bands and the artists they include, the awards won by the artist and the instruments played by the musician. We used the Protégé ontology editor developed by Stanford University to build our Music Ontology. Then we created a java application and added Jena jar files to be able to create a GUI frame where we will be able to write a SPARQL query, press execute and see the results of the query displayed in the form of a table. We also created a JavaScript web application that contains a text field for the queries, a button to run the query and a table to display the results.



2. CLASSES

Define the following classes:

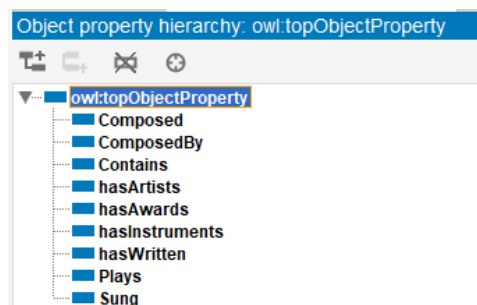
- Album: To contain the songs.
- Award: Given to artists.
- Band: To have artists that play songs together.
- Instrument: The instruments that the musician will play.
- Person: Parent class of Artist, for expansion purposes if wanted to add different type of people that are not artists.
- Artist: Parent class of Composer, Musician, Singer, and Writer, which are all considered artists.
- Composer: Composes songs.
- Musician: Plays instrument.
- Singer: Sings the songs.
- Writer: Write the song lyrics
- Song: The actual song class that has a name, language and other properties discussed in the following sections.



3. OBJECT PROPERTIES

➤ Define the following object properties:

- Composed: connects Composer to Song.
- Contains: connects Album to Song.
- hasArtists: connects Band to Artist.
- hasAwards: connects Artist to Award.
- hasInstruments: connects Song to Instrument.
- hasWritten: connects Writer to Song.
- Plays: connects Musician to Instrument.
- Sung: connects Band/Singer to Song.





4. RESTRICTIONS

Define minimum and maximum cardinality restrictions on the object properties:

- Each Album contains at least 1 and at most 15 songs:
 - Add a restriction on the **Contains** property with a minimum cardinality of 1 and a maximum cardinality of 15.
- Each Band has at least 2 Artists:
 - Add a restriction on the **hasArtists** property with a minimum cardinality of 2.
- Each Band sung at least 1 song:
 - Add a restriction on the **Sung** property with a minimum cardinality of 1.
- Each Song has at least 1 instrument:
 - Add a restriction on the **hasInstruments** property with a minimum cardinality of 1.
- Each Composer composed at least 1 Song:
 - Add a restriction on the **Composed** property with a minimum cardinality of 1.
- Each Musician Plays at least 1 Instrument:
 - Add a restriction on the **Plays** property with a minimum cardinality of 1.
- Each Singer sung at least 1 Song:
 - Add a restriction on the **Sung** property with a minimum cardinality of 1.
- Each Writer has Witten at least 1 Song:
 - Add a restriction on the **hasWritten** property with a minimum cardinality of 1.



5. DATA PROPERTIES

Data Property	Domain	Range
- Age	- Person	- Integer
- Agent	- Singer	- String
- Country	- Band	- String
- Date	- Band - Award	- Data Time
- Description	- Song	- String
- Emotions	- Song	- String
- Gender	- Person	- String
- ID	- Song	- long
- Language	- Song	- String
- Name	- Song - Album - Band - Award - Instrument - Person	- String
- Nationality	- Person	- String
- Release Date	- Album - Song	- Date Time
- Time Duration	- Song	- Decimal
- Top Hits	- Artist	- String
- Type	- Award - Instrument	- String
- Views	- Song	- Decimal
- Genre	- Song	- String

6. INSTANCES

After adding the classes, their data and object properties, along with their restrictions we added some instance to be able to query on. Some of these instances are mentioned below.

Instances of Album and example of data and object property assertions of the first instance:

Instances +

- A_Rush_of_Blood_to_the_Head
- BE
- ButterAlbum
- Everyday_Life
- Ghost_Stories
- Love_Yourself
- Rare
- Stars_Dance

Object property assertions +

- Contains Clocks

Data property assertions +

- releaseData "2002-08-26T07:10:00"^^xsd:dateTime
- name "A Rush of Blood to The Head"

Instances of Award and example of data and object property assertions of the first instance:

Instances +

- American_Music_Awards
- AmericanMusicAward
- BestFanArmyAward
- Glamour_Beauty_Awards
- Gracie_Allen_Award

Object property assertions +

Data property assertions +

- type "Favorite Pop/Rock Female Artist"
- date "2016-05-29T01:50:30"^^xsd:dateTime
- name "American Music Awards"

Instances of Band and example of data and object property assertions of the first instance:

Instances +

- BTS
- Coldplay

Object property assertions +

- hasArtists Jessica_Agombar
- hasArtists j-hope
- hasArtists Jimin
- hasArtists Rob_Grimaldi
- Sung Butter
- hasArtists V
- hasArtists RM
- hasArtists Bang_Si-hyuk
- hasArtists Jin
- hasArtists Jung_Kook
- Sung Dynamite
- hasArtists David_Stewart
- Sung FAKE_LOVE
- hasArtists SUGA

Data property assertions +

- name "BTS"
- Country "Seoul, South Korea"
- date "2013-02-13T06:18:00"^^xsd:dateTime



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Instances of Instrument and example of data and object property assertions of the first instance:

Instances +	Object property assertions +
AcousticGuitar	
AltoSaxophone	
Bass_drum	
Bass_guitar	
grandPiano	
	Data property assertions +
	type "Acoustic guitar"
	name "Guitar"

Instances of Composer and example of data and object property assertions of the first instance:

Instances +	Object property assertions +
Bang_Si-hyuk	hasWritten FAKE_LOVE
Chris_Gehringer	Composed FAKE_LOVE
David_Stewart	
Jessica_Agombar	
Justin_Tranter	
Mike_Del_Rio	
RM	
Rob_Grimaldi	
	Data property assertions +
	nationality "South Korean"
	name "Bang Si-hyuk"
	topHits "\"I Need U\" by BTS, \"Blood Sweat & Tears\" by BTS, \"Spring Day\" by BTS, \"Boy with Luv\" by BTS featuring Halsey"
	gender "Male"
	age 49

Instances of Musician and example of data and object property assertions of the first instance:

Instances +	Object property assertions +
Chris_Martin	Plays Bass_drum
Guy_Berryman	hasWritten A_Sky_Full_of_Stars
Jin	hasWritten Orphans
Jonny_Buckland	hasWritten Arabesque
Jung_Kook	hasWritten Clocks
SUGA	Plays Bass_guitar
V	Sung Clocks
Will_Champion	
	Data property assertions +
	age 46
	nationality "English"
	gender "Male"
	Agent "AAE Music"
	name "Chris Martin"
	topHits "\"I'm A Big Deal\", \"Clocks\", \"The Scientist\", \"Viva la Vida\""



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Instances of Singer and example of data and object property assertions of the first instance:

Instances +	Object property assertions +
Chris_Martin	Plays Bass_drum
j-hope	hasWritten A_Sky_Full_of_Stars
Jimin	hasWritten Orphans
Jin	hasWritten Arabesque
Jung_Kook	hasWritten Clocks
RM	Plays Bass_guitar
Selena_Gomez	Sung Clocks
SUGA	
V	
	Data property assertions +
	age 46
	nationality "English"
	gender "Male"
	Agent "AAE Music"
	name "Chris Martin"
	topHits "'I'm A Big Deal, I'"Clocks , I'"The Scientist, I'"Viva la Vida!"

Instances of Writer and example of data and object property assertions of the first instance:

Instances +	Object property assertions +
Bang_Si-hyuk	hasWritten FAKE_LOVE
Chris_Martin	Composed FAKE_LOVE
David_Stewart	
Guy_Berryman	
Jessica_Agombar	
Jonny_Buckland	
Julia_Michaels	
Justin_Tranter	
Mike_Del_Rio	
Rob_Grimaldi	
Will_Champion	
	Data property assertions +
	nationality "South Korean"
	name "Bang Si-hyuk"
	topHits "'I Need U" by BTS, I'"Blood Sweat & Tears" by BTS, I'"Spring Day" by BTS, I'"Boy with Luv" by BTS featuring Halsey"
	gender "Male"
	age 49

Instances of Song and example of data and object property assertions of the first instance:

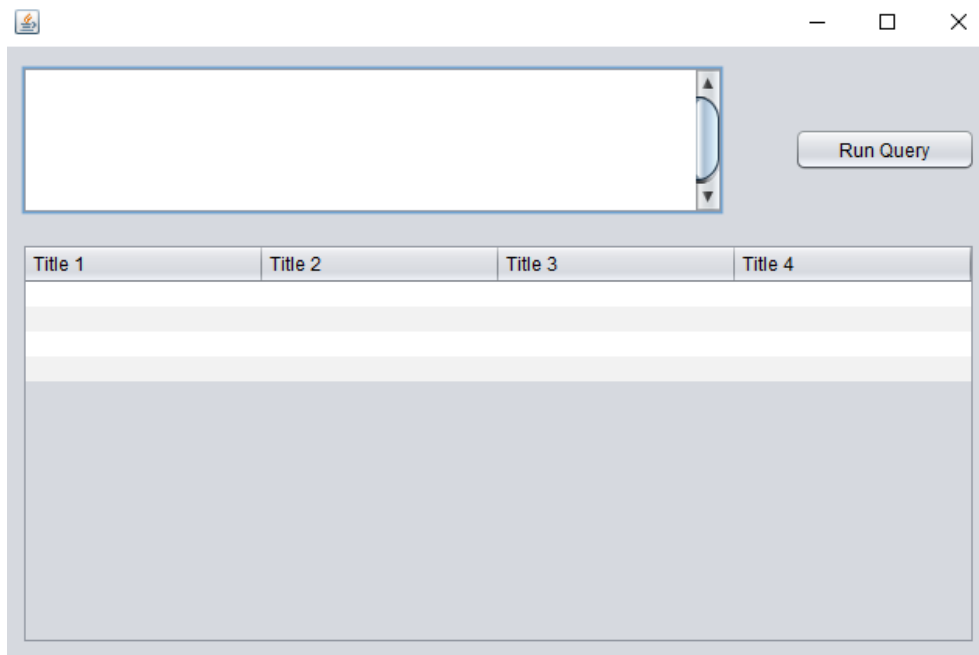
Instances +	Object property assertions +
A_Sky_Full_of_Stars	hasInstruments grandPiano
Anothers_Arms	
Arabesque	
Birthday	
Butter	
Clocks	
Dance_again	
Dynamite	
FAKE_LOVE	
In_My_Place	
Lose_You_to_Love_Me	
Orphans	
	Data property assertions +
	releaseData "2014-05-02T10:00:00"^^xsd:dateTime
	name "A Sky Full of Stars"
	genre "Progressive house, alternative rock"
	language "English"
	id 51484
	description "'A Sky Full of Stars" is song about appreciating someone romantically and investing one's self in that person. This path is not really a metaphor for anything. The lyric emphasizes that the beloved "lights up," meaning that she is very important and beautiful."
	emotions "The emotions conveyed in I'"A sky full of stars" is about unconditional love."
	views 8170000
	timeDuration 4.27

7. JAVA APPLICATION

After creating the java application, we added the Jena jar files in the Libraries folder, then we added the OpenOWL.java in our package, and added the directory path to our owl file.

```
25 |  
26 |  
27 | OntModel mode = null;  
28 | mode = ModelFactory.createOntologyModel( OntModelSpec.OWL_MEM_RULE_INF );  
29 | java.io.InputStream in = FileManager.get().open( "C:/music_ont.owl" ); // be sure file into c:\
```

Later, we added a JFrame form, and added a text field to write the queries, a button to run the query and a table to display the result of the query.



In the `run_query_btnActionPerformed` function, in the `DisplayFrame.java`, first we check if query field is empty we return, if not empty we assign the query string to variable `q`, then we assign the prefixes of our ontology, `rdf`, `rdfs`, and `owl`, along with our query all to variable `querystring`. `GetResultAsString` in the `OpenOWL.java` is called and the query string is passed to it, its result is assigned to the result variable.

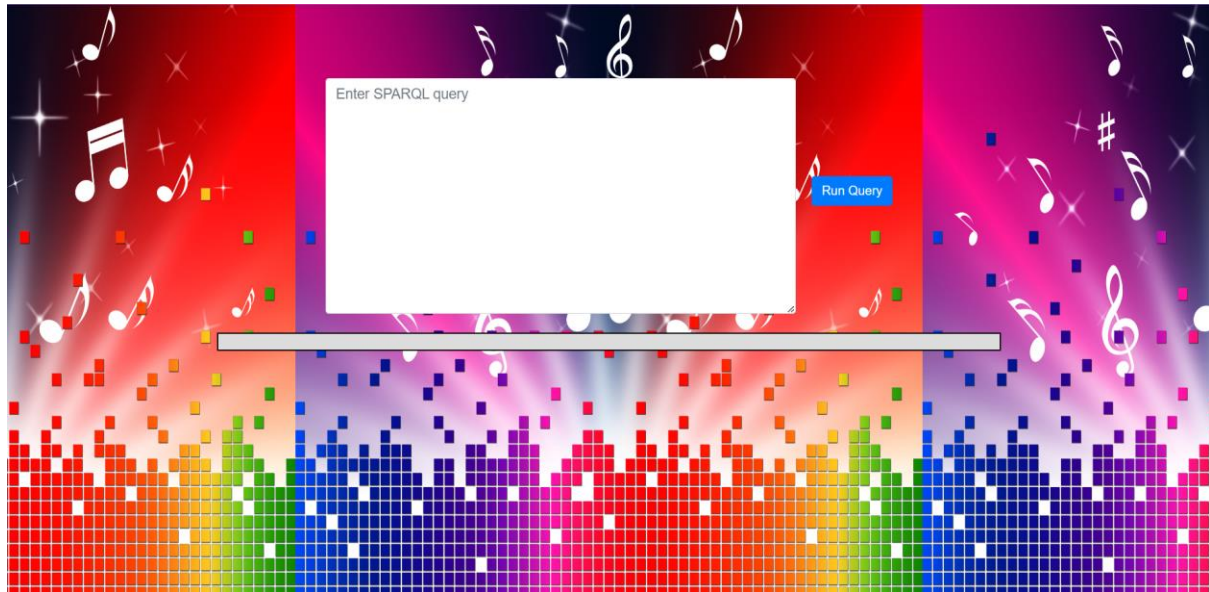
Finally, if the results value is `rien` we return, otherwise we split the results into lines and split the lines to labels with respect to `|` character that's between the labels and put these labels in the column names, then we split the rest of the lines again and put these values in the cells of the table and set the model to the result table.



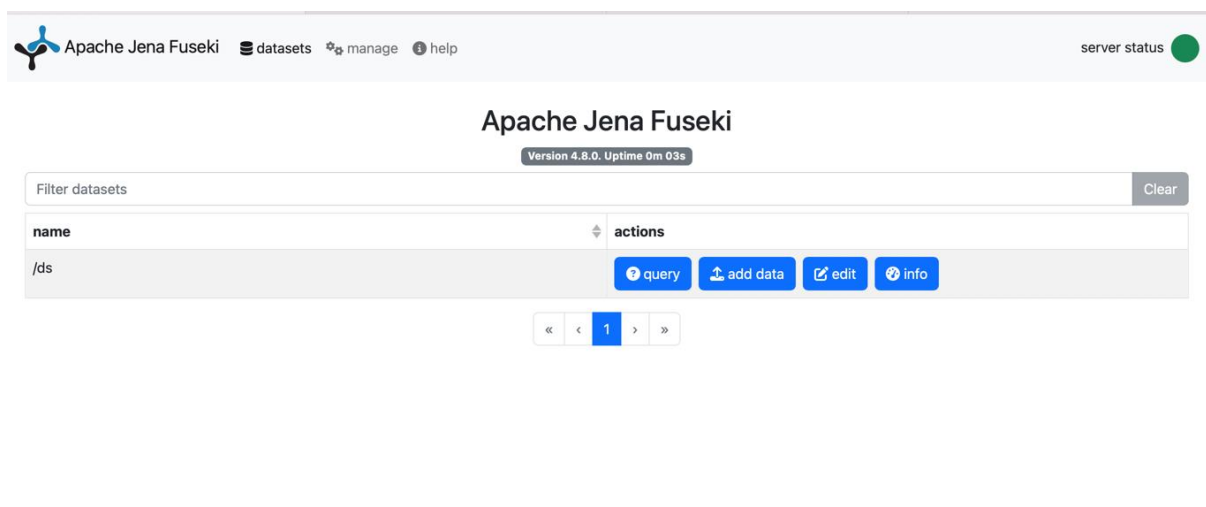
```
private void run_query_btnActionPerformed(java.awt.event.ActionEvent evt) {  
  
    if("").equals(query_txt.getText()) // check if text area is empty  
    {  
        System.out.println("empty string");  
        return;  
    }  
  
    String q = query_txt.getText(); // get query from text area  
  
    try {  
        // OntModel model = OpenOWL.OpenConnectOWL();  
        String queryString;  
        // form the query string  
        queryString = "PREFIX m:<http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3/> "  
            + "PREFIX owl: <http://www.w3.org/2002/07/owl#> "  
            + "PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> "  
            + "PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#> " + q;  
  
        String results = OpenOWL.GetResultAsString(queryString); //GetResultAsString gets query result as string  
        System.out.println(results);  
  
        if (results.equals("rien")){ //if the result is nothing  
            return;  
        }  
  
        String []lines = results.split("\\R");//split the result by new line  
        String [] labels = lines[1].split("\\|");//split each line by | charecter  
        String [] colNames = new String [labels.length -1];  
  
        // get column names from secound line  
        for (int i=1; i< labels.length; i++){  
  
            colNames[i-1] = labels[i].trim();  
            System.out.println(labels[i]);  
  
        }  
  
        Object [][] output = new Object [lines.length-3][labels.length-1] ;  
  
        // get the output of the query in 2d array by parsing the result string  
        for ( int i =3; i < lines.length; i++) {  
  
            String [] line = lines[i].split("\\|");  
            for ( int j =1 ; j < line.length; j++){  
                output [i-3][j-1]=line[j].trim();  
            }  
        }  
  
        res_table.setModel(new javax.swing.table.DefaultTableModel(output ,colNames)); // fill the table  
  
    } catch (Exception ex) {  
        ex.printStackTrace();  
    }  
}
```

8. JAVASCRIPT WEBAPP

Our web application, which enables users to input a SPARQL query and view the results in a tabular format, is created using HTML and JavaScript code. The HTML code is used to specify the layout of a web page, including the text area, background image, and results table. The query input, button interaction with the server, and result presentation in the table are all handled by the JavaScript code.



In order to produce a dataset that can be accessed via the SPARQL query language, we first uploaded our owl file to the Apache Jena Fuseki Server.





After that, we'll use JavaScript to send requests to the Fuseki server and display the results. When a user writes a SPARQL query into the text area and clicks the "Run Query" button, JavaScript code iterates through each line of the query input, determining if it begins with the keyword "PREFIX," and adding that line to the prefixes array if it does. If not, the line is added to the "query" String. The final SPARQL query is then created and transmitted to the server using the fetch () method by combining the prefix declarations and the main query into a single string. The query's results are returned by the server in JSON format. The results are then parsed by JavaScript code and shown in a table.

```
/*When the User pressed on the Run query Button, then this function is called*/
Button.addEventListener('click', () => {
  // Get the query input value
  const queryInputValue = queryInput.value.trim();
  if (!queryInputValue) {
    alert('Please enter a SPARQL query');
    return;
  }
  //At First, we split the input into lines
  const lines = queryInputValue.split('\n');
  /*It initializes an empty array called "prefixes" to store any prefix declarations found in the query input,
  and an empty string called "query" to store the main query.*/
  const prefixes = [];
  let query = '';
  /*It loops through each line of the query input and checks if it starts with the keyword "PREFIX" or not.
  If it does, it adds the line to the "prefixes" array. If it doesn't, it adds the line to the "query" string.*/
  for (const line of lines) {
    if (line.trim().toUpperCase().startsWith('PREFIX')) {
      prefixes.push(line);
    } else {
      query += line + '\n';
    }
  }
}
```

```
/*If there is no prefixes declarations entered by the user, then the default prefixes will be added to the
prefixes array*/
if (prefixes.length === 0) {
  //Use the default onesss
  prefixes.push('PREFIX owl: <http://www.w3.org/2002/07/owl#>\n');
  prefixes.push('PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>\n');
  prefixes.push('PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>\n');
  prefixes.push('PREFIX ex: <http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3/>\n');
}

/* Then we will uses the join() method to concatenate the elements of the "prefixes" array into a single string
concatenate this string with the query string */

const queryWithPrefixes = prefixes.join('') + query;

/* To handle the different types of queries, we make a regular expression to retrieve the type of the query*/
const queryTypeRegex = /(ASK|SELECT|DESCRIBE)/i;
const match = queryTypeRegex.exec(queryInputValue.trim());
//Get the First matched String
const queryType = match ? match[1].toUpperCase() : null;

//Indicates the location of our server on Apache jena Fuseski
let endpoint = 'http://localhost:3030/ds/query';
```



```

    /**We used the fetch() function to send a GET request to the server at the URL
    "http://localhost:3030/ds/query", where "ds" is the name of the dataset being queried.
    The query parameter is added to the URL using template literals, and the "encodeURIComponent()"
    function is used to encode the query string to ensure it is URL-safe.*/
    fetch(endpoint + '?query=' + encodeURIComponent(queryWithPrefixes))
  .then(response => {
    if (queryType === 'DESCRIBE') {
      // If the query is a DESCRIBE query, parse the response as text returns a JavaScript object called "data"
      return response.text();
    } else {
      // If the query is a SELECT query, parse the response as JSON and returns a JavaScript object called "data"
      return response.json();
    }
  })
  .then(data => {
    console.log(data);
    if (queryType === 'ASK') {
      /**Handle ASK query results by getting the value of the boolean variable of json format
      and assigned it to result variable*/
      const result = data.boolean;
      resultsTable.querySelector('thead tr').innerHTML = '';
      resultsTable.querySelector('tbody').innerHTML = `<tr><td>${result}</td></tr>`;
    }
  })

```

```

    } else if (queryType === 'DESCRIBE') {
      // Handle DESCRIBE query results
      try {
        // Parse the response data as an RDF graph using rdflib.js
        const store = $rdf.graph();
        $rdf.parse(data, store, endpoint, 'text/turtle');

        // Get the triples from the graph and construct a table
        const results = store.statementsMatching();
        const tableRows = results.map(result => {
          const subject = result.subject.value;
          const predicate = result.predicate.value;
          const object = result.object.value;
          return `<tr><td>${subject}</td><td>${predicate}</td><td>${object}</td></tr>`;
        });
        resultsTable.querySelector('thead tr').innerHTML = `<th>Subject</th><th>Predicate</th><th>Object</th>`;
        resultsTable.querySelector('tbody').innerHTML = tableRows.join('');
      } catch (error) {
        // If there was an error parsing the response data as Turtle, log the error and set the data variable to null
        console.error(error);
        data = null;
      }
    }
  })

```

```

    else {
      // Handle SELECT query results
      const results = data.results.bindings;
      /*the "map()" and "join()" functions are used to transform the results into HTML table rows and cells*/
      const tableRows = results.map(result => {
        /*Each row in the table corresponds to a single query result, and each cell in the row corresponds to
        a single variable in the SELECT clause.*/
        const variables = Object.keys(result);
        const rowCells = variables.map(variable => {
          return `<td>${result[variable].value}</td>`;
        });
        return `<tr>${rowCells.join('')}</tr>`;
      });
      const variables = Object.keys(results[0]);
      const tableHeaders = variables.map(variable => {
        return `<th>${variable}</th>`;
      });

      /*the code updates the HTML table in the web application by setting the innerHTML property of the table's <thead>
      resultsTable.querySelector('thead tr').innerHTML = tableHeaders.join('');
      resultsTable.querySelector('tbody').innerHTML = tableRows.join('');
    }

    // Return the data variable
    return data;
  })
  .catch(error => console.error(error));
});

```

9. SPARQL QUERY AND RESULT

Select Queries

- 1) List the songs(name, genre, views) sung by Selena Gomez ordered by release data and the album that each song belong to.

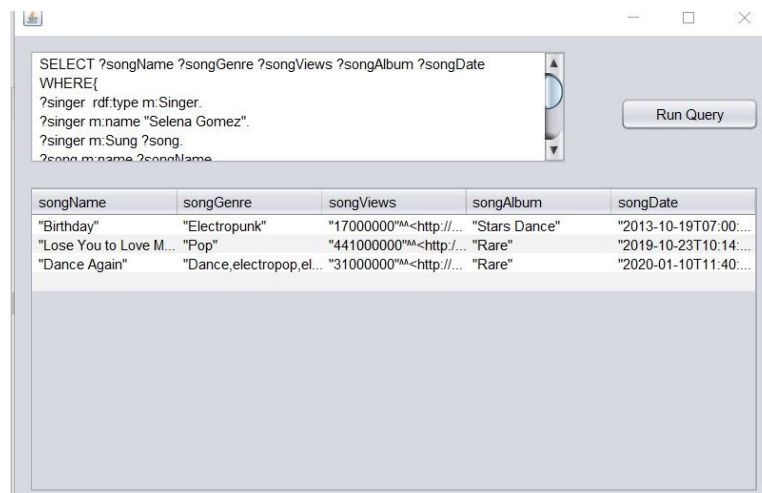
The query selects five variables to be returned in the results:

- "?songName": the name of the song
- "?songGenre": the genre of the song
- "?songViews": the number of views of the song
- "?songAlbum": the name of the album that contains the song
- "?songDate": the release date of the song

The WHERE clause specifies the conditions that the selected data must meet:

- "?singer" is an instance of the "Singer" class
- The name of the singer is "Selena Gomez"
- "?singer" has sung a song.
- And this song must have a Name, genre, number of views, release date, belongs to an album, and this album has a name.

Java App Result



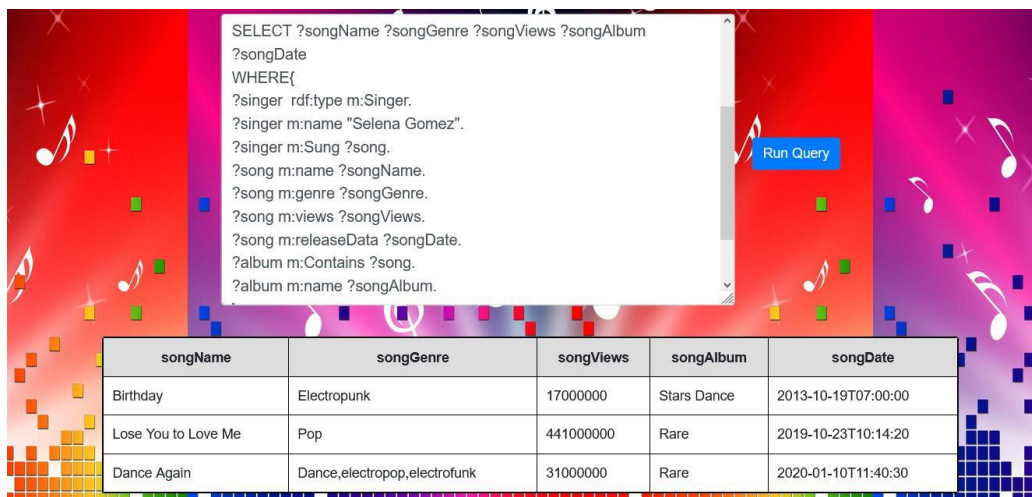
The screenshot shows a Java application window with a text area containing a SPARQL query and a table displaying the results. The query is:

```
SELECT ?songName ?songGenre ?songViews ?songAlbum ?songDate
WHERE{
?singer rdf:type m:Singer.
?singer m:name "Selena Gomez".
?singer m:Sung ?song.
?song m:name ?songName.
?song m:genre ?songGenre.
?song m:views ?songViews.
?song m:releaseData ?songDate.
?album m:Contains ?song.
?album m:name ?songAlbum.
}
```

The results table is as follows:

songName	songGenre	songViews	songAlbum	songDate
"Birthday"	"Electropunk"	"17000000"^^<http://...	"Stars Dance"	"2013-10-19T07:00:00..."
"Lose You to Love M..."	"Pop"	"441000000"^^<http://...	"Rare"	"2019-10-23T10:14:00..."
"Dance Again"	"Dance, electropop, el..."	"31000000"^^<http://...	"Rare"	"2020-01-10T11:40:00..."

Webapp Result



The screenshot shows a web application with a text area containing a SPARQL query and a table displaying the results. The query is:

```
SELECT ?songName ?songGenre ?songViews ?songAlbum
?songDate
WHERE{
?singer rdf:type m:Singer.
?singer m:name "Selena Gomez".
?singer m:Sung ?song.
?song m:name ?songName.
?song m:genre ?songGenre.
?song m:views ?songViews.
?song m:releaseData ?songDate.
?album m:Contains ?song.
?album m:name ?songAlbum.
}
```

The results table is as follows:

songName	songGenre	songViews	songAlbum	songDate
Birthday	Electropunk	17000000	Stars Dance	2013-10-19T07:00:00
Lose You to Love Me	Pop	441000000	Rare	2019-10-23T10:14:20
Dance Again	Dance, electropop, electrofunk	31000000	Rare	2020-01-10T11:40:30



2) List the awards taken by Selena Gomez with the date and type.

The query selects three variables to be returned in the results:

- "?awardName": the name of the award
- "?type": the type of the award
- "?date": the date on which the award was received

The WHERE clause specifies the conditions that the selected data must meet:

- "?singer" is an instance of the "Singer" class
- The name of the singer is "Selena Gomez"
- "?singer" has received an award
- And this award must have a Name, type, and date on which it was received

Java App Result

The screenshot shows a Java application window with a text area containing an SPARQL query and a table displaying the results. The query is:

```
SELECT ?awardName ?type ?date
WHERE{
?singer rdf:type m:Singer.
?singer m:name "Selena Gomez".
?singer m:hasAwards ?award.
}
```

The results table is as follows:

awardName	type	date
"Gracie Allen Award"	"Outstanding Female Rising Star in a.."	"2010-03-29T01:50:30"AA<http://www..
"American Music Awards"	"Favorite Pop/Rock Female Artist"	"2016-05-29T01:50:30"AA<http://www..
"Glamour Beauty Awards"	"Best Makeup Products of the Year"	"2021-07-29T01:50:30"AA<http://www..

Web App Result

The screenshot shows a web application interface with a text area containing an SPARQL query and a table displaying the results. The query is:

```
SELECT ?awardName ?type ?date
WHERE{
?singer rdf:type m:Singer.
?singer m:name "Selena Gomez".
?singer m:hasAwards ?award.
?award m:name ?awardName.
?award m:type ?type.
?award m:date ?date.
}
```

The results table is as follows:

awardName	type	date
American Music Awards	Favorite Pop/Rock Female Artist	2016-05-29T01:50:30
Gracie Allen Award	Outstanding Female Rising Star in a Comedy Series	2010-03-29T01:50:30
Glamour Beauty Awards	Best Makeup Products of the Year	2021-07-29T01:50:30

- 3) List the songs of the album everyday life or ghost stories with the instrument used in every song.

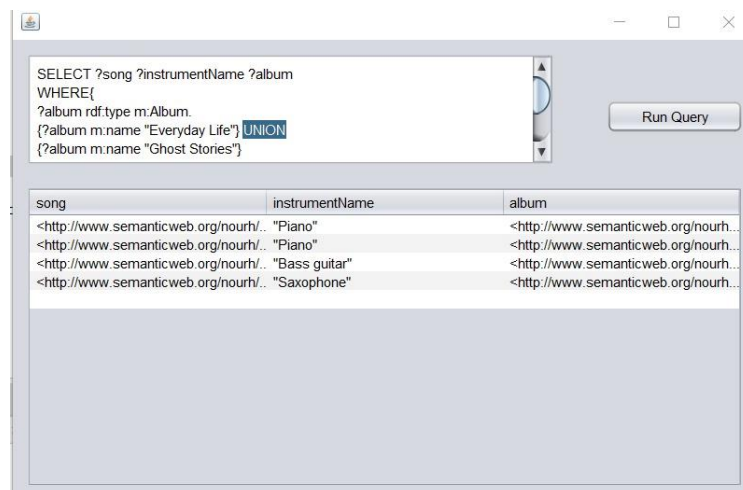
The query selects three variables to be returned in the results:

- "?song": the name of the song
- "?instrumentName": the name of the instrument used in the song
- "?album": the name of the album of the song

The WHERE clause specifies the conditions that the selected data must meet:

- "?album" is an instance of the "Album" class
- The name of the album is either "Everyday Life" or "Ghost Stories"
- This album contains a song
- The song has an instrument
- And this instrument has a name

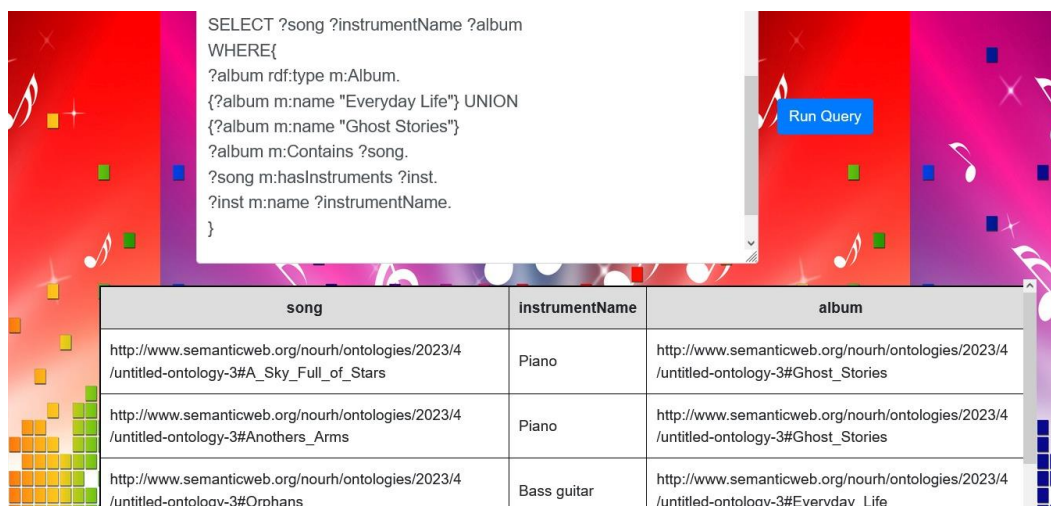
Java App Result



SELECT ?song ?instrumentName ?album
WHERE{
?album rdf:type m:Album.
{?album m:name "Everyday Life"} UNION
{?album m:name "Ghost Stories"}
?album m:Contains ?song.
?song m:hasInstruments ?inst.
?inst m:name ?instrumentName.
}

song	instrumentName	album
<http://www.semanticweb.org/nourh/... "Piano"	"Piano"	<http://www.semanticweb.org/nourh/...
<http://www.semanticweb.org/nourh/... "Piano"	"Piano"	<http://www.semanticweb.org/nourh/...
<http://www.semanticweb.org/nourh/... "Bass guitar"	"Bass guitar"	<http://www.semanticweb.org/nourh/...
<http://www.semanticweb.org/nourh/... "Saxophone"	"Saxophone"	<http://www.semanticweb.org/nourh/...

Web App Result



SELECT ?song ?instrumentName ?album
WHERE{
?album rdf:type m:Album.
{?album m:name "Everyday Life"} UNION
{?album m:name "Ghost Stories"}
?album m:Contains ?song.
?song m:hasInstruments ?inst.
?inst m:name ?instrumentName.
}

song	instrumentName	album
http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3#A_Sky_Full_of_Stars	Piano	http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3#Ghost_Stories
http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3#Anothers_Arms	Piano	http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3#Ghost_Stories
http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3#Orphans	Bass guitar	http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3#Everyday_Life



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4) List the names and the ages of the members of the band Coldplay and awards if they have.

The query selects three variables to be returned in the results:

- "?memberName": the name of the band member
- "?memberAge": the age of the band member
- "?award": the name of any award received by the band member (optional)

The WHERE clause specifies the conditions that the selected data must meet:

- "?band" is an instance of the "Band" class
- The name of the band is "Coldplay"
- "?band" has artists (members)
- The artist has name, and age.
- And the artist may have awards

Java App Result

SELECT ?memberName ?memberAge ?award
WHERE{
?band rdf:type m:Band.
?band m:name "Coldplay".
?band m:hasArtists ?member.
}

memberName	memberAge	award
"Jonny Buckland"	45	<http://www.semanticweb.org/nourh...
"Chris Martin"	46	
"Guy Berryman"	45	<http://www.semanticweb.org/nourh...
"Will Champion"	44	

Web App Result

SELECT ?memberName ?memberAge ?award
WHERE{
?band rdf:type m:Band.
?band m:name "Coldplay".
?band m:hasArtists ?member.
?member m:name ?memberName.
?member m:age ?memberAge.
OPTIONAL{?member m:hasAwards ?award.}
}

memberName	memberAge	award
Guy Berryman	45	http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3#GrammyAward
Will Champion	44	
Chris Martin	46	
Jonny Buckland	45	http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3#NMEAward

5) List the songs of BTS band that exceed million views and their duration.

The query selects three variables to be returned in the results:

- "?name": the name of the song
- "?songViews": the number of views of the song
- "?duration": the duration of the song

The WHERE clause specifies the conditions that the selected data must meet:

- The band BTS is an instance of the "Band" class
- The band BTS has artists
- The artist has sung a song
- The value of the variable "?songViews" is specified for "?song" and filtered to only select songs with more than one million views.
- The song has a name, and time duration

Java App Result

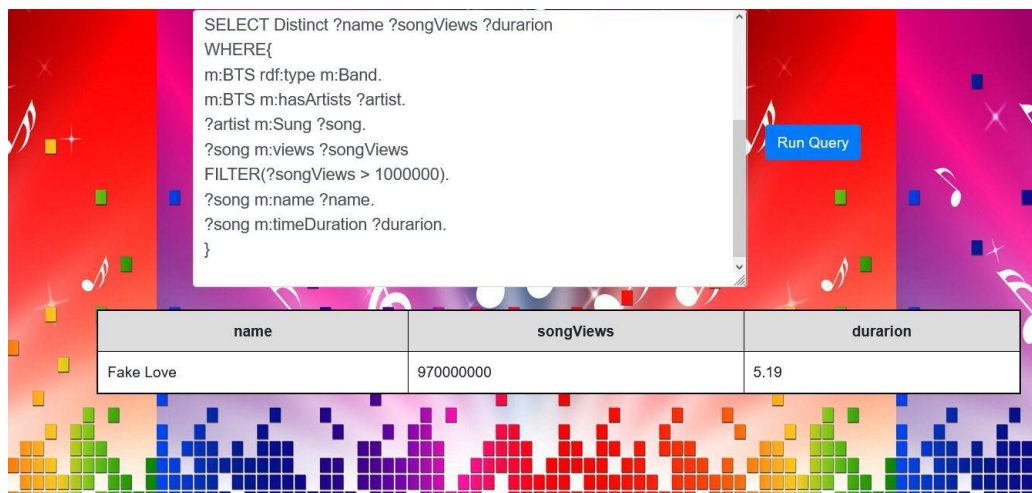


```

SELECT Distinct ?name ?songViews ?duration
WHERE{
m:BTS rdf:type m:Band.
m:BTS m:hasArtists ?artist.
?artist m:Sung ?song.
}
  
```

name	songViews	duration
"Fake Love"	"970000000"	5.19

Web App Result



```

SELECT Distinct ?name ?songViews ?duration
WHERE{
m:BTS rdf:type m:Band.
m:BTS m:hasArtists ?artist.
?artist m:Sung ?song.
?song m:views ?songViews
FILTER(?songViews > 1000000).
?song m:name ?name.
?song m:timeDuration ?duration.
}
  
```

name	songViews	duration
Fake Love	970000000	5.19



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6) List the Ids , names , genre and language of BTS songs.

The query selects four variables to be returned in the results:

- "?ID": the id of the song
- "?Name": name of the song
- "?Genre": genre of the song
- "?Language": Language of the song

The WHERE clause specifies the conditions that the selected data must meet:

- "?Song" is an instance of the "Song" class
- The band BTS sung the song
- And the song has id.

Java App Result

The screenshot shows a Java application window with a text area containing the following query:

```
SELECT ?ID ?Name ?Genre ?Language
WHERE{
?Song rdf:type m:Song.
m:BTS m:Sung ?Song.
?Song m:id ?ID.
```

To the right of the text area is a "Run Query" button. Below the text area is a table with the following data:

ID	Name	Genre	Language
"771118" ^{^^} <http://www.w3.org/...	"Butter"	"Dance-pop, disco-pop"	"English"
"55221666" ^{^^} <http://www.w3.org/...	"Dynamite"	"Disco-pop, funk-pop"	"English"
"90191" ^{^^} <http://www.w3.org/2...	"Fake Love"	"Pop, hip-hop"	"Korean"

Web App Result

The screenshot shows a web application interface with a query editor and a results table. The query editor contains the following query:

```
PREFIX m: <http://www.semanticweb.org/nourh/ontologies/2023/4/
/untitled-ontology-3/>
SELECT ?ID ?Name ?Genre ?Language
WHERE{
?Song rdf:type m:Song.
m:BTS m:Sung ?Song.
?Song m:id ?ID.
?Song m:name ?Name.
?Song m:genre ?Genre.
?Song m:language ?Language.
}
```

To the right of the query editor is a "Run Query" button. Below the query editor is a table with the following data:

ID	Name	Genre	Language
771118	Butter	Dance-pop, disco-pop	English
90191	Fake Love	Pop, hip-hop	Korean
55221666	Dynamite	Disco-pop, funk-pop	English

7) List the artist names , ages and top hits of the BTS band that sung songs.

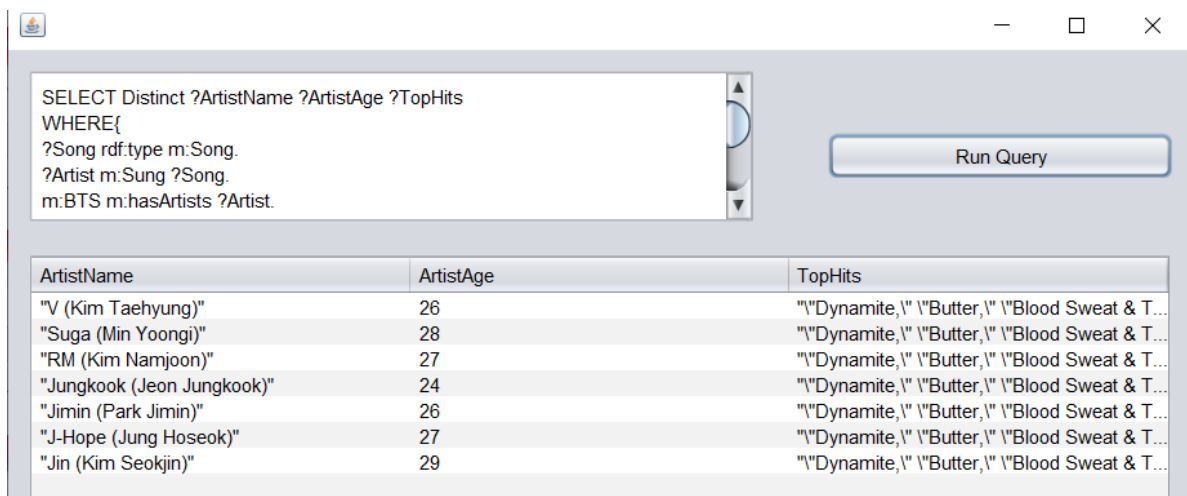
The query selects three variables to be returned in the results:

- "?ArtistName": the id of the song
- "?ArtistAge": name of the song
- "?TopHits": genre of the song

The WHERE clause specifies the conditions that the selected data must meet:

- "?Song" is an instance of the "Song" class
- "?Artist" sung the song.
- "?Artist" is a member of BTS band.

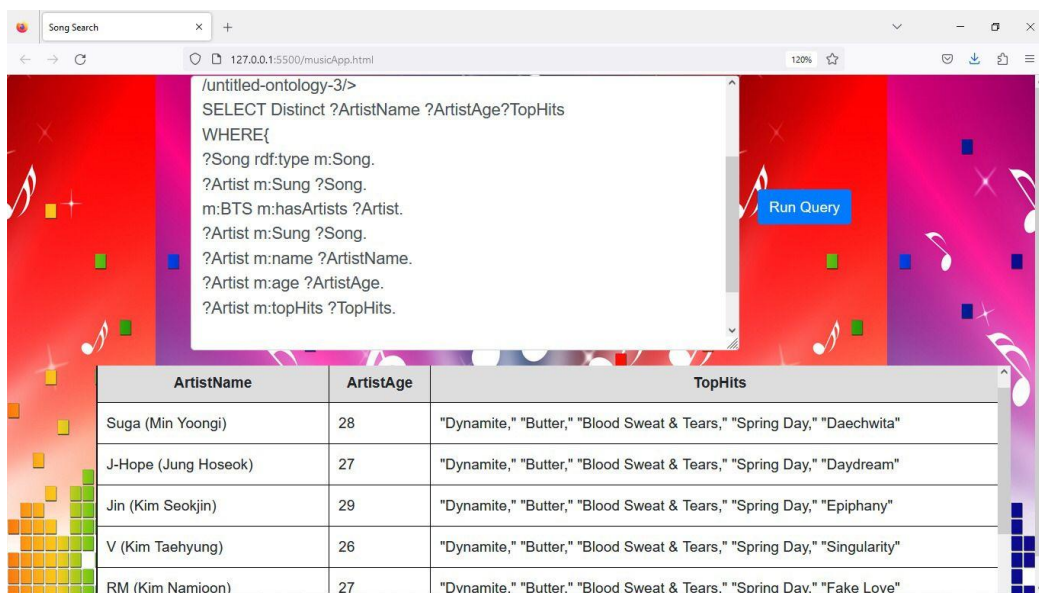
Java App Result



The screenshot shows a Java application window with a text area containing a SPARQL query and a "Run Query" button. Below the text area is a table with three columns: ArtistName, ArtistAge, and TopHits. The table contains six rows of data for the BTS band members.

ArtistName	ArtistAge	TopHits
"V (Kim Taehyung)"	26	"Dynamite," "Butter," "Blood Sweat & T..."
"Suga (Min Yoongi)"	28	"Dynamite," "Butter," "Blood Sweat & T..."
"RM (Kim Namjoon)"	27	"Dynamite," "Butter," "Blood Sweat & T..."
"Jungkook (Jeon Jungkook)"	24	"Dynamite," "Butter," "Blood Sweat & T..."
"Jimin (Park Jimin)"	26	"Dynamite," "Butter," "Blood Sweat & T..."
"J-Hope (Jung Hoseok)"	27	"Dynamite," "Butter," "Blood Sweat & T..."
"Jin (Kim Seokjin)"	29	"Dynamite," "Butter," "Blood Sweat & T..."

Web App Result



The screenshot shows a web application window with a text area containing a SPARQL query and a "Run Query" button. Below the text area is a table with three columns: ArtistName, ArtistAge, and TopHits. The table contains six rows of data for the BTS band members.

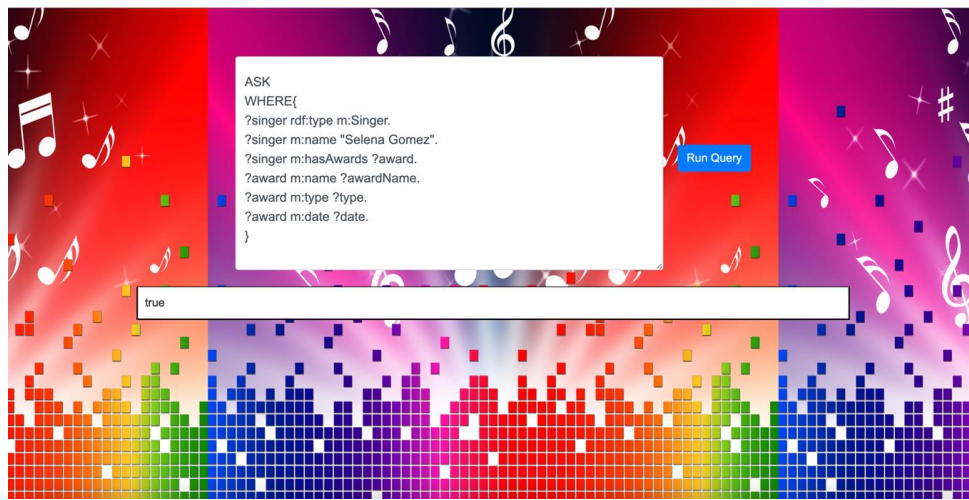
ArtistName	ArtistAge	TopHits
Suga (Min Yoongi)	28	"Dynamite," "Butter," "Blood Sweat & Tears," "Spring Day," "Daechwita"
J-Hope (Jung Hoseok)	27	"Dynamite," "Butter," "Blood Sweat & Tears," "Spring Day," "Daydream"
Jin (Kim Seokjin)	29	"Dynamite," "Butter," "Blood Sweat & Tears," "Spring Day," "Epiphany"
V (Kim Taehyung)	26	"Dynamite," "Butter," "Blood Sweat & Tears," "Spring Day," "Singularity"
RM (Kim Namjoon)	27	"Dynamite," "Butter," "Blood Sweat & Tears," "Spring Day," "Fake Love"

Ask Queries

- 1) Ask if there exists a singer whose name is Selena Gomez , and has award. The award has a name, type and date.

The WHERE clause specifies the conditions that the selected data must meet:

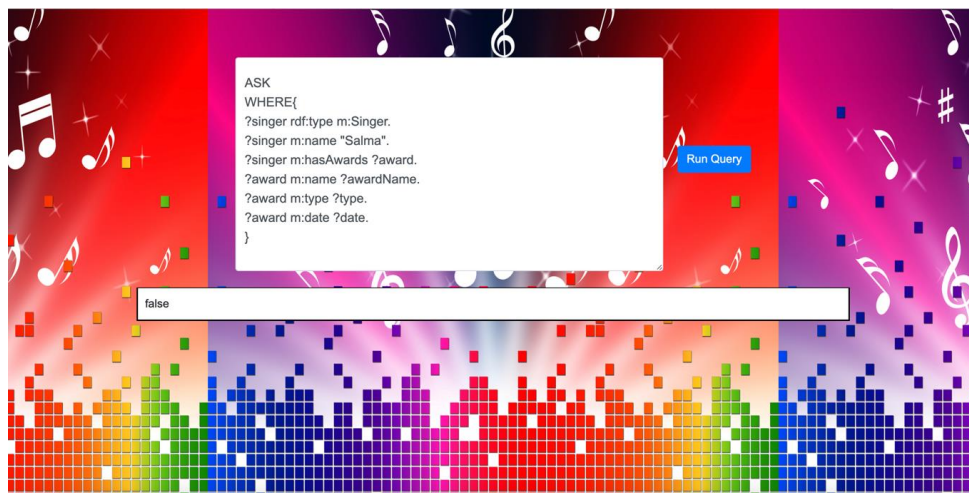
- "?singer" is an instance of the "Singer" class
- The name of the singer is "Selena Gomez"
- "?singer" has received an award
- And this award must have a Name, type, and date on which it was received



- 2) Ask if there exists a singer whose name is Salma , and has award. The award has a name, type and date.

The WHERE clause specifies the conditions that the selected data must meet:

- "?singer" is an instance of the "Singer" class
- The name of the singer is "Salma"
- "?singer" has received an award
- And this award must have a Name, type, and date on which it was received



Describe Query

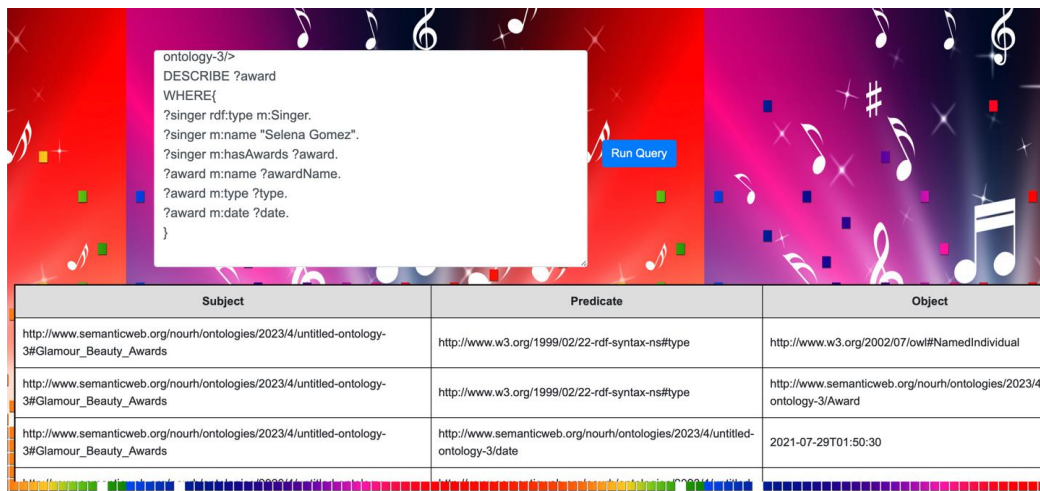
- 1) Describe the awards received by a singer whose name is Selena Gomez .The award has a name, type, and date.

The query Describes one variable to be returned in the results:

- "?award" : any award received by Selena Gomez.

The WHERE clause specifies the conditions that the selected data must meet:

- "?singer" is an instance of the "Singer" class
- The name of the singer is "Salma"
- "?singer" has received an award
- And this award must have a Name, type, and date on which it was received



```

ontology-3/>
DESCRIBE ?award
WHERE{
?singer rdf:type m:Singer.
?singer m:name "Selena Gomez".
?singer m:hasAwards ?award.
?award m:name ?awardName.
?award m:type ?type.
?award m:date ?date.
}
  
```

Subject	Predicate	Object
http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3#Glamour_Beauty_Awards	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.w3.org/2002/07/owl#NamedIndividual
http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3#Glamour_Beauty_Awards	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.semanticweb.org/nourh/ontologies/2023/4/ontology-3/Award
http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3#Glamour_Beauty_Awards	http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3/date	2021-07-29T01:50:30

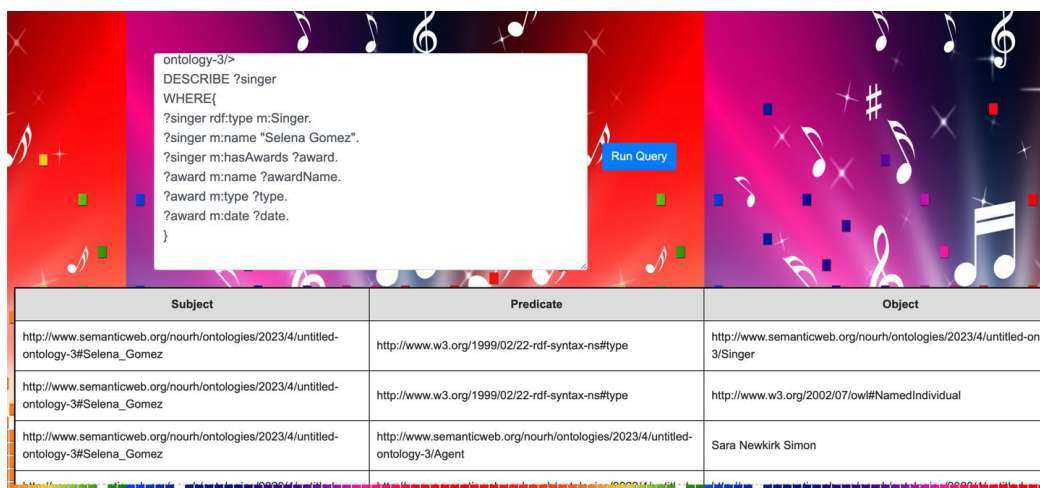
- 2) Describe the singer who received an award and whose name is Selena Gomez. The award has a name, type, and date.

The query Describes one variable to be returned in the results:

- "?singer" : any singer who satisfies the where clause.

The WHERE clause specifies the conditions that the selected data must meet:

- "?singer" is an instance of the "Singer" class
- The name of the singer is "Salma"
- "?singer" has received an award
- And this award must have a Name, type, and date on which it was received



```

ontology-3/>
DESCRIBE ?singer
WHERE{
?singer rdf:type m:Singer.
?singer m:name "Selena Gomez".
?singer m:hasAwards ?award.
?award m:name ?awardName.
?award m:type ?type.
?award m:date ?date.
}
  
```

Subject	Predicate	Object
http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3#Selena_Gomez	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3/Singer
http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3#Selena_Gomez	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.w3.org/2002/07/owl#NamedIndividual
http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3#Selena_Gomez	http://www.semanticweb.org/nourh/ontologies/2023/4/untitled-ontology-3/Agent	Sara Newkirk Simon