

This is CS50

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

...

A1 *fx*

	A	B	C	D	E	F	G	H	I
1									
2									
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15									
16									
17									



Sheet1



flat-file database

CSV

regular expressions

.	any character
.*	0 or more characters
.*+	1 or more characters
?	optional
^	start of input
\$	end of input
...	

relational database

SQL

C
R
U
D

CREATE

READ

UPDATE

DELETE

CREATE, INSERT

SELECT

UPDATE

DELETE, DROP

...

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

```
.mode csv
```

```
.import FILE TABLE
```

.schema


```
SELECT columns FROM table;
```

```
...
```

AVG

COUNT

DISTINCT

LOWER

MAX

MIN

UPPER

...

WHERE

LIKE

ORDER BY

LIMIT

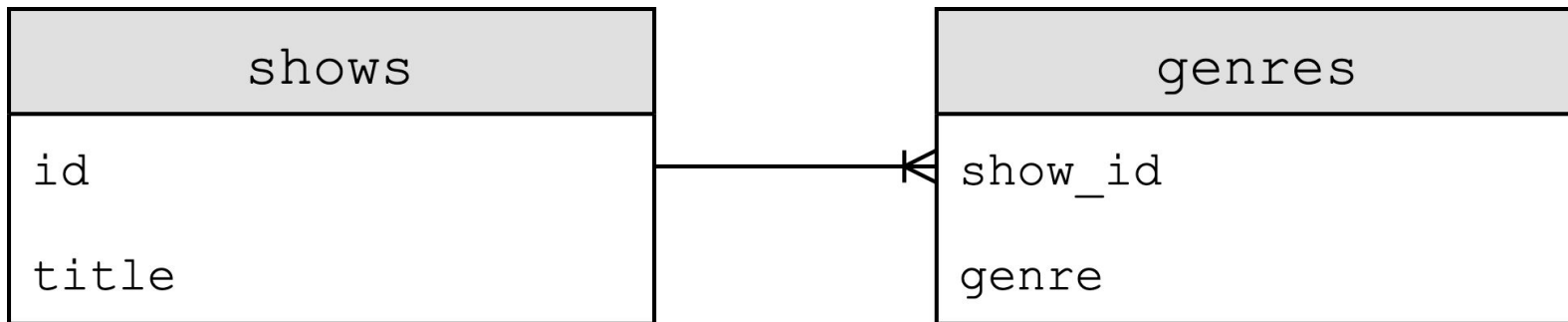
GROUP BY

...

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

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

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



BLOB

INTEGER

NUMERIC

REAL

TEXT

NOT NULL

UNIQUE

PRIMARY KEY

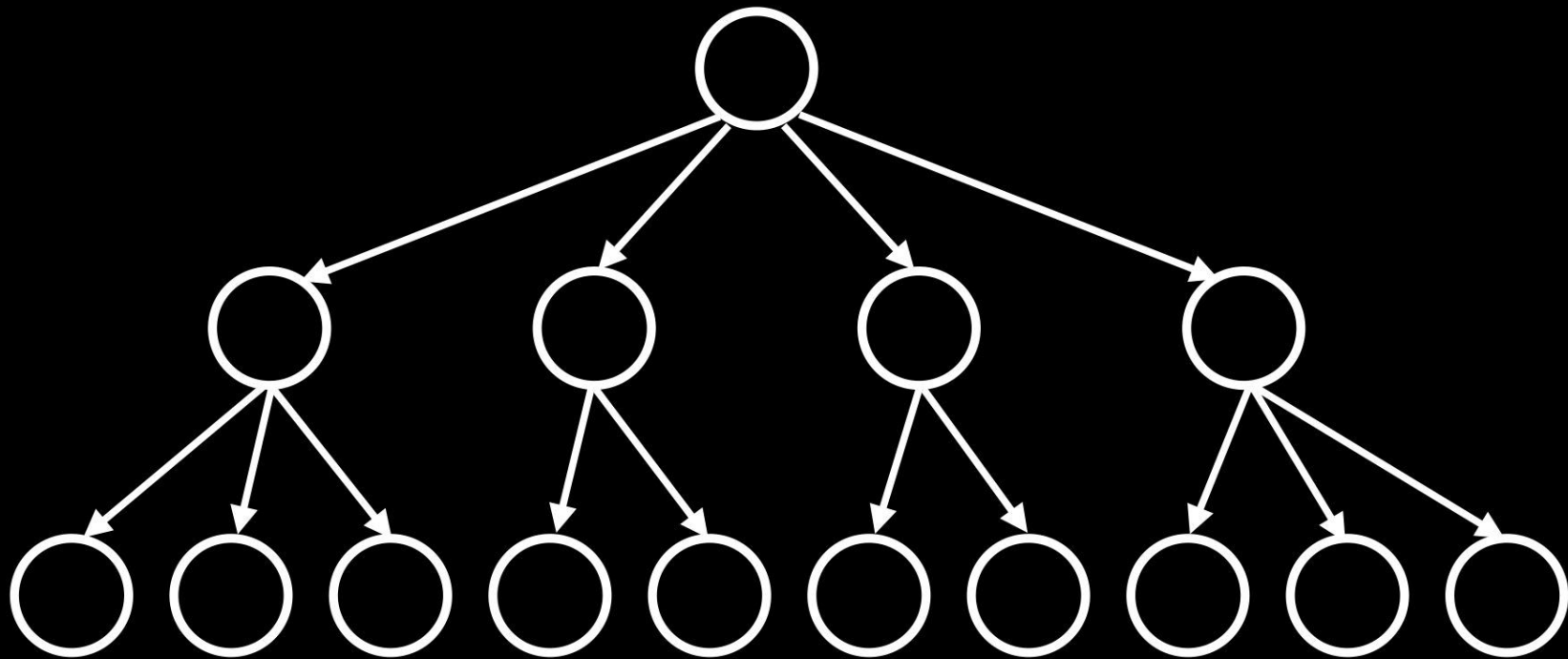
FOREIGN KEY

IMDb

indexes

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

B-trees



JOIN

...

JOIN

...

JOIN

...

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

SQL injection attacks

Central Authentication Service

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SIGN IN



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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("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
```

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

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

```
db.execute("BEGIN TRANSACTION")
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);
db.execute("COMMIT")
```

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