Introduction to Databases with SQL

Announcements

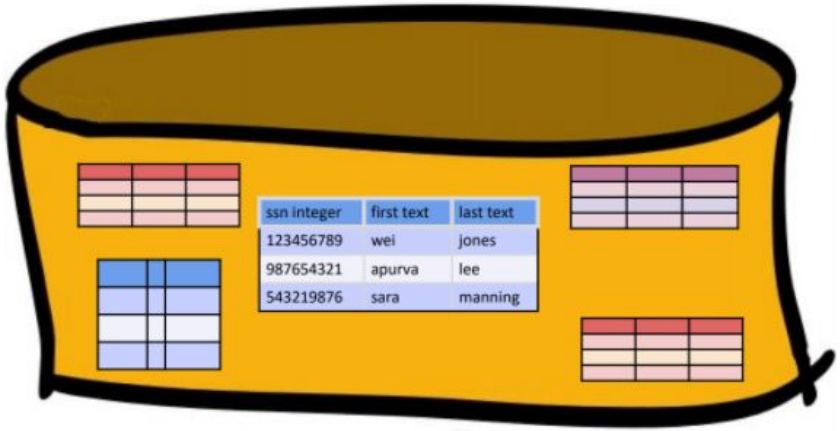
- HW 3abc releasing tonight
  - Golang Coding Assignment
  - SQL Gradescope Assignment
  - Feedback Form
  - Due *next* Thursday, 10/8
- Project Demo this Thursday!
- AWS Educate accounts
  - Register + join asap

Today

- 1. What are databases?
- 2. What is SQL?
- 3. Intro to SQL

What are Databases?

- Otherwise known as repositories of data
- E.g., banking, hotel reservations, personal records



Databases vs Spreadsheets

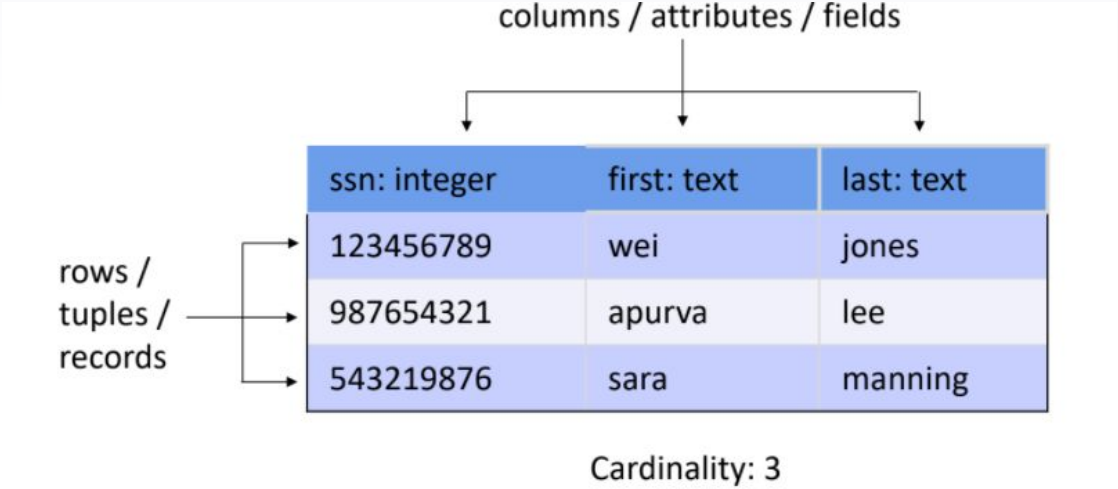
Databases:

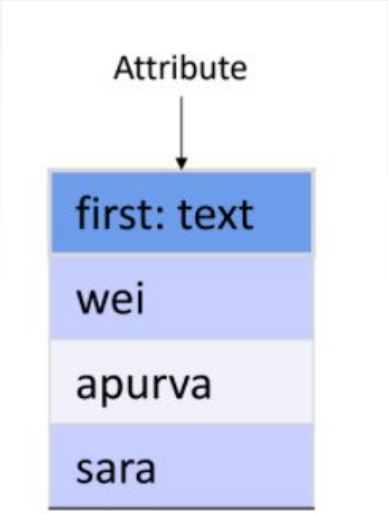
- Data is stored in a record of a table
- Operations done after retrieval
- Contains only raw data

Spreadsheets:

- Data is stored in individual, unique cells
- Operations can be done on a cell by cell basis
- Can contain manipulated data

Sets of relations (tables)





Source: CS186

Database Management Systems (DBMS)

A software software package that is designed

to manage and store databases

- E.g.: DB2 (IBM), SQL Server, Access (Microsoft), MySQL, PostgreSQL, Oracle Xi/Yg (Oracle), HSQLDB, SQLite (open source)

SQL (Structured Query Language)

SQL is the language most popularly used to access tables in a database, obtain a subset of data from a table, or modify data within a table.

With SQL, you can request certain columns or return rows that match a certain condition. It can even do operations such as getting the MAX and MIN value of a column (along with the other columns associated with the row that the MAX or MIN value is in), SUM for finding the total sum of all the values in a column, or AVG of a column.

It can also put rows into a table or replace rows in a table

SQL Pros and Cons

Pros:

Declarative

Lots of options

Cons:

Constrained

SQL Examples

There are a few SQL commands that are essential to using SQL, and we'll provide a few examples of these as well as what they do below:

SELECT [names of columns (comma separated) or * (to get all columns)] - The SELECT keyword is the very first thing to appear in a SQL command. It determines what columns (or SUM, MAX, MIN of columns) that will be returned by the query

FROM [name of tables (comma separated)] - The FROM keyword follows the SELECT command and determines which tables are used in the query (there can be multiples tables in a single database)

SQL Examples

An example SQL command that would get all the rows and columns in a table would look like this:

SELECT * FROM table;

Or if you wanted to get certain columns of all the rows from a table:

SELECT name, email FROM profiles;

Or getting the information on the maximum priced item:

SELECT name, manufacturer, MAX(price) FROM items;

SQL Examples

You can also write queries that return rows that match a certain condition using the WHERE keyword:

SELECT * FROM users WHERE name = “Ryan”; //Note: to do != in SQL we use <>

The ORDER BY keyword can be used to return rows ordered by a certain column:

SELECT * FROM users ORDER BY name;

Along with the ASC (Ascending) or DESC (Descending) keyword at the end, that determines which way it is sorted

SELECT * FROM users ORDER BY name DESC;

SQL Examples

Last important keyword: LIMIT

The LIMIT keyword can be used to limit the number of rows returned:

SELECT * FROM users LIMIT 25;

It can also be used as LIMIT [offset, limit] which allows you to return blocks of 25 rows that are further down in the table:

SELECT * FROM users LIMIT 10, 25;

SQL Examples

The following commands can be used to modify data in the table:

INSERT INTO [table] VALUES ([values (comma separated)])

And the REPLACE INTO command can be used to replace a row if the primary key matches

REPLACE INTO [table] VALUES ([values (comma separated)])

SQL Practice

Write a query that gets the name, email address, and age of the oldest person in the users table

Write a query that gets the second set of 25 rows from the users table ordered by name