SQL

SQL = Structrured Query Language

- ISO standard
- but there are some differences between the systems that use it
- declaring lenguage (WHAT to do, not HOW to do it)
- insensible to CAPITAL letters

Postgres

@ command line

- psql -l → list databases and exit
- psql → connect to default DB
- psql -d name → connect to specific DB
- psql -c ‘sql query‘ → execute and return the result
- psql -f file.name → execute commands from file, then exit

- psql -d dsc -c ’\l’

@ psql

```
dsc=# this is one line
dsc-# notice the minus (-) in this line
dsc-# again -
dsc-# until I put ;
ERROR:  syntax error at or near "this"
LINE 1: this is one line
```

- you cannot return to prevous line while writing a command!
- The command is interpreted when ";" is encountered!
- CTRL+C stops psql from interpreting the command
- there exist command history ….
- BUT all CTR+C commands are NOT saved in history

@ psql

**Non SQL commands start with: **

- \l =*list* = returns the list of the available DB

- \c = *connect* = returns the name of the actual DB
- \c name = connect to specific DB

- \d = *describe* = returns the list of the tables
- \d nombre = returns more information of the specific table
- \i file.sql =execute sql from file
- \q =quit (Ctrl+d)
- \h = list SQL commands (\h +command = command help)
- \? =list psql commands

We are in the shell!!!

All shell commands start with: \!

- \!pwd
- \! ls -l
- \! cd ..
- \! ls -l

- \cd ..

Create and Delete a DB

```
CREATE DATABASE Networking;
\d

DROP DATABASE Networking;
\d
```

Tables

Data is organized in tables.

Tables consist of columns, which can be of different types (text, number, date, etc).

```
CREATE TABLE friends (    nombre VARCHAR,
                          edad INT,
                          email VARCHAR);
\d friends

DROP TABLE friends ;
\d
```

Populating the tables

```
CREATE TABLE friends (          nombre VARCHAR,
                                edad INT,
                                email VARCHAR);
INSERT INTO friends VALUES ('Lionel Messi', 29, 'messi@fcbarcelona.es');
INSERT INTO friends VALUES (‘Donald Tramp', 71, ‘trump@twitter.com');
INSERT INTO friends VALUES (‘Ivanka Tramp', 35);
INSERT INTO friends VALUES (‘Melania Tramp', 'melania@supersmile');
INSERT INTO friends (nombre, email) VALUES ('Melania Tramp', 'melania@supersmile');


INSERT INTO friends VALUES (‘Mario',25), (‘Marina',24) , (‘Renata',1, ‘notiene’);
```

Extracting the information

```
SELECT * FROM friends ;

SELECT nombre, edad FROM friends;
```

Filtering information

```
SELECT * FROM friends WHERE edad < 25;

SELECT nombre, edad FROM friends WHERE edad <> 24;
SELECT nombre, edad FROM friends WHERE edad != 24;


SELECT  * FROM friends WHERE nombre LIKE ‘%T' ;
SELECT  * FROM friends WHERE UPPER(nombre) LIKE ‘%T' ;
SELECT  * FROM friends WHERE UPPER(nombre) NOT LIKE ‘%T%' ;
```

Special data type: NULL

```
SELECT * FROM friends WHERE edad IS NULL;
```

Deleting Information

```
DELETE FROM friends ;

DELETE FROM friends WHERE edad < 18;
```

Diferencias entre DROP y DELETE

- We have seen and used DROP and DELETE commands. What is the difference between them? When would you use one and when the other?

- DROP completely deletes the table and you cannot eliminate the data selectively. We use this when we are sure not to need the table any more.
- DELETE eliminates selectively the table rows, and leaves the rest of rows intact. We use it when for example we want to eliminate a user from our system.

Exercise 1

- Generate 'Facebook' table where every person is identified with the name, age, city of residence, and email. The table should at least have 5 rows.

- Write a query to obtain Facebook friends which are younger than <18 or older than 65 years.

- Write a query to obtain all facebook friends which do not reside in Madrid.

Primary Key

- Primary key uniquely identifies each row of the table.
- For example DNI could be seen as excellent primary key in a table consisting of personal information.

- Primary key cannot be empty
- There cannnot be two rows with the same primary key
- Once created, the primary key of a row should not be changed

Primary Key

```
CREATE TABLE facebook (nombre VARCHAR,
                       email VARCHAR,
                       edad INT,
                       PRIMARY KEY (email));
```

Primary key can also be added to the existing table:

```
ALTER TABLE friends ADD PRIMARY KEY (email);
```

Editing the table structure

Adding a new column:

```
ALTER TABLE friends ADD COLUMN telefono VARCHAR;
```

Deleting just one column:

```
ALTER TABLE friends DROP COLUMN telefono;
```

Updating the information inside the table

Change city of residance for all Facebook friends:

```
UPDATE facebook SET residencia = 'Getafe';
```

Block underage users:

```
UPDATE facebook SET state= ’blocked’ WHERE edad < 18;
```

Exercise 2

- Add phone and username columns to your Facebook table.
- What is the content of these two columns after their creation?
- Update the phone number of all of your facebook friends
- All your Facebook friends use their email as user name, so that both columns conicide.How can you take advantage of this fact when updating the user name column

Wget

@Linea de comandos:

- wget https://raw.githubusercontent.com/masterdatascience/postgres/master/my_fb_friends.csv
- wget https://raw.githubusercontent.com/masterdatascience/postgres/master/my_ldin_contacts.csv

Git

@Linea de comandos:

- git clone https://github.com/masterdatascience/postgres

@Postgres:

```
ALTER TABLE facebook RENAME TO old_facebook;
CREATE TABLE facebook AS SELECT
                                    nombre,
                                    edad,
                                    residencia,
                                    email FROM old_facebook;

\! cat ./my_fb_friends.csv
ALTER TABLE facebook ADD PRIMARY KEY(email);
\copy facebook from './my_fb_friends.csv' delimiter '^ ' csv header;
```

Alias

- Alias is used to chage momentarely the name of something, during a query
- Alias is specified with AS

```
SELECT *, (edad*2) as doub_edad from facebook where (edad*2)>49;
SELECT * FROM facebook AS t WHERE t.residencia = 'Valencia';
```

Eliminating the duplicates

Cities present in Facebook table:

SELECT DISTINCT residencia FROM facebook;

What is the difference with respect to this query?

SELECT residencia FROM facebook;

Sorting the results

When we launch a query the order of the obtained results is not guaranteed!

We can define the order by using order by.

from lowest to highest

```
SELECT * FROM facebook ORDER BY edad;
```

from highest to lowest:

```
SELECT * FROM facebook ORDER BY edad DESC;
```

Sorting by multiple options

```
SELECT * FROM facebook
ORDER BY edad, nombre;
```

```
SELECT * FROM facebook
ORDER BY edad DESC, nombre ASC;
```

Limiting the number of results

```
SELECT * FROM facebook
ORDER BY edad DESC
LIMIT 5;
```

Limiting the number of results

- With offset we can start counting at the specific line

```
SELECT * FROM facebook
ORDER BY edad DESC
OFFSET 5
LIMIT 3;
```

Logical Operators

AND

BETWEEN

IN

NOT

OR

```
SELECT * FROM facebook
WHERE edad BETWEEN 18 AND 30;
```

```
SELECT * FROM facebook
WHERE edad NOT IN (15, 16,17);
```

Aggregate function

compute a single result value from a set of input values.

AVG	COUNT	MAX
MIN	SUM	

```
SELECT COUNT(*) FROM facebook;
```

```
SELECT AVG(edad), MIN(edad), MAX(edad) FROM facebook;
```

Group by

- is used to group together those rows in a table that share the same values in all the columns listed.
- The effect is to combine each set of rows sharing common values into one group row that is representative of all rows in the group
- This is done to eliminate redundancy in the output and/or compute aggregates that apply to these groups.

```
SELECT residencia, COUNT(*), AVG(edad)
FROM facebook
GROUP BY residencia;
```

Group by

```
SELECT residencia, edad, COUNT(*) FROM facebook
GROUP BY residencia, edad;
```

```
SELECT residencia, COUNT(*), AVG(edad) FROM facebook
GROUP BY residencia HAVING AVG(edad)>20;
```

Multiple queries

- The result of a query is nothing more than a temporal table. Hence we can apply a query over the result of another query.

```
SELECT *, ( SELECT AVG(edad)
                FROM facebook
                WHERE residencia='Madrid' ) AS Mad_average
FROM facebook;

SELECT *, ( SELECT AVG(edad)
                FROM facebook
                WHERE residencia='Madrid' ) AS Mad_average
FROM facebook
WHERE edad <(SELECT AVG(edad)
                FROM facebook
                WHERE residencia=’Madrid’) ;
```

Multiple queries

- WHERE + IN, ANY, ALL

```
SELECT *
FROM facebook
WHERE residencia IN (SELECT residencia
                     FROM facebook
                     GROUP BY residencia
                     HAVING AVG(edad)>35) ;

SELECT * FROM facebook
WHERE usuario = ANY (SELECT nombre FROM friends WHERE nombre
LIKE '%a%‘);
```

Linkedin

@Linea de comandos:

- echo "drop table if exists linkedin">psql_create_contactos.sq
- mv my_ldin_contacts.csv linkedin
- csvsql -d '^ linkedin -i postgresql >> psql_create_contactos.sql
- echo "\\\copy linkedin from './linkedin' delimiter '^' csv header; " >> psql_create_contactos.sq
- cat ./psql_create_contactos.sql
- psql -d networking -f psql_create_contactos.sql

@Postgres:

- \d linkedin
- select * from linkedin;

JOINS

- Joins the result of different queries
- Join combination can be:

  INNER JOIN,

  LEFT OUTER JOIN,

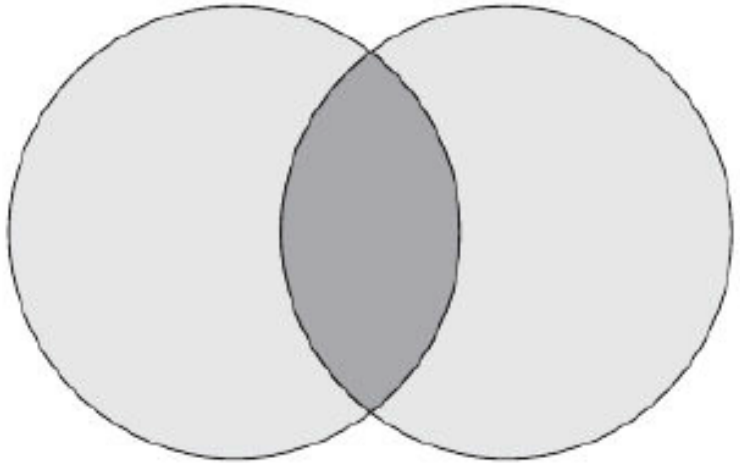
  RIGHT OUTER JOIN,

  FULL JOIN

- Multiple quieries (especially join) can be very slow and can consume a lot of memory.
- Data model should facilitate multiple queries, but try NOT to duplicate too much the data☺

INNER JOIN

- Combines the data of various tables and returns the overlap



```
SELECT fb.email
FROM facebook AS fb
INNER JOIN linkedin AS ln
ON fb.email=ln.email;
```

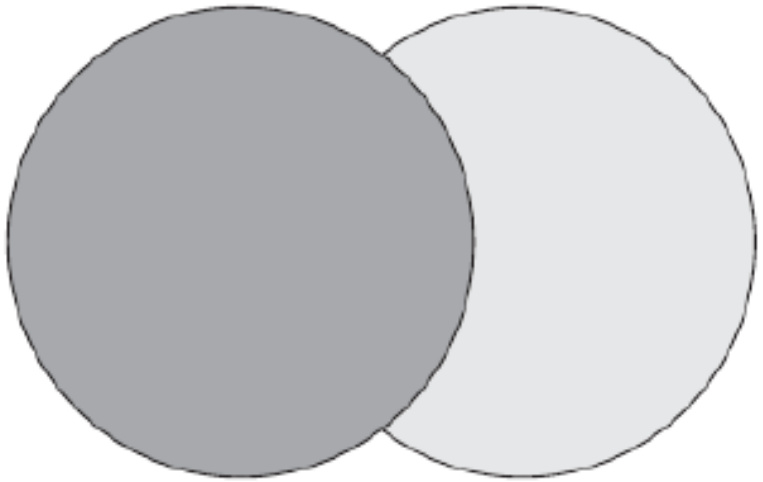
INNER JOIN

```
create table twitter (email VARCHAR, account VARCHAR);
insert into twitter values ('isra@centerofworld.com', 'isra_oops');
insert into twitter values ('kiko@centerofworld.com', 'Kiko');

SELECT fb.email AS email, fb.nombre AS fb, ln.contact AS ln, tw.account AS tw
FROM facebook AS fb
INNER JOIN linkedin AS ln ON fb.email=ln.email
INNER JOIN twitter AS tw ON tw.email=fb.email;
```

LEFT OUTER JOIN

- All rows from the LEFT table with the additional data of the RIGHT table



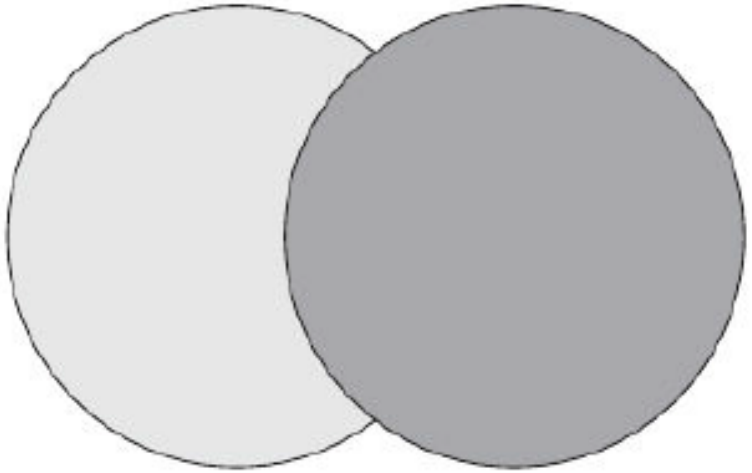
```
SELECT fb.*, ln.contact, ln.company
FROM facebook as fb
LEFT OUTER JOIN
linkedin AS ln
ON fb.email=ln.email;
```

DO SANITY CHECK!!!!

RIGHT OUTER JOIN

- All rows from the RIGHT table with the additional data of the LEFT table

```
SELECT ln.*, fb.nombre, fb.edad, fb.residencia
FROM facebook as fb
RIGHT OUTER JOIN
linkedin AS ln
ON fb.email=ln.email;
```

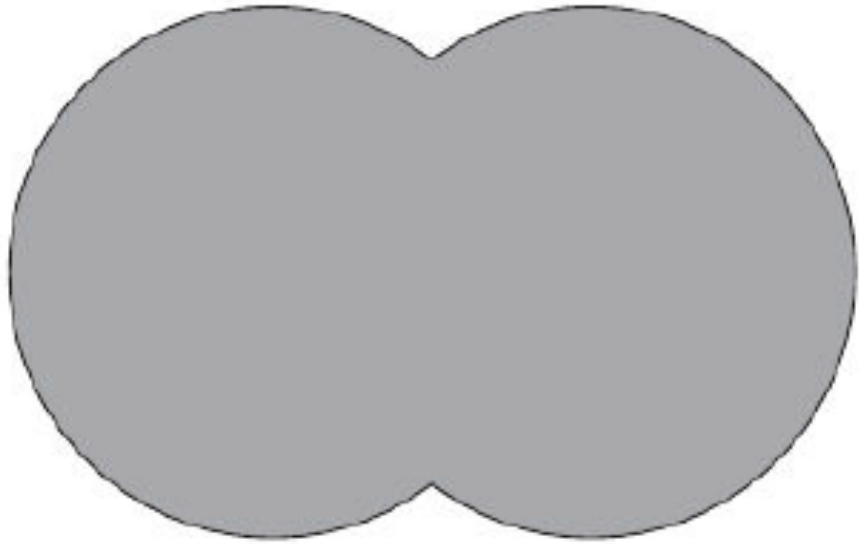


DO SANITY CHECK!!!!

FULL JOIN

- Combination of LEFT OUTER JOIN and RIGHT OUTER JOIN

```
SELECT ln.*, fb.*
FROM facebook as fb
FULL JOIN
linkedin AS ln
ON fb.email=ln.email;
```



Exercise 3

- Import optd_aircraft.csv and optd_airlines.csv in postgres
  (/Data/opentraveldata/)

- Which airplane has the highest number of engines?
  (optd_aircraft)

- What number of engines is most common on airplanes?
  (optd_aircraft)

History

- /home/dsc/.psql_history