

Introduction to creating relational databases and SQL

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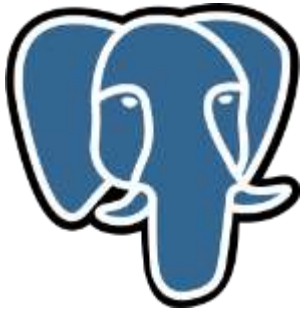
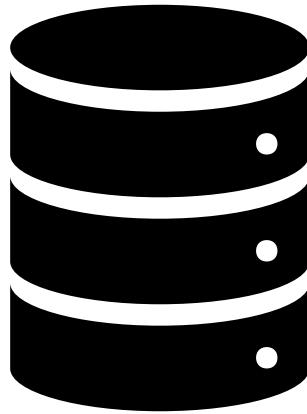
Outline

- Terminology
- Introduction to relational databases
- Differences between spreadsheets and relational databases
- SQLite
- Demonstration/walkthrough
- Additional resources

Terminology

- “**SQL** (Structured Query Language) is a descriptive computer language designed for updating, retrieving, and calculating data in table-based databases” ([MDN Web Docs](#))
- Table
- [Database engine](#)
- Create, Read, Update, and Delete (CRUD)

Introduction to relational databases



Spreadsheets vs. relational databases

Data types

- CSV is a text-based file format
- Binary data (e.g., images) can be stored in databases

Data integrity

- Spreadsheets will not enforce data standards (e.g., non-empty cells or redundancy)
- Databases will store only the specified data type in a given column

Data volume

- There is a limit to the number of rows a spreadsheet can store
- There is no limit to the number of tables, rows, or columns in a database

Relationships

- Finding related information requires formulas and relies on appropriate data entry
- Related tables can be merged to perform queries

SQLite

- Embedded database and database engine
- Public domain
- Digital format [recommended by the Library of Congress for datasets](#)
- [Major known users](#) from among millions of applications
 - **Apple**: Many native applications across devices
 - **Google**: The Android operating system and Chrome web browser
 - **Microsoft** Windows 10 and other Microsoft products
 - **Mozilla** Firefox (web browser) and Thunderbird (email client)
 - All **Python** distributions since Python 2.5

How SQLite stores data

- **Data types (flexible)**

- NULL (missing or unknown values)
- INTEGER (positive or negative whole numbers)
- REAL (real numbers with decimal values)
- TEXT (character data)
- BLOB (binary large object)

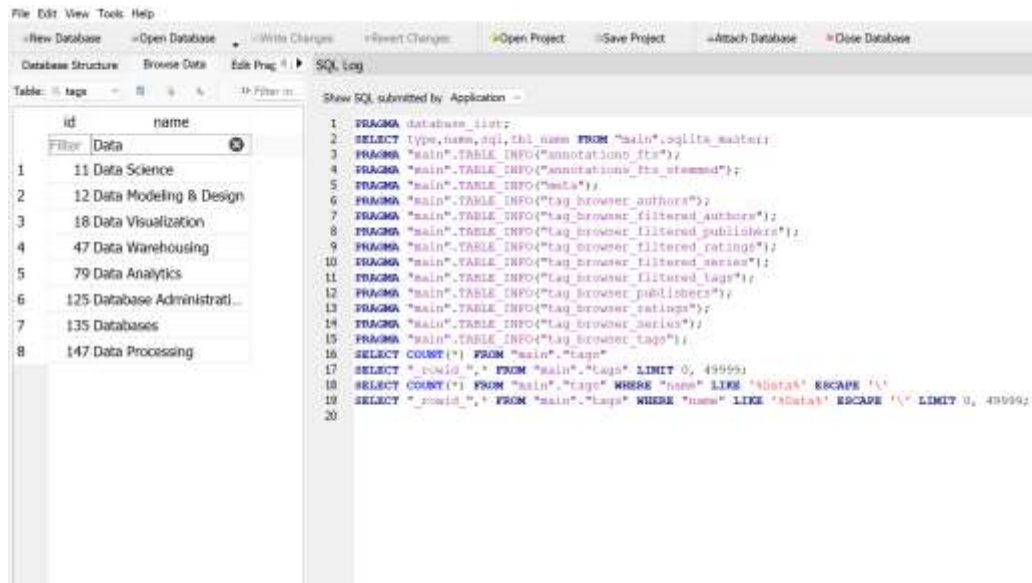
- **File type (extensions)**

- .db
- .db3
- .sqlite
- .sqlite3

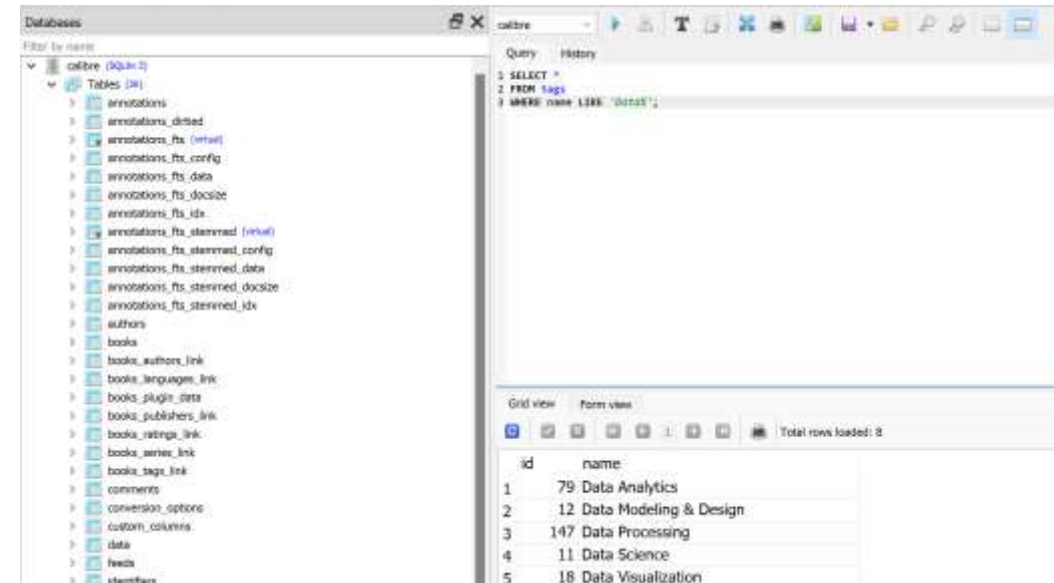


Database management tools

[DB Browser for SQLite](#)



[SQLiteStudio](#)



Additional Resources

- **Tutorials**
 - [Data Carpentry](#) (uses DB Browser for SQLite)
 - [SQLBolt](#) (browser-based)
 - [SQL Zoo](#) (browser-based)
- [SQLite documentation](#)
- [Library of Congress: SQLite, Version 3](#)
 - Technical details
 - [Useful references](#)