

CS50 for JDs

SQL



DB Browser for SQLite

sqlitebrowser.org

database

relational database

SQL

noSQL

data warehouse

data mart

data lake

data

cs50.ly/favorites



Favorite TV Shows

[Sign in to Google](#) to save your progress. [Learn more](#)

* Required

title *

Title of your favorite TV show

Your answer

genres *

Genre(s) of that TV show

Action

Adventure

Animation





Untitled spreadsheet ☆

File Edit View Insert Format Data Tools Add-ons Help



Share



100% | \$ % .0 .00 123 | Default (Ari... | 10 | **B** *I* ~~S~~ A | [Grid] [List] [More] | ^

A1 *fx*

	A	B	C	D	E	F	G	H	I
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									



Sheet1 ▾



flat-file database

CSV

cs50.ly/responses

```
import csv

titles = set()

with open("favorites.csv") as file:

    reader = csv.DictReader(file)

    for row in reader:
        titles.add(row["title"])

for title in sorted(titles):
    print(title)
```

schema

YouTunes

- Sales
- Employees
- Songs
- Albums
- Customers
- Invoices

cs50.ly/youtunes

cs50.ly/critiques

cs50.ly/shows

SQL

SQLite

sqlite3

```
.mode csv
```

```
.import FILE TABLE
```

DB Browser for SQLite

sqlitebrowser.org

cs50.ly/responses

SQL

C
R
U
D

CREATE

READ

UPDATE

DELETE

CREATE, INSERT

SELECT

UPDATE

DELETE

...

.schema

```
SELECT columns FROM table;
```

```
...
```

AVG

COUNT

DISTINCT

LOWER

MAX

MIN

UPPER

...

WHERE

LIKE

ORDER BY

LIMIT

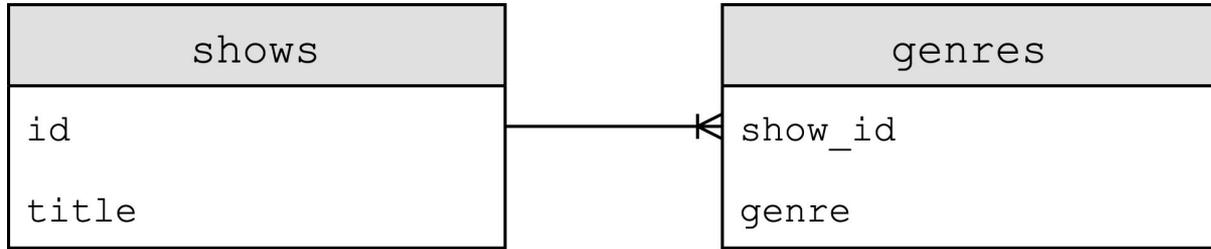
GROUP BY

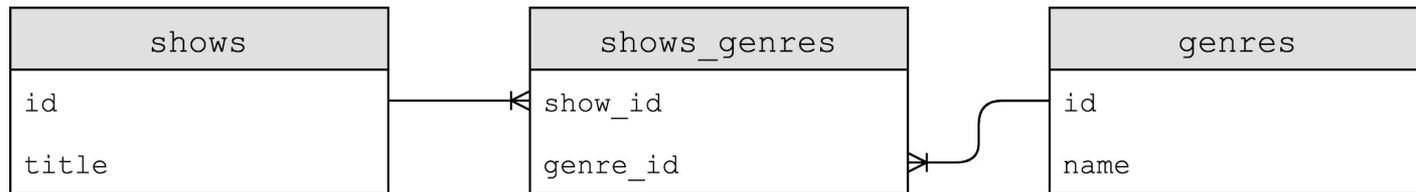
...

```
INSERT INTO table (column, ...) VALUES(value, ...);
```

```
UPDATE table SET column = value WHERE condition;
```

```
DELETE FROM table WHERE condition;
```





```
CREATE TABLE table (column type, ...);
```

BLOB

INTEGER

NUMERIC

REAL

TEXT

NOT NULL

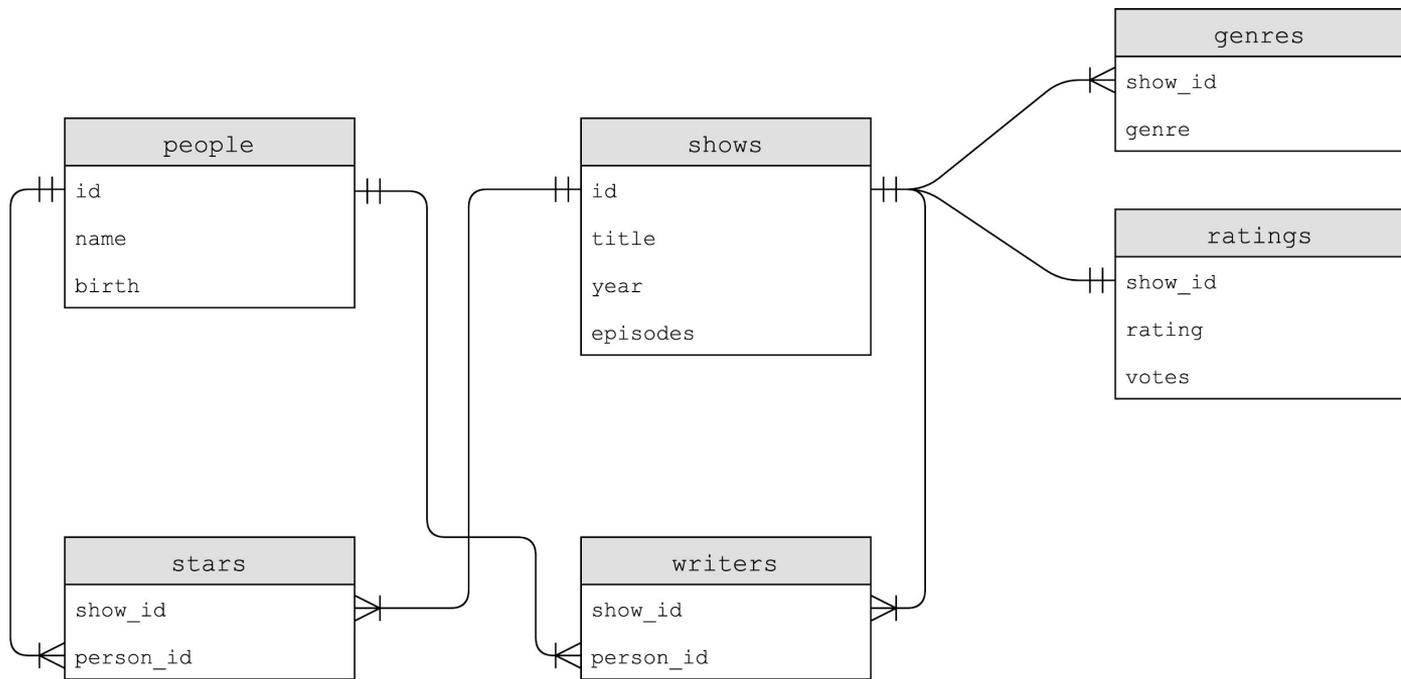
UNIQUE

PRIMARY KEY

FOREIGN KEY

IMDb

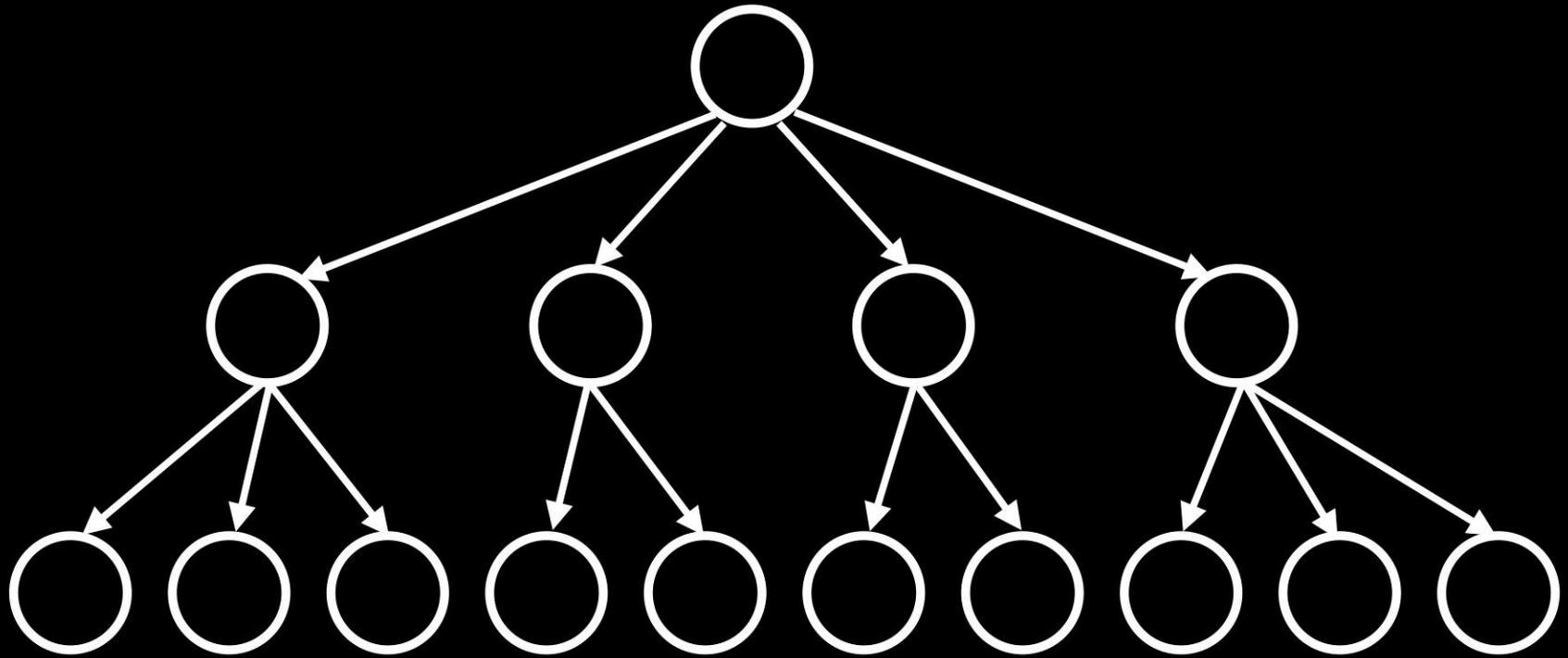
cs50.ly/shows



indexes

```
CREATE INDEX name ON table (column, ...);
```

B-trees



```
CREATE INDEX name ON table (column, ...);
```

cs50.ly/problems

JOIN

...

JOIN

...

JOIN

...

JOIN

...

Law Firm

- Attorneys
- Clients
- Cases
- Fees

cs50.ly/firm

replication

SQL injection attacks

HARVARDKEY

Sign In

Email Address

Password 

[SIGN IN](#)

[FORGOT YOUR PASSWORD?](#)

HARVARDKEY

Sign In

Email Address

malan@harvard.edu'--

Password



SIGN IN

[FORGOT YOUR PASSWORD?](#)

```
rows = db.execute(f"SELECT * FROM users WHERE username = '{username}' AND password = '{password}'")

if len(rows) == 1:
    # Log user in
```

```
rows = db.execute(f"SELECT * FROM users WHERE username = '{username}' AND password = '{password}'")

if len(rows) == 1:
    # Log user in
```

```
rows = db.execute(f"SELECT * FROM users WHERE username = 'malan@harvard.edu--' AND password = '{password}'")

if len(rows) == 1:
    # Log user in
```

```
rows = db.execute("SELECT * FROM users WHERE username = ? AND password = ?", username, password)
```

```
if len(rows) == 1:
```

```
    # Log user in
```

```
rows = db.execute("SELECT * FROM users WHERE username = ? AND password = ?", username, password)
```

```
if len(rows) == 1:
```

```
    # Log user in
```



ZU 0666', 0, 0); DROP DATABASE TABLICE;

ZU 0666', 0, 0); DROP DATABASE TABLE;

PL PASIŃKOWSKI D. 114 M. Białe Błonie 4 251 07 948

HI, THIS IS
YOUR SON'S SCHOOL.
WE'RE HAVING SOME
COMPUTER TROUBLE.



OH, DEAR - DID HE
BREAK SOMETHING?

IN A WAY-



DID YOU REALLY
NAME YOUR SON
Robert'); DROP
TABLE Students;-- ?



OH. YES. LITTLE
BOBBY TABLES,
WE CALL HIM.

WELL, WE'VE LOST THIS
YEAR'S STUDENT RECORDS.
I HOPE YOU'RE HAPPY.



AND I HOPE
YOU'VE LEARNED
TO SANITIZE YOUR
DATABASE INPUTS.

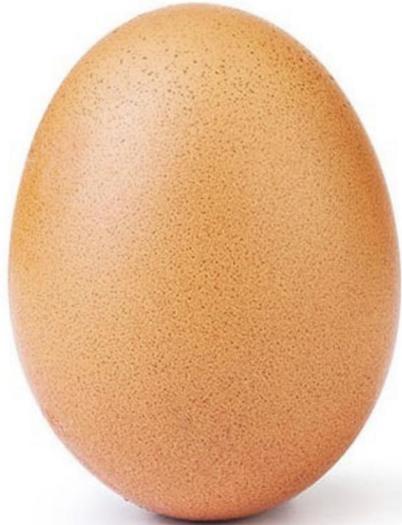
race conditions



Photo



world_record_egg



```
rows = db.execute("SELECT likes FROM posts WHERE id = ?", id);
likes = rows[0]["likes"]
db.execute("UPDATE posts SET likes = ? WHERE id = ?", likes + 1, id);
```

BEGIN TRANSACTION

COMMIT

ROLLBACK

Lab 1

Assignment 3

Office Hours

CS50 for JDs

SQL