

# CSE 344 Introduction to Data Management

Section 1: Introduction to SQLite

TA: Daseul Lee (dslee@cs)

# Introduction

- Office hours at CSE 218

Daseul Lee

10:30am – 11:20am on Tuesdays & Wednesdays

Priya Rao Chagaleti

11:30am – 12:20pm on Mondays & Thursdays

Joseph Xu

2:30pm – 3:20pm on Fridays

- GoPost for discussion & questions

# Section Plan

- During section each week, we will:
  - Highlight the important concepts from lectures
  - Work on some sample problems
  - Demo or brief introduction to homework
  - Any other suggestions?

# Review: Database & DBMS

- What is database?
- What is database management system (DBMS)?
- What kind of features and operations would you want from DBMS?

# SQL (Structural Query Language)

- A special-purpose programming language designed for managing data held in a relational database management system (RDBMS)
- It is a declarative query language:  
Describes what the program should accomplish, not how to go about accomplishing it
- What can it do?  
Data insert, query, update and delete, schema creation and modification, and data access control

# SQLite: What is it

- SQLite is a C library that implements a relational database management system (DBMS).
  - Simple, lightweight: good for embedded software
  - But does not provide all of the functionalities that other DBMSs do
- `sqlite3`: a standalone program that can run queries and manage an SQLite database

## References:

<http://www.sqlite.org/lang.html> (SQL Syntax)

<http://www.sqlite.org/datatype3.html> (SQL Data type)

<http://www.w3schools.com/sql/default.asp> (w3school SQL tutorial)

# SQLite: How to Run it (1/2)

- On the Linux machines, or Mac:
  - Open a terminal, then run the command:  
`sqlite3 [database]`  
where "database" is the name of the database file you want to use.
  - WARNING: If you don't specify a database file, sqlite3 won't complain, but your data will be lost!

# SQLite: How to Run it (2/2)

- On the Windows machines:
  - Open a Cygwin terminal, then proceed as if you were on Linux.
  - If that doesn't work, you may need to install the "sqlite3" Cygwin package from Cygwin Setup.
  - If \*that\* doesn't work, try downloading sqlite yourself.
- Download it yourself:
  - Get the "sqlite-shell" binary for your OS from:  
<http://www.sqlite.org/download.html>
  - Extract "sqlite3" or "sqlite3.exe" from the archive and run it from a command line.



# SQLite: Demo

# SQLite: . Commands (Not SQL)

- `.help` - list other `.` commands
- `.header(s) ON/OFF` - show/hide column headers in query results
- `.mode [mode type]` - change how to separate the columns in each row/tuple (for better formatting)
- `.read [file name]` - read and execute SQL code from the given file
- `.separator [string]` - change the separator for output mode or importing files, i.e. `.separator ,`
- `.nullvalue [string]` - print the given string in place of NULL values
- `.import [file name] [table name]` - load the file to the table
  - be careful to set the separator correctly!
- `.show` - see how we have set our parameters
- `.exit` - exit from `sqlite3`

# SQLite: Basic SQL statements

- **CREATE** - creates a new table  
ex) `CREATE TABLE [table] ( ... );`
- **INSERT INTO** - inserts new data into a table  
ex) `INSERT INTO [table] VALUES ([value1], [value2], ...);`
- **SELECT** - extracts data from a table  
ex) `SELECT [column(s)] FROM [table_name];`
- **UPDATE** - updates data in a table  
ex) `UPDATE FROM [table] SET ... WHERE ...;`
- **DELETE** - deletes data from a table  
ex) `DELETE FROM [table] WHERE ...;`

\*Note: Queries are case-insensitive in SQLite

# SQLite: SQL keyword, operator, etc

- WHERE clause - filter records
- AND, OR operator - filter records based on more than one condition
- LIKE operator - used in a WHERE clause to search for a specified pattern in a column
- AS - give an alias name to a table or a column
- Relational operators: =, >, >=, <, <=
- Special functions: DATE(...), LENGTH(string), SUBSTR(string, start index, end index), etc

# SQLite: Example (1/3)

**Class**

dept	number	title
CSE	378	Machine Organization and Assembly Language
CSE	451	Introduction to Operating Systems
CSE	461	Introduction to Computer Communication Networks

**Teaches**

username	dept	number
zahorjan	cse	378
tom	cse	451
tom	cse	461
zahorjan	cse	451
zahorjan	cse	461
djw	cse	461
levy	cse	451

**Instructor**

username	fname	lname	started_on
zahorjan	John	Zahorjan	1985-01-01
djw	David	Wetherall	1999-07-01
tom	Tom	Anderson	1997-10-01
levy	Hank	Levy	1988-04-01

# SQLite: Example (2/3)

- Simple example queries
  - What courses are offered?
  - What's the first name of the instructor with login 'zahorjan'?
  - What 400-level CSE classes are offered?
  - What classes have titles starting with Introduction?
    - If we misspell Introduction as IMtroduction, how can we catch that?

# SQLite: Example (3/3)

- Fun with strings
  - Show the class titles and their lengths
  - Truncate all class titles to 12 characters
- Date and time representations
  - Which instructors started before 1990?
  - Which instructors started before now?
  - Which instructors started on or after January 1, 15 years ago?

# SQLite: things to watch out for

- SQLite allows a key to be null
- Older versions of sqlite do not enforce FOREIGN KEY constraints.
  - Newer versions are opt-in at both compile time and runtime (with `PRAGMA FOREIGN_KEYS = ON`)
- SQLite ignores string length maximums or fixed string lengths: N in `VARCHAR(N)` or `CHAR(N)`
- SQLite does not have a separate data type for dates, times, or combined date and time.
  - Instead, these are represented as specially formatted strings; dates are represented as yyyy-mm-dd
- And many more as you will discover!



# Homework 1

- Create a table in sqlite3 and issue queries
- What to turn in: sql file containing sql commands that answer each question and relevant comments
  - Do not turn in input/output files
  - Don't forget a semicolon at the end of each sql command
  - You can add comments to sql file (for numbering each question)
    - `/* comment */` or `-- comment`

# Upcoming deadlines

- Webquiz 1: Thursday, 10/3
- Homework 1: Friday, 10/4

# Questions?