



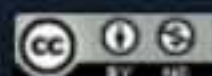
Unit 03.04

## Data Models and Relational SQL: JOINS

### USING DATABASES WITH PYTHON

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# Relational Power

- By removing the replicated data and replacing it with references to a single copy of each bit of data we build a “web” of information that the relational database can read through very quickly - even for very large amounts of data
- Often when you want some data it comes from a number of tables linked by these foreign keys

We finally have touched  
the relational power and



# The JOIN Operation

- The JOIN operation **links across several tables** as part of a select operation
- You must tell the JOIN **how to use the keys** that make the connection between the tables using an **ON clause**

And the JOIN basically says, we are selecting data from more than one table.





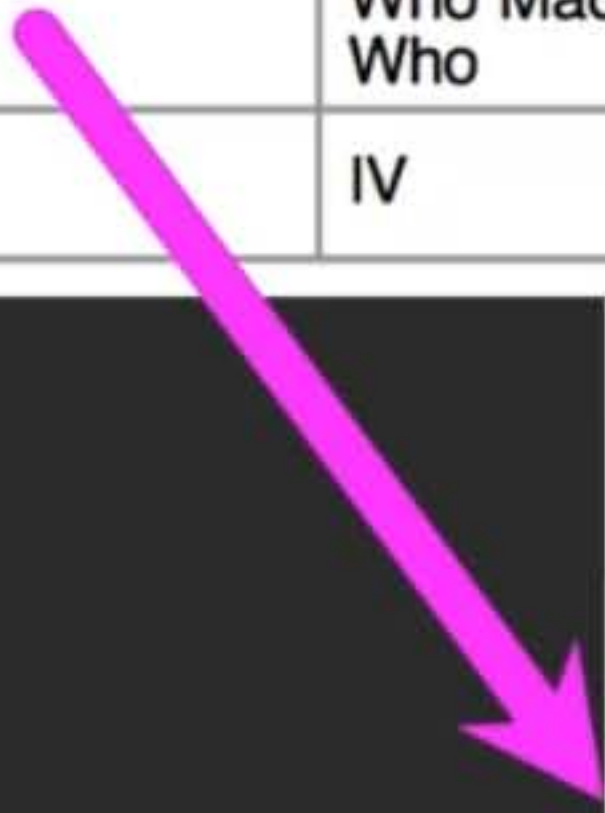
id	artist_id	title
Filter	Filter	Filter
1	2	Who Made Who
2	1	IV

Album

Artist

	title	name
1	Who Made Who	AC/DC
2	IV	Led Zeppelin

id	name
Filter	Filter
1	Led Zeppelin
2	AC/DC



```
select Album.title, Artist.name from Album join Artist on Album.artist_id = Artist.id
```



What we want  
to see

The tables that  
hold the data

How the tables  
are linked

And so we have this example here of our data,



SQL 1

```
1 select Album.title, Artist.name from Album join Artist on Album.artist_id = Artist.id
2
```

	title	name
1	Who Made Who	AC/DC
2	IV	Led Zeppelin

2 Rows returned from: select Album.title, Artist.name from Album join Artist on Album.artist\_id = Artist.id (took 3ms)

DB Schema

Name	Type	Schema
▶ Album		CREATE TABLE Album (id...
▶ Artist		CREATE TABLE `Artist` (`id`...
▶ Genre		CREATE TABLE Genre (id...
▶ Track		CREATE TABLE Track (id...
▶ sqlite_sequ...		CREATE TABLE sqlite_se...
▼ Indices (3)		
▶ sqlite_autoi...		
▶ sqlite_autoi...		
▶ sqlite_autoi...		
Views (0)		
Triggers (0)		

Oops.

I've got the title from one table and





id	artist_id	title
Filter	Filter	Filter
1	2	Who Made Who
2	1	IV

id	name
Filter	Filter
1	Led Zeppelin
2	AC/DC

	title	artist_id	id	name
1	Who Made Who	2	2	AC/DC
2	IV	1	1	Led Zeppelin

```
select Album.title, Album.artist_id, Artist.id, Artist.name  
from Album join Artist on Album.artist_id = Artist.id
```

So here we once again have our SELECT, and



	title	name
1	Black Dog	Rock
2	Stairway	Rock
3	About to Rock	Metal
4	Who Made Who	Metal

id	title	album_id	genre_id	len	rating	count
Filter	Filter	Filter	Filter	Filter	Filter	Filter
1	Black Dog	2	1	297	5	0
2	Stairway	2	1	482	5	0
3	About to Rock	1	2	313	5	0
4	Who Made Who	1	2	207	5	0



id	name
Filter	Filter
1	Rock
2	Metal

```
select Track.title, Genre.name from Track join Genre on Track.genre_id = Genre.id
```

What we want  
to see

The tables that  
hold the data

How the tables  
are linked

Okay, so let's construct another one.



	title	name
1	Black Dog	Rock
2	Stairway	Rock
3	About to Rock	Metal
4	Who Made Who	Metal

id	title	album_id	genre_id	len	rating	count
Filter	Filter	Filter	Filter	Filter	Filter	Filter
1	Black Dog	2	1	297	5	0
2	Stairway	2	1	482	5	0
3	About to Rock	1	2	313	5	0
4	Who Made Who	1	2	207	5	0

id	name
Filter	Filter
1	Rock
2	Metal

ALL COMBINATIONS

select Track.title, Genre.name from Track join Genre on ~~Track.genre\_id = Genre.id~~

What we want to see

The tables that hold the data

How the tables are linked

all combinations. All combinations.



	title	genre_id	id	name
1	Black Dog	1	1	Rock
2	Black Dog	1	2	Metal
3	Stairway	1	1	Rock
4	Stairway	1	2	Metal
5	About to Rock	2	1	Rock
6	About to Rock	2	2	Metal
7	Who Made Who	2	1	Rock
8	Who Made Who	2	2	Metal

```
SELECT Track.title,  
       Track.genre_id,  
       Genre.id, Genre.name  
FROM Track JOIN Genre
```

Joining two tables without  
an **ON** clause gives all  
possible combinations of

rows.  
So this is exactly  
the same SELECT statement.



# It can get complex...

```
select Track.title, Artist.name, Album.title, Genre.name from  
Track join Genre join Album join Artist on Track.genre_id =  
Genre.id and Track.album_id = Album.id and Album.artist_id =  
Artist.id
```

	title	name	title	name
1	Black Dog	Led Zeppelin	IV	Rock
2	Stairway	Led Zeppelin	IV	Rock
3	About to Rock	AC/DC	Who Made Who	Metal
4	Who Made Who	AC/DC	Who Made Who	Metal

What we want  
to see

The tables which  
hold the data

How the tables  
are linked

Because now what we want  
is the track title,



<input checked="" type="checkbox"/> Hells Bells	5:13	AC/DC	Who Made Who	Rock	★★★★★	61
<input checked="" type="checkbox"/> Shake Your Foundations	3:54	AC/DC	Who Made Who	Rock	★★★★★	70
<input checked="" type="checkbox"/> Chase the Ace	3:01	AC/DC	Who Made Who	Rock		56
<input checked="" type="checkbox"/> For Those About To Rock (We ...	5:54	AC/DC	Who Made Who	Rock	★★★★★	61
<input checked="" type="checkbox"/> Dúlamán	3:43	Altan	Natural Wonders M...	New Age		31
<input checked="" type="checkbox"/> Rode Across the Desert	4:10	America	Greatest Hits	Easy Listen...	★★★★★	23
<input checked="" type="checkbox"/> Now You Are Gone	3:08	America	Greatest Hits	Easy Listen...	★★★★★	18
<input checked="" type="checkbox"/> Tin Man	3:30	America	Greatest Hits	Easy Listen...	★★★★★	23
<input checked="" type="checkbox"/> Sister Golden Hair	3:22	America	Greatest Hits	Easy Listen...	★★★★★	24
<input checked="" type="checkbox"/> Track 01	4:22	Billy Price	Danger Zone	Blues/R&B	★★★★★	26
<input checked="" type="checkbox"/> Track 02	2:45	Billy Price	Danger Zone	Blues/R&B	★★★★★	18
<input checked="" type="checkbox"/> Track 03	3:26	Billy Price	Danger Zone	Blues/R&B	★★★★★	22
<input checked="" type="checkbox"/> Track 04						18
<input checked="" type="checkbox"/> Track 05						21
<input checked="" type="checkbox"/> War Pigs/Luke's Wall						25
<input checked="" type="checkbox"/> Paranoid						22
<input checked="" type="checkbox"/> Planet Caravan						25
<input checked="" type="checkbox"/> Iron Man						26
<input checked="" type="checkbox"/> Electric Funeral						22
<input checked="" type="checkbox"/> Hand of Doom						23
<input checked="" type="checkbox"/> Rat Salad						31
<input checked="" type="checkbox"/> Jack the Stripper/Fairies Wear ..						24
<input checked="" type="checkbox"/> Bomb Squad (TECH)						1
<input checked="" type="checkbox"/> clay techno						2
<input checked="" type="checkbox"/> Heavy						1
<input checked="" type="checkbox"/> Hi metal man						1
<input checked="" type="checkbox"/> Mistro						1

	title	name	title	name
1	Black Dog	Led Zepplin	IV	Rock
2	Stairway	Led Zepplin	IV	Rock
3	About to Rock	AC/DC	Who Made Who	Metal
4	Who Made Who	AC/DC	Who Made Who	Metal

4:20 Brent Brent's Album

And so, we start here.