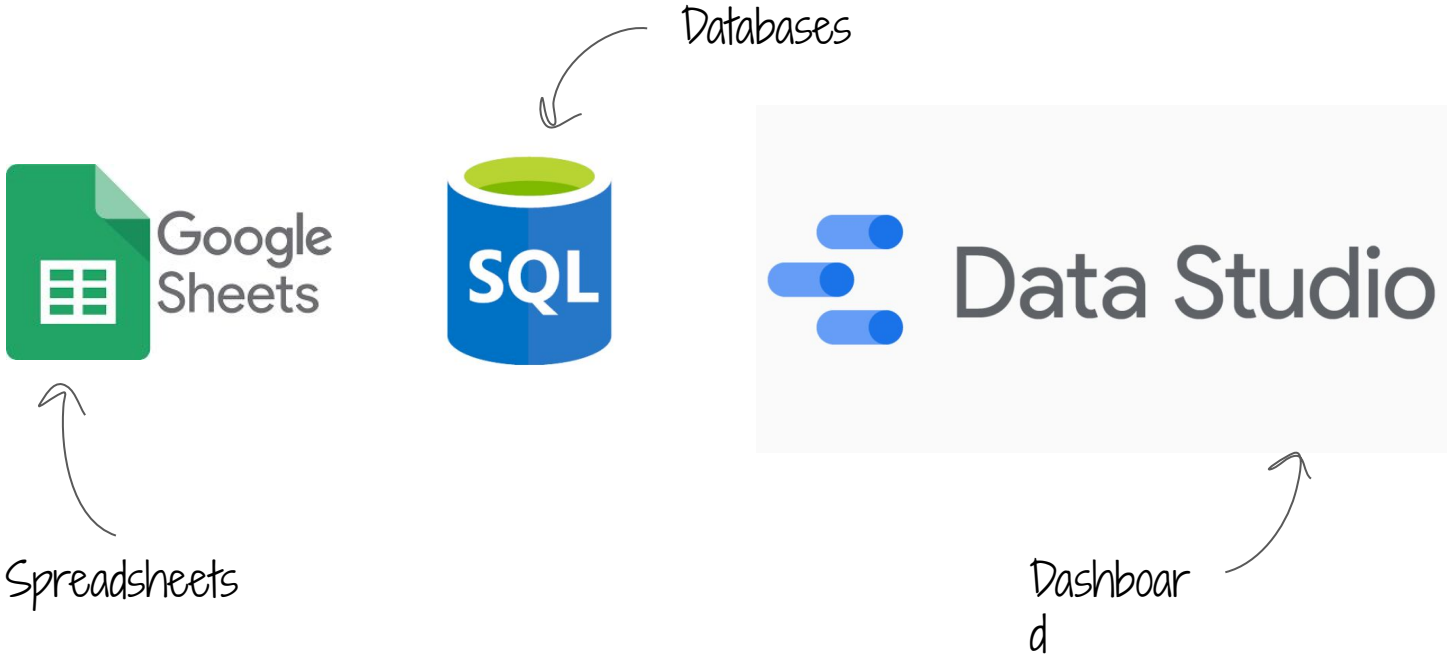

Bootcamp Live 02
Intro to Databases with SQL
Instructor: Kasidis Satangmongkol

Why should we learn databases?



What can databases do?

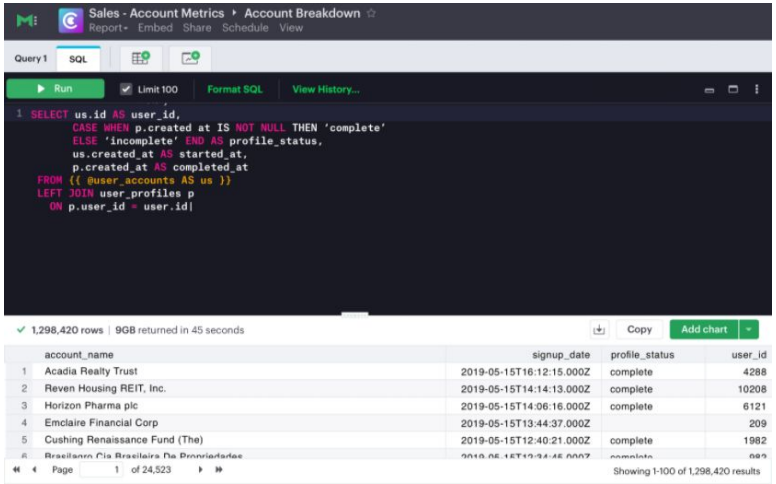
Store

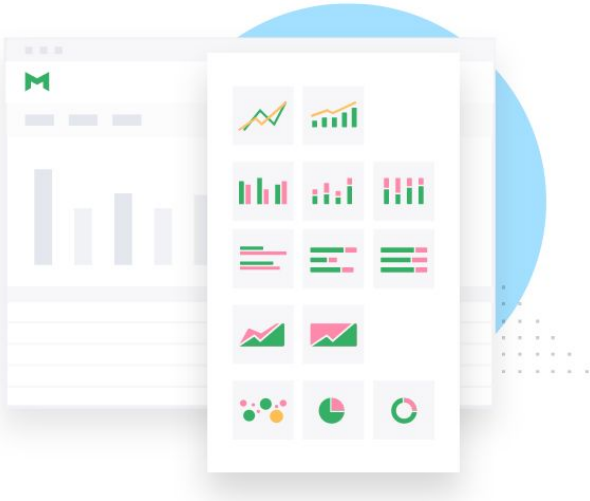
Analyze

Present

Some databases also have data visualization features

SQL is a fundamental skill for data analyst





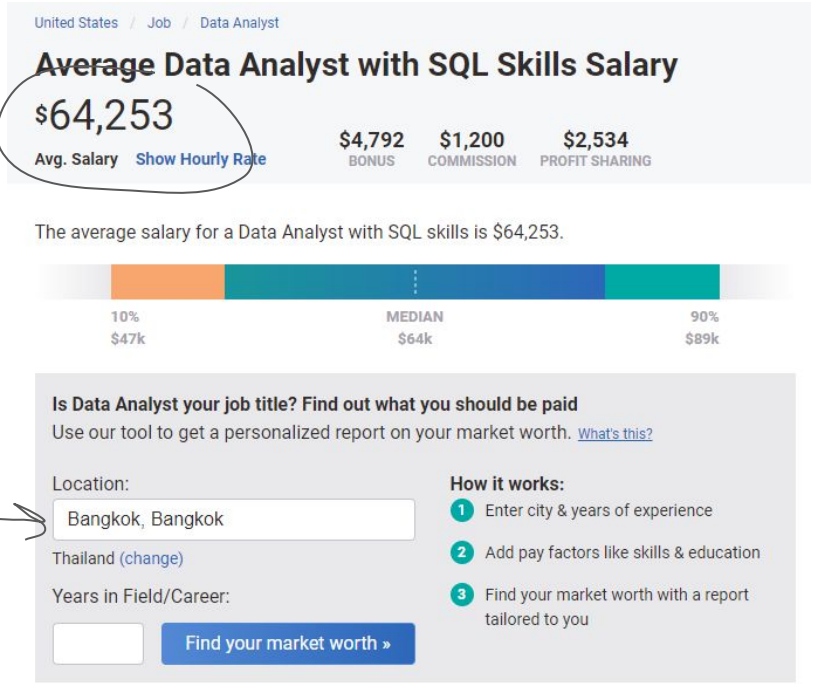
Customize your visualizations

Visualize any SQL result with Mode's native chart builder and add a personal touch with our HTML editor.

SQL is easy to learn, Quick win!

Average salary in USA

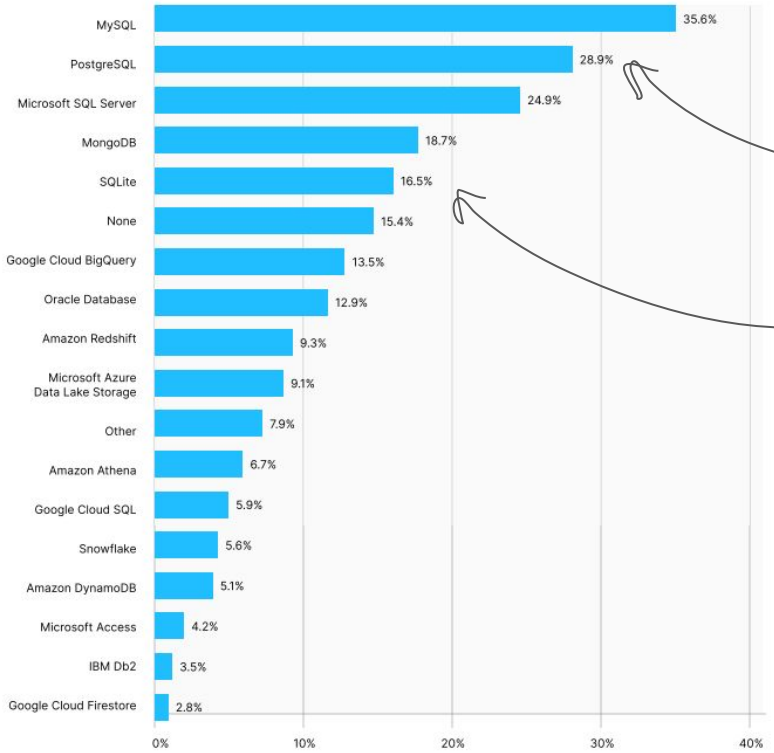
Data Analyst with SQL Skills Salary | PayScale



Convert to THB
* 30 / 2.5

You can find your net worth using this free tool

There are many versions of SQL



We'll teach PostgreSQL too :)

SQLite is a standard language (pure)

State of Data Science and Machine Learning 2020 | Kaggle

We have been using SQL for 50 years

Structured Query Language

verb. Ask a question about our data

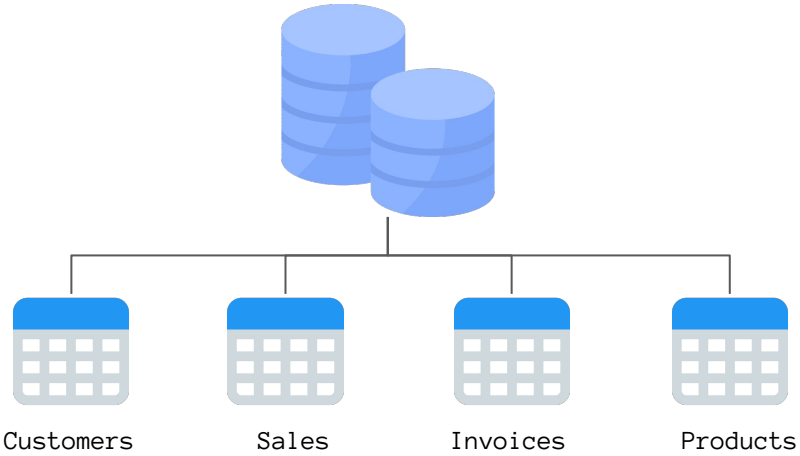
How database work?

Query

Result

Every company has databases (99.99%)

What database looks like?



You are already familiar with database technology

employee_csv

Schema Details Preview

Row	EmployeeID	FirstName	LastName	HireDate	City	Salary	Terminated
1	1	Sun	Bak	2020-01-28	Seoul	120000	false
2	3	Kala	Dandekar	2020-03-31	Mumbai	140000	false
3	4	Riley	Blue	2020-04-18	London	90000	false
4	6	Lito	Rodriguez	2020-06-19	Mexico City	250000	false
5	2	Nomi	Marks	2020-02-11	San Francisco	110000	true
6	5	Wolfgang	Bogdanow	2020-05-20	Berlin	115000	true
7	7	Will	Gorski	2020-07-04	Chicago	180000	true

At the heart of SQL is selecting the data you want

Select columns

Row	EmployeeID	FirstName	LastName	HireDate	City	Salary	Terminated
1	1	Sun	Bak	2020-01-28	Seoul	120000	false
2	3	Kala	Dandekar	2020-03-31	Mumbai	140000	false
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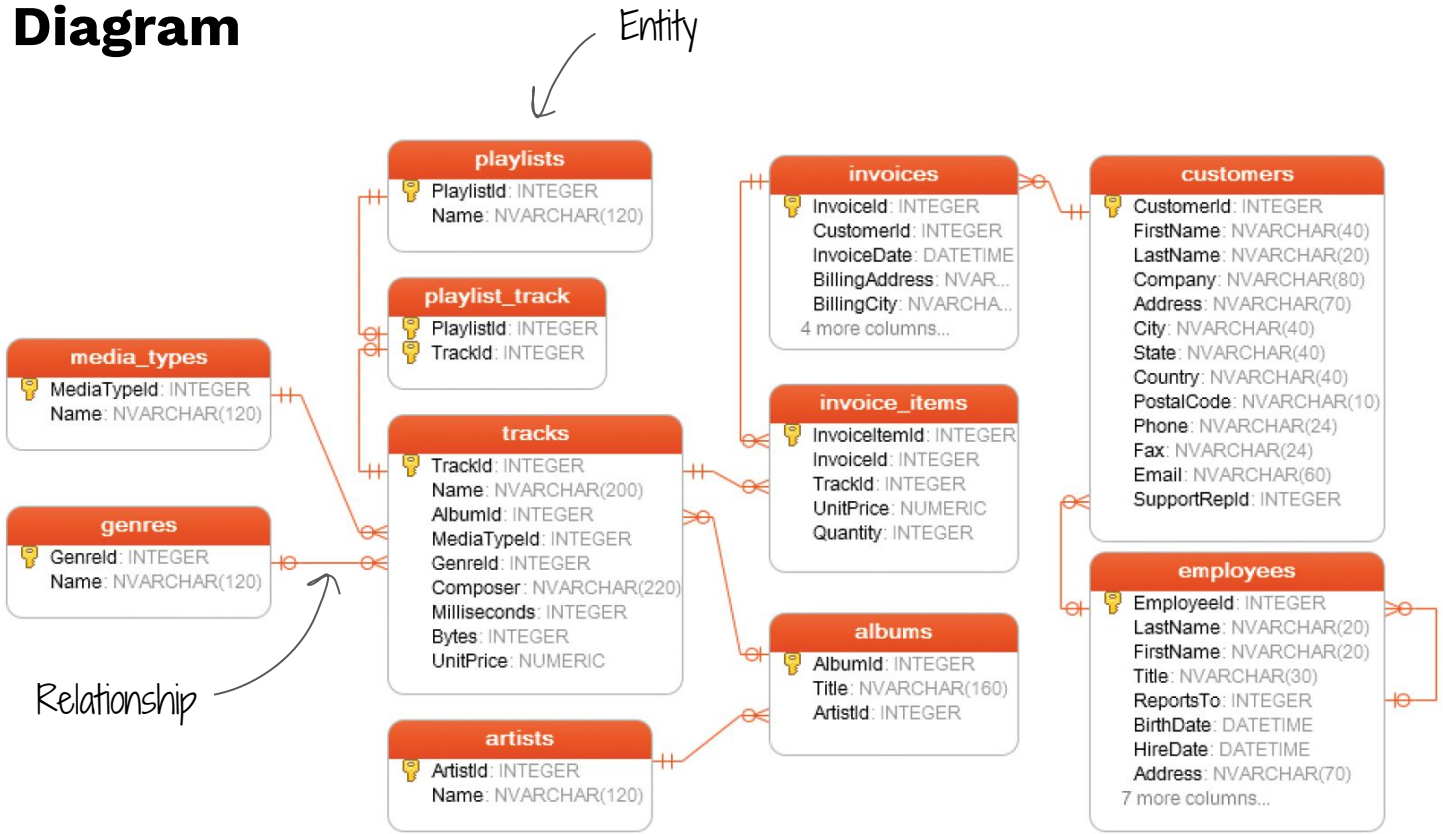
6	5	Wolfgang	Bogdanow	2020-05-20	Berlin	115000	true
7	7	Will	Gorski	2020-07-04	Chicago	180000	true

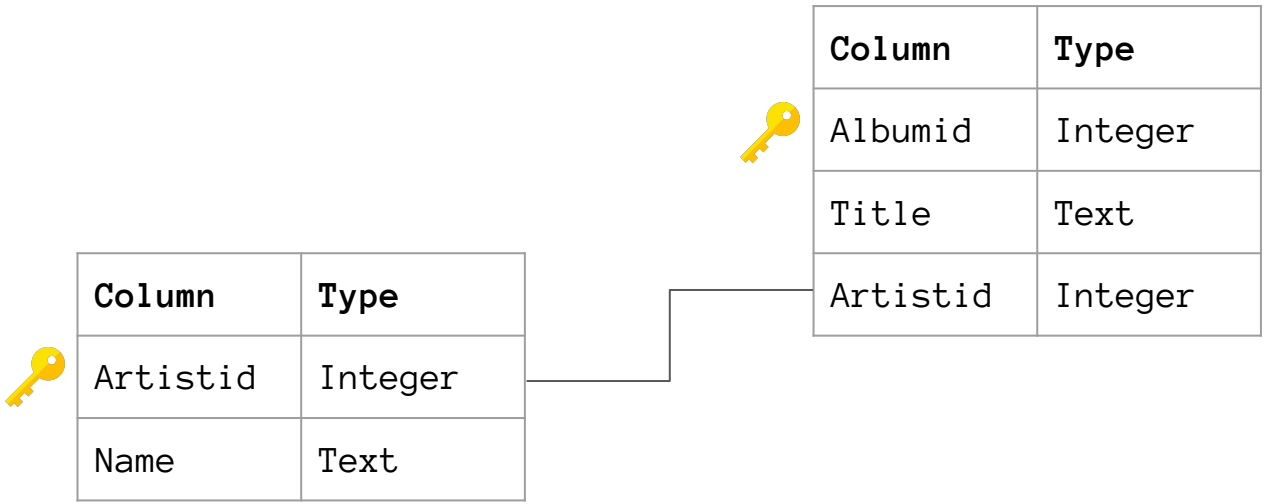
Filter rows

ER Diagram



SQLite Tutorial - An Easy Way to Master SQLite Fast

Primary and foreign keys



SQL clauses we use in our data analyst role

Clauses	What it does?
SELECT	Select columns
FROM	From table
JOIN	Join multiple tables
WHERE	Filter data
Aggregate Functions	AVG SUM MIN MAX COUNT
GROUP BY	Group by statistics
HAVING	Filter groups
ORDER BY	Sort data


SQL
The first part will cover all the SQL basics :)

Select all columns

```sql
SELECT * FROM customers;
```

Select all columns

Select specific columns

```
SELECT
    firstname,
    lastname,
    email,
    country
FROM customers;
```

Choose specific columns

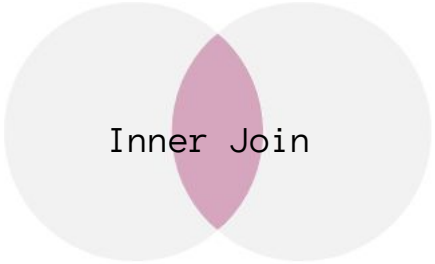
Filter rows with where clause

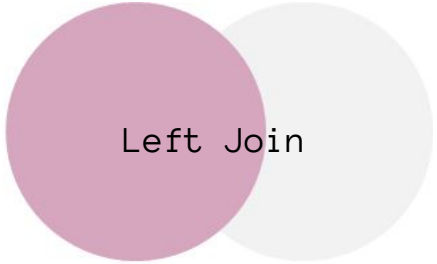
condition

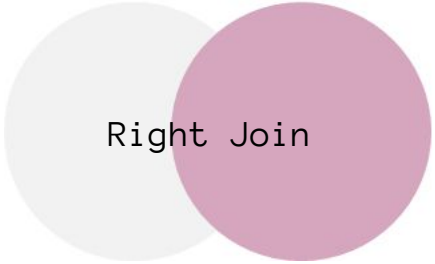
```
SELECT *
FROM customers
WHERE country = ‘USA’;
```

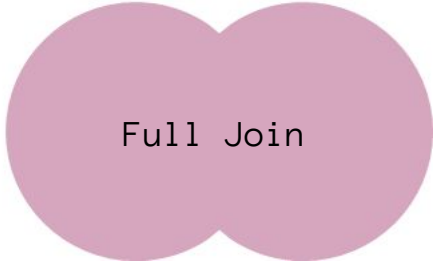
```
SELECT *
FROM customers
WHERE country IN (‘USA’, ‘Canada’, ‘United Kingdom’);
```

Review join types









Inner and Left Join contribute around 90-95% of our work

Inner join

Table 1

PK_ID	Name
1	David
2	John
3	Marry
4	Anna
5	Kevin

+

Table 2

FK_ID	Major
1	Econ
2	Econ
5	Data
12	Engineer
35	Mkt

=

Result Set

PK_ID	Name	Major
1	David	Econ
2	John	Econ
5	Kevin	Data

Left join

Table 1

PK_ID	Name
1	David
2	John
3	Marry
4	Anna
5	Kevin

+

Table 2

FK_ID	Major
1	Econ
2	Econ
5	Data
12	Engineer
35	Mkt

=

Result Set

PK_ID	Name	Major
1	David	Econ
2	John	Econ
3	Marry	NULL
4	Anna	NULL
5	Kevin	Data

Full join

Table 1

PK_ID	Name
1	David
2	John
3	Marry
4	Anna
5	Kevin

+

Table 2

FK_ID	Major
1	Econ
2	Econ
5	Data
12	Engineer
35	Mkt

=

Result Set

PK_ID	Name	Major
1	David	Econ
2	John	Econ
3	Mary	NULL
4	Anna	NULL
5	Kevin	Data
12	NULL	Engineer
35	NULL	Mkt

Join example

```
SELECT A.*, B.*
FROM customers A
JOIN invoices  B
ON A.customerid = B.customerid;
```

This query joins two tables - customers and invoices

Join example

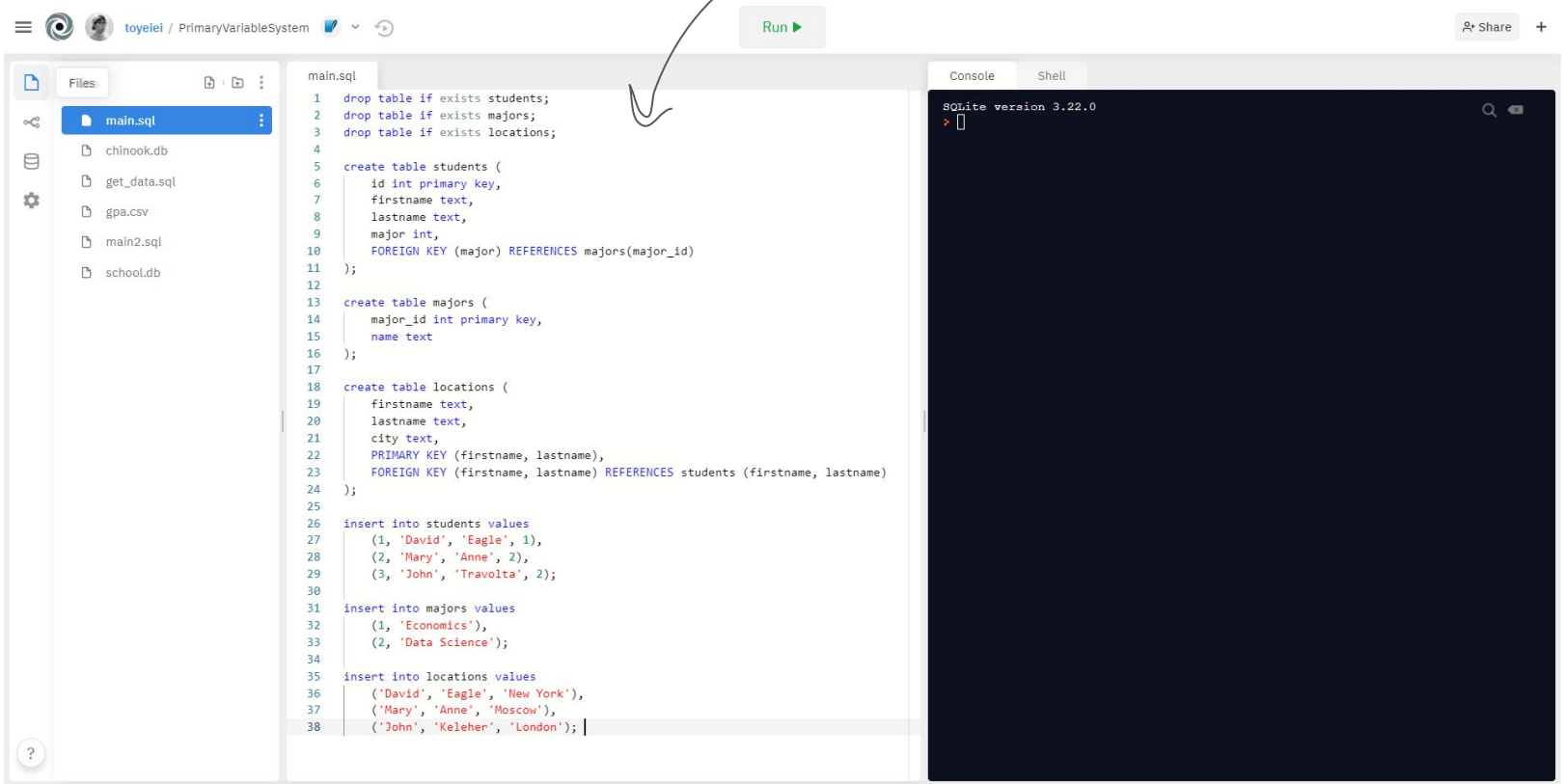
```
SELECT
    A.*,
    B.*,
    C.*,
    D.*
FROM table1 A
JOIN table2 B ON A.id = B.id
JOIN table3 C ON B.id = C.id
JOIN table4 D ON C.id = D.id;
```

It's easy to join more than two tables (4-5 tables is quite normal)


SQL
Warning! The following slides are advanced SQL topics. Be prepared and hope you enjoy.

Repl.it

Repl.it online editor



Essential command lines

Command	What it does?
.help	เรียกดูชื่อ sql commands ทั้งหมด
.open	เปิดไฟล์ database
.read	อ่านไฟล์ sql script
.mode	เปลี่ยน mode การแสดงผล
.header	แสดงชื่อ column ใน terminal
.table	แสดงชื่อ tables ใน database
.schema	แสดง schema ของตารางทั้งหมด
.import	นำเข้า csv file เป็น table

We can also run SQL in terminal

Console | Shell

```
SQLite version 3.22.0
>
> .shell pwd
/home/runner/PrimaryVariableSystem
>
> .shell ls -l
total 908
-rw-r--r-- 1 runner runner 884736 Dec 16 10:20 chinook.db
-rw-r--r-- 1 runner runner     45 Dec 16 10:34 get_data.sql
-rw-r--r-- 1 runner runner     40 Dec 16 11:10 gpa.csv
-rw-r--r-- 1 runner runner    119 Dec 16 11:42 main2.sql
-rw-r--r-- 1 runner runner    851 Dec 16 11:24 main.sql
-rw-r--r-- 1 runner runner  28672 Dec 16 11:24 school.db
>
> .shell cat gpa.csv
id,gpa
1,3.45
2,3.67
3,3.89
4,2.55
>
> .shell echo "Hello world"
Hello world
>
> .open chinook.db
>
> .table
albums          employees       invoices        playlists
artists         genres          media_types     tracks
customers       invoice_items   playlist_track
>
> select firstname, lastname, country from customers limit 5;
Luís|Gonçalves|Brazil
Leonie|Köhler|Germany
François|Tremblay|Canada
Bjørn|Hansen|Norway
František|Wichterlová|Czech Republic
>
```

We call this "TERMINAL"

Join syntax

```
SELECT A.*, B.*
FROM customers A
JOIN invoices  B
ON A.customerid = B.customerid;
```

Alias or shorter name

PK = FK

Join using

```
SELECT A.*, B.*
FROM customers A
JOIN invoices  B
USING (customerid);
```

Using if the column names in both tables are the same

Join more than one column

```
SELECT A.*, B.*
FROM tableA  A
JOIN tableB  B
    ON  A.customerid = B.customerid
    AND A.country = B.country;
```

use AND to add more columns to join

Review CASE syntax

```
SELECT
    CASE
        WHEN company IS NULL THEN 'End Customers'
        ELSE 'Corporate'
    END AS segment
FROM customers;
```

Condition

Value if True

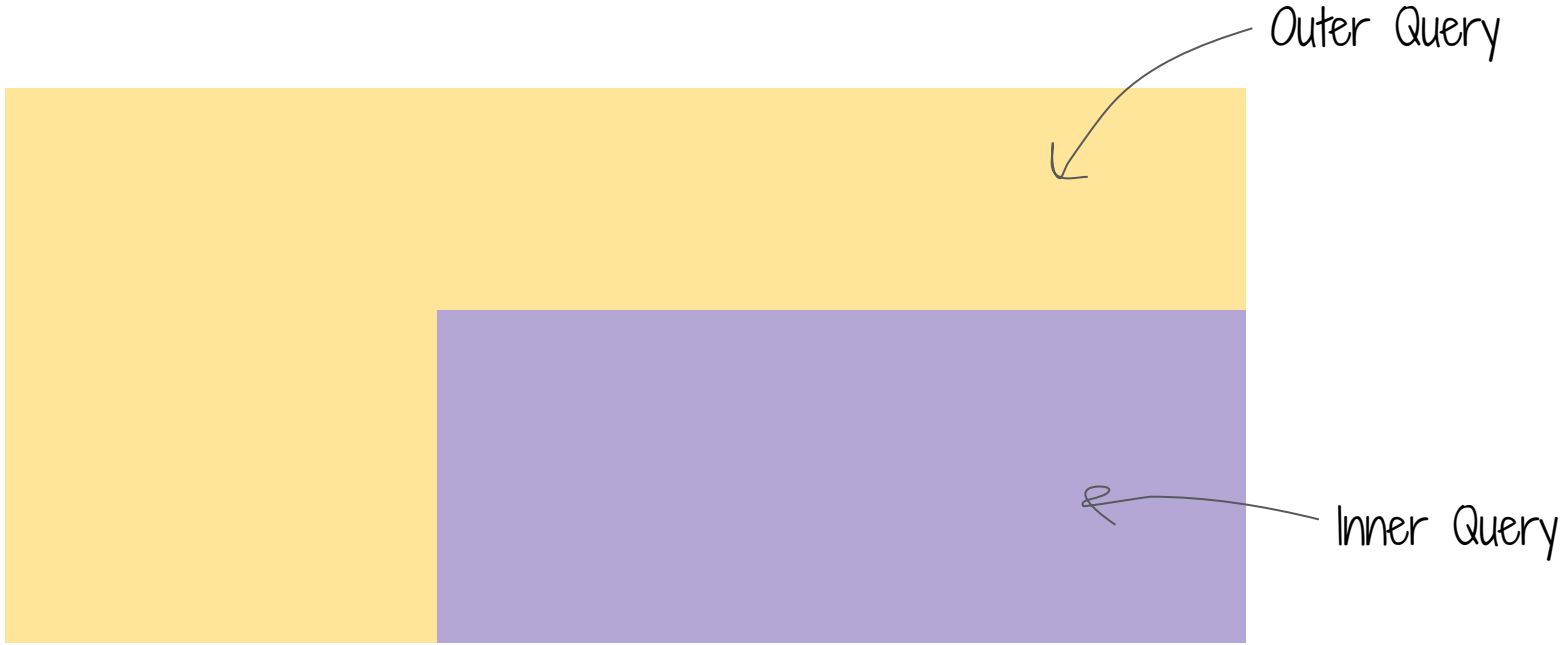
Value if False

Case + Aggregate Functions

```
SELECT
    CASE
        WHEN company IS NULL THEN ‘End Customers’
        ELSE ‘Corporate’
    END AS segment,
    COUNT(*) AS N
FROM customers
GROUP BY 1;
```

Count customers in each segment

Intro to subqueries



Inner run first

```
SELECT firstname, lastname, country FROM (

    SELECT * FROM customers
    WHERE country IN ('USA', 'United Kingdom', 'Canada')
)

ORDER BY 3 DESC;
```

Inner Query

Outer run later

```
SELECT firstname, lastname, country FROM (

    SELECT * FROM customers
    WHERE country IN ('USA', 'United Kingdom', 'Canada')
)

ORDER BY 3 DESC;
```

Outer Query

We often use subqueries in where clause

```
SELECT * FROM tracks
WHERE bytes = (
    SELECT MAX(bytes) FROM tracks
);
```

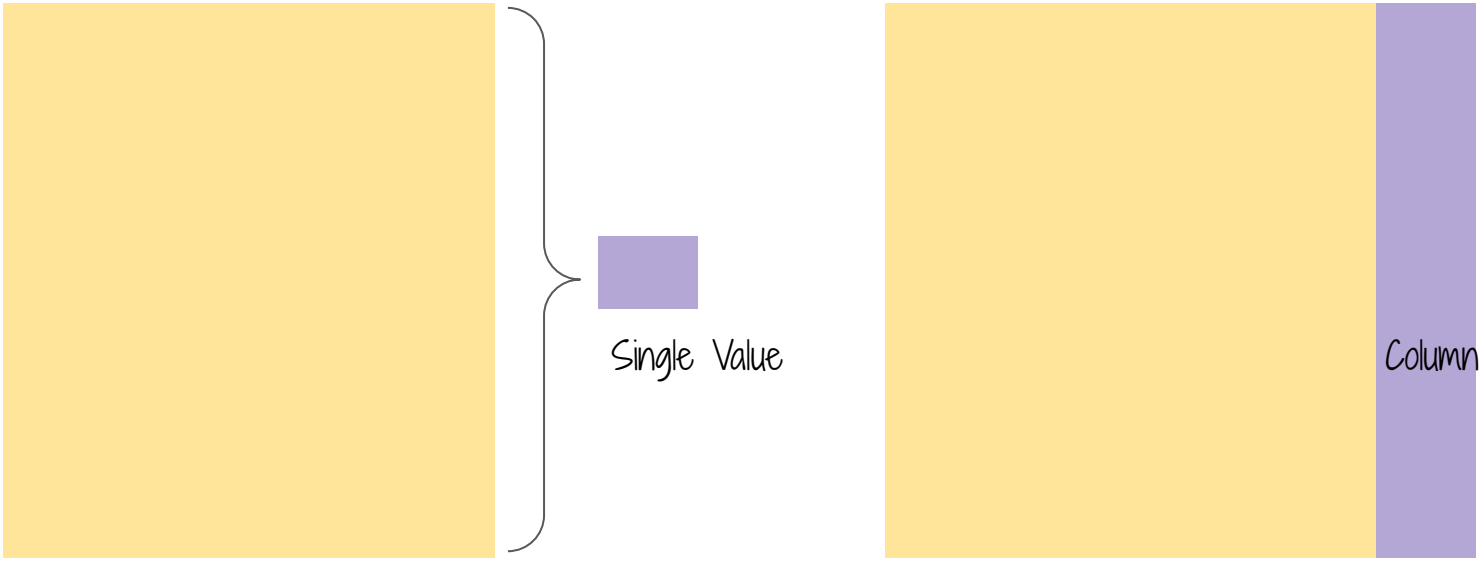
Find max bytes

Intro to window functions

Two things you need to know about window functions

1. they are in **SELECT** clause
2. they create new columns in the result table

Aggregate vs. Window functions



Aggregate Function

Window Function

Window function syntax

```
WINDOW_FUNCTION( )  OVER( PARTITION BY … ORDER BY … )
```

Function Name

Create window

The easiest window function

```
SELECT
    firstname,
    lastname,
    ROW_NUMBER() OVER() AS rowNum
FROM customers;
```

FirstName	LastName	rowNum
Luís	Gonçalves	1
Leonie	Köhler	2
François	Tremblay	3
Bjørn	Hansen	4
František	Wichterlová	5
Helena	Holý	6
Astrid	Gruber	7
Daan	Peeters	8
Kara	Nielsen	9
Eduardo	Martins	10
Alexandre	Rocha	11
Roberto	Almeida	12
Fernanda	Ramos	13
Mark	Philips	14
Jennifer	Peterson	15

Common window functions

Function	What it does?
ROW_NUMBER()	สร้างคอลัมน์ row number เรียงตั้งแต่ 1 - n
RANK()	สร้างคอลัมน์ ranking
DENSE_RANK()	สร้างคอลัมน์ ranking
LAG()	สร้างคอลัมน์ LAG value (t-1)
LEAD()	สร้างคอลัมน์ LEAD value (t+1)
NTILE()	สร้างคอลัมน์ segment จับกลุ่ม records
SUM() OVER()	สร้างคอลัมน์ผลรวมแบบ running total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