Title	Assignment 06: Information Management (GISC 6354)
Handed Out	Thursday, March 07, 2024
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1. Look up websites containing the following data representations:

a) Using JSON

b) Using XML

Analyze the websites in terms of structure and composition. Name the technology/methods used for creating the web database.

Ans

a) **Using JSON**

- JSON is a lightweight data interchange format that is easy for humans to read and write and easy for machines to parse and generate. JSON defines only two data structures: objects and arrays. An object is a set of name-value pairs, and an array is a list of values. JSON defines seven value types: string, number, object, array, true, false, and null (Introduction to JSON, 2024).

JSON syntax/structure can be summarized as follows (Introduction to JSON, 2024):

- Objects: Enclosed in braces {}, containing name-value pairs separated by commas. Names are strings, followed by a colon (:) and their corresponding values. Values can be any of the seven types, including objects or arrays.
- Arrays: Enclosed in brackets [], with values separated by commas. Each value within an array can be of a different type, including objects or arrays.
- Structure: Objects and arrays can contain other objects or arrays, creating a hierarchical or tree-like structure for the data.

Technology/Methods for Web Database:

- Backend technologies such as Node.js, Python Django, or Java Spring may be used for server-side processing and database interactions (JSON Defined, 2024).
- Databases like MongoDB, PostgreSQL, MySQL, or Firebase may be utilized to store structured data (JSON Databases Explained, 2024).
- APIs are commonly used to expose JSON data to client-side applications, enabling dynamic content retrieval and manipulation.

b) Using XML:

XML is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable. It's often used for representing structured data in documents on the web (XML (eXtensible Markup Language), 2024).

Structure and Composition Analysis (Murrell, 2024)**:**

- XML documents consist of nested elements, each with a start tag, content, and an end tag.
- Attributes may be used within elements to provide additional metadata or properties.
- XML documents often follow a hierarchical structure, similar to a tree, with parent-child relationships between elements.
- XML namespaces may be used to avoid naming conflicts and enable the mixing of different XML vocabularies.

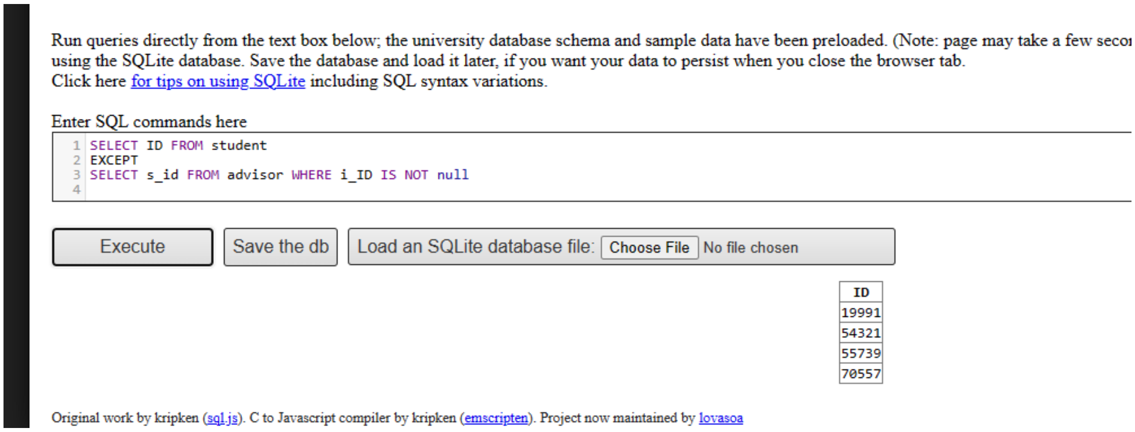
Technology/Methods for Web Database:

- XML databases like BaseX, eXist-db, or MarkLogic may be used for storing and querying XML data directly.
- XQuery or XPath may be used to query and manipulate XML data.
- Server-side technologies like Java servlets, ASP.NET, PHP, or Python with frameworks like Flask or Django may be used for generating XML documents dynamically.
- Transformation technologies like XSLT (eXtensible Stylesheet Language Transformations) may be used to convert XML data into different formats for presentation.

2. SQL exercise:

I. Express the following query in SQL using no subqueries and no set operations. (Hint: left outer join).

SELECT ID **FROM** student
EXCEPT
SELECT s_id **FROM** advisor **WHERE** i_ID **IS NOT** null



Run queries directly from the text box below; the university database schema and sample data have been preloaded. (Note: page may take a few secoı
using the SQLite database. Save the database and load it later, if you want your data to persist when you close the browser tab.
Click here for tips on using SQLite including SQL syntax variations.

Enter SQL commands here

```
SELECT ID FROM student
EXCEPT
SELECT s_id FROM advisor WHERE i_ID IS NOT null
```

ID
19991
54321
55739
70557

Original work by kripken (sql.js). C to Javascript compiler by kripken (emscripten). Project now maintained by lovasoa

Figure 1: Results for SQL query using except

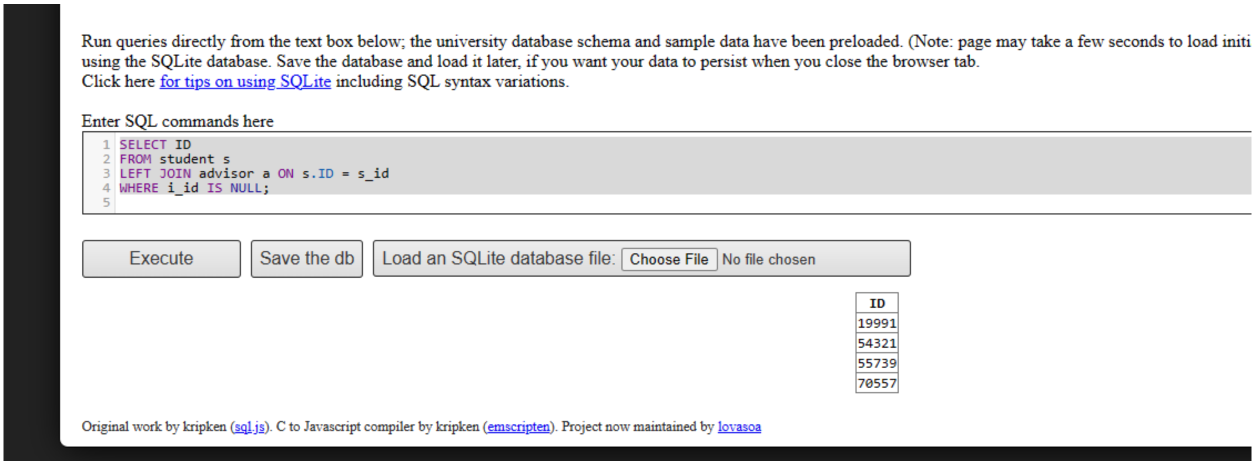
Ans:

```
SELECT ID

FROM student s

LEFT JOIN advisor a ON s.ID = s_id

WHERE i_id IS NULL;
```



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SELECT ID
FROM student s
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WHERE i_id IS NULL;
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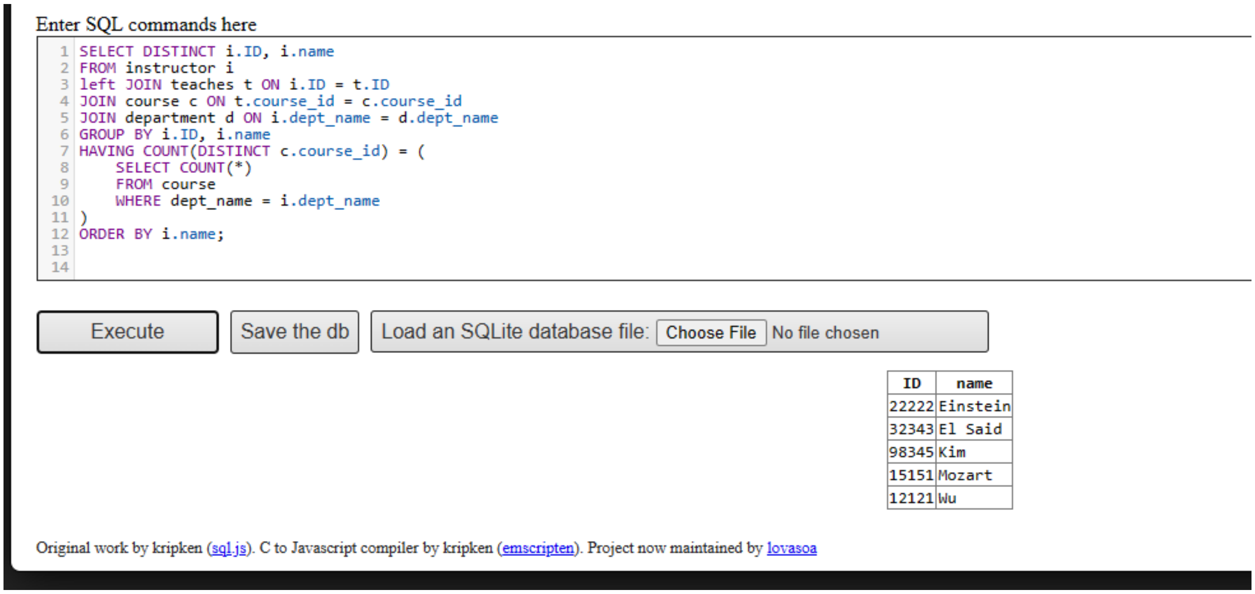
Figure 2: Results for SQL query using left join

II. Using the university schema, write an SQL query to find the names and IDs of those instructors who teach every course taught in his or her department (i.e., every course that appears in the course relation with the instructor's department name). Order result by name.

Ans:

```
SELECT DISTINCT i.ID, i.name

FROM instructor i

JOIN teaches t ON i.ID = t.ID

JOIN course c ON t.course_id = c.course_id

JOIN department d ON i.dept_name = d.dept_name

GROUP BY i.ID, i.name

HAVING COUNT(DISTINCT c.course_id) = (

  SELECT COUNT(*)
  FROM course
  WHERE dept_name = i.dept_name
)
ORDER BY i.name;
```



Enter SQL commands here

```
SELECT DISTINCT i.ID, i.name
FROM instructor i
left JOIN teaches t ON i.ID = t.ID
JOIN course c ON t.course_id = c.course_id
JOIN department d ON i.dept_name = d.dept_name
GROUP BY i.ID, i.name
HAVING COUNT(DISTINCT c.course_id) = (
    SELECT COUNT(*)
    FROM course
    WHERE dept_name = i.dept_name
)
ORDER BY i.name;
```

ID	name
22222	Einstein
32343	El Said
98345	Kim
15151	Mozart
12121	Wu

Original work by kripken (sql.js). C to Javascript compiler by kripken (emscripten). Project now maintained by lovasoa

Figure 3: Results of SQL query for instructors that teach every course offered in their department.

References

Introduction to JSON. (2024, 03 19). Retrieved from Java Platform, Enterprise Edition (Java EE) 8; The Java EE Tutorial: https://javaee.github.io/tutorial/jsonp001.html

JSON Databases Explained. (2024, 3 19). Retrieved from MongoDB website: https://www.mongodb.com/databases/json-database

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Murrell, P. (2024). *6.1 XML syntax*. Retrieved from The University of Auckland: https://www.stat.auckland.ac.nz/~paul/ItDT/HTML/node46.html

XML (eXtensible Markup Language). (2024, 03 19). Retrieved from Codeless Platforms: https://www.codelessplatforms.com/docs/knowledge-base/glossary-of-terms/what-is-xml/#:~:text=XML%20stands%20for%20eXtensible%20Markup,across%20different%20systems%20and%20platforms.