Class 2 MySQL
Elements of Databases
Jan 28, 2022
Announcements

• Survey results on remote learning
• Recap on how participation questions work
• Checking your GCP credits balance
• Authenticate with your EID before joining class meetings:
  https://utexas.zoom.us/
Simple Select Statements

SELECT c1, c2, c3, cn
FROM T1
WHERE c1 > 100 AND c2 = 'foo'
ORDER BY c3, c4;

SELECT c1, c2, c3, cn
FROM T1
WHERE c1 IS NOT NULL AND (c2 = 'XY' OR c3 = 'ABC')
ORDER BY c2 DESC;
Simple Create, Insert, Update, Delete Statements

CREATE TABLE T1 (c1 INT PRIMARY KEY,
    c2 VARCHAR(30) NOT NULL,
    c3 VARCHAR(30));

INSERT INTO T1 (c1, c2, c3) VALUES (1, 'Austin', 'TX');

UPDATE T1 SET c2 = 'ATX', c3 = 'Texas' WHERE c1 = 1;

DELETE FROM T1 WHERE c3 NOT IN ('Texas', 'TX', 'CA');

DELETE FROM T1 WHERE c3 IS NULL;
MySQL Overview

- MySQL databases are used everywhere
- Simple and easy-to-use
- Open-source software (commercialized by Oracle)
- Implements the relational model
- Designed for storing structured data
- Feature-rich SQL support
- Supports many languages
- Small to medium size data (< TB storage)
- Low to moderate QPS of reads and writes (10K)
- Scale reads through read replicas
- Scale writes through sharding (e.g. Vitess)
MySQL environment on Google Cloud

Environment built by following our MySQL and Jupyter setup guides (assigned as homework).
MySQL Code Lab:

- Clone snippets repo
- Open mysql notebook
- Create database
- Create tables
- Populate tables
- Sample some records
- Remove header row
- Create Primary Keys
- Create Foreign Keys
- Test Foreign Keys
College Database Schema

Student(sid, fname, lname, dob, status)
Class(sid, cno, cname, credits, grade)
Instructor(tid, name, dept)
Teaches(tid, cno)
Exercise: SQL

Write the SQL to answer these two questions:

Who takes CS327E or CS329E?
Who takes CS327E and CS329E?

Schema:

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>Student(sid, fname, lname, dob, status)</td>
</tr>
<tr>
<td>Class</td>
<td>Class(sid, cno, cname, credits, grade)</td>
</tr>
<tr>
<td>Instructor</td>
<td>Instructor(tid, name, dept)</td>
</tr>
<tr>
<td>Teaches</td>
<td>Teaches(tid, cno)</td>
</tr>
</tbody>
</table>
Exercise: SQL

Who takes CS327E and CS329E?

Is this query a correct implementation?

```sql
SELECT sid
FROM Class
WHERE cno = 'CS327E'
    AND cno = 'CS329E'
```
Relational Model

- Database is a collection of relations
- Relation is a table with columns (fields) and rows (tuples)
- Field properties: named, typed, single-valued
- Tuple properties: unique and unordered

Foreign Keys: When one or more fields in a table (child table) refer to one or more fields in another table (parent table).

Notation:

<table>
<thead>
<tr>
<th>Notation</th>
<th>Customer(id, fname, lname, address, ...)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Order(orderno, custno, date_ordered, ...)</td>
</tr>
</tbody>
</table>
Data Modeling

- Entity type: A type of object
- Usually a noun
- Common examples: Person, Team, Product, Order, Shipment

- Entity: A real-world object
- Common examples: "Joe Biden", "Texas Longhorns", "Gmail", etc.

Analogies with OOP:
- Entity type: analogous to class
- Entity: analogous to objects
- Attribute: analogous to members of an object
Design Guidelines

1. A table represents a single entity type or a $m:n$ relationship.

2. The fields represent the attributes of an entity type or attributes of a $m:n$ relationship.

3. Each field is assigned a data type that best fits its domain of values.

4. Each table has a Primary Key (PK) constraint which is made up of one or more fields that uniquely represent each entity in that table.

5. 1:1 and 1:m relationships are represented as a Foreign Key (FK) relationship, in which the child table has a FK constraint on the field(s) that reference its parent’s PK fields.
Project 1