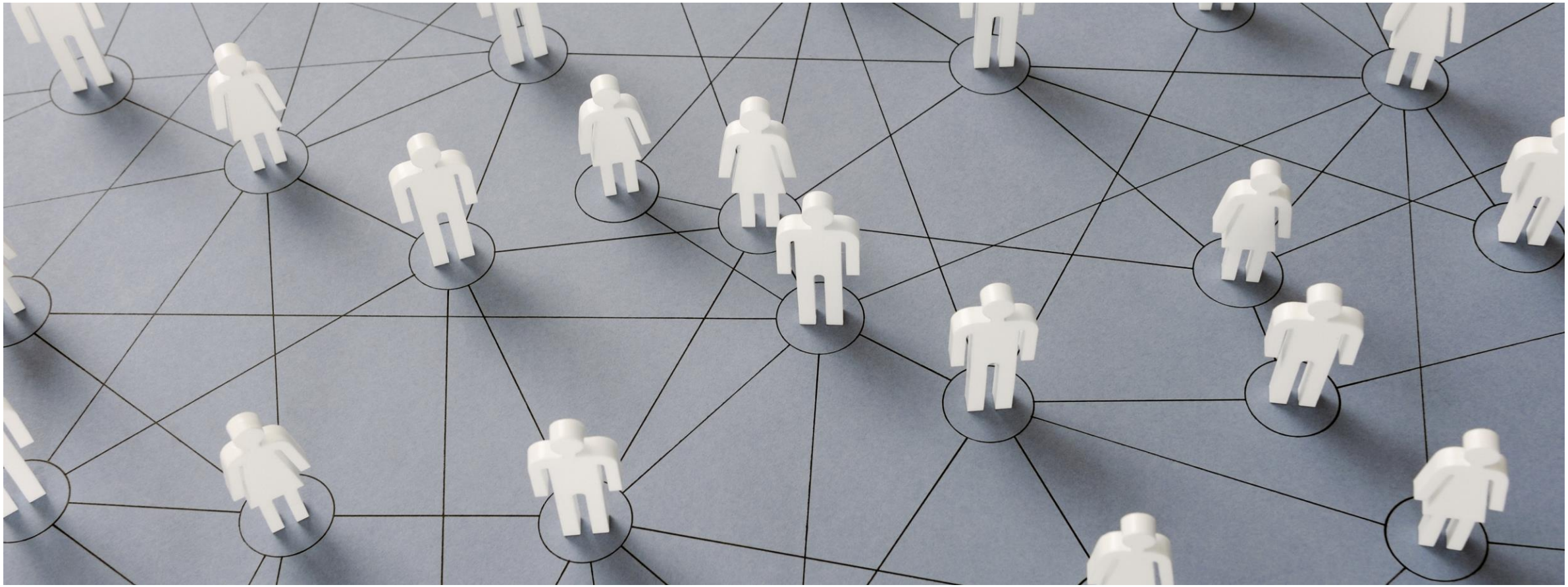
WORKSHOPS

Danai Korre

Week 5 - Data Representation / Relational databases



UNDERSTANDING DATABASES AND SQL

THE UNIVERSITY of EDINBURGH
School of Engineering

Field

Record

Name	Surname	email	telephone
Dan	Madden	excessive1822@example.com	1-433-819-5293
Clora	Morton	jewellery1915@example.com	1-485-863-5763
Anisa	Cook	micro1958@example.com	1-489-801-5083

Tables

Job
Optical Engineer
Mechanical Engineer
Manager

Name	Surname	email	telephone
Dan	Madden	excessive1822@example.com	1-433-819-5293
Clora	Morton	jewellery1915@example.com	1-485-863-5763
Anisa	Cook	micro1958@example.com	1-489-801-5083

Database

Job
Optical Engineer
Mechanical Engineer
Manager

Name	Surname	email	telephone
Dan	Madden	excessive1822@example.com	1-433-819-5293
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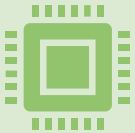
SQL

SQL: stands for Structured Query Language and is a standard language for accessing and manipulating databases



RDBMS: stands for Relational Database Management System and is the basis for SQL

More about SQL here

STANDARD QUERY LANGUAGE (SQL)

- SQL is a universal language that is used in most (almost all commercial relational database systems) and is ubiquitous in all manufacturing, service and other industries.
- It is a simple ‘predicate’ based language, eg

CREATE TABLE ‘tablename’

column1-name datatype

column2-name datatype

etc

STANDARD QUERY LANGUAGE (SQL)

- Further examples……
- Inserting data

INSERT

INTO tablename (column1name, column2name,….)

VALUES (‘value1’, ‘value2’,….);

- Or deleting data

DELETE

From tablename

WHERE condition;

STANDARD QUERY LANGUAGE (SQL)

- And general data queries using SELECT statements…

SELECT

FROM tablename

WHERE condition;

- A condition can many forms, eg

tablename.field = ‘Harry’

tablename.column < 100

SQL SYNTAX

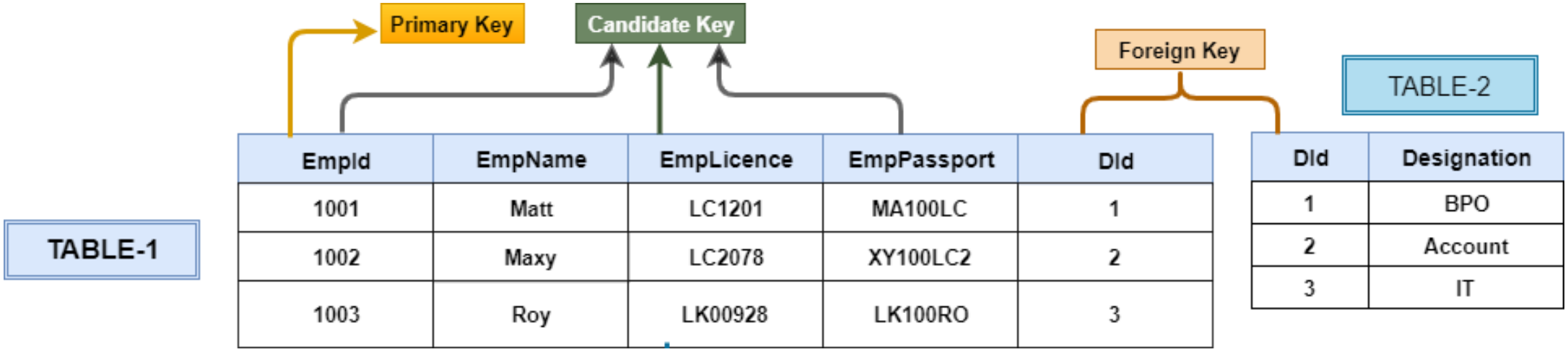
Databases contain one or more tables and each table has a name such as ‘Customers’ or ‘Manufacturers’. Most actions performed on a database are done using SQL statements such as

```
SELECT * FROM Customers;
```

Some of The Most Important SQL Commands

SELECT - extracts data from a database
UPDATE - updates data in a database
DELETE - deletes data from a database
INSERT INTO - inserts new data into a database
CREATE DATABASE - creates a new database
ALTER DATABASE - modifies a database
CREATE TABLE - creates a new table
ALTER TABLE - modifies a table
DROP TABLE - deletes a table
CREATE INDEX - creates an index (search key)
DROP INDEX - deletes an index

KEYS



EmpId	EmpName	EmpLicence	EmpPassport	DId
1001	Matt	LC1201	MA100LC	1
1002	Maxy	LC2078	XY100LC2	2
1003	Roy	LK00928	LK100RO	3

DId	Designation
1	BPO
2	Account
3	IT

Source: powerbidocs.com

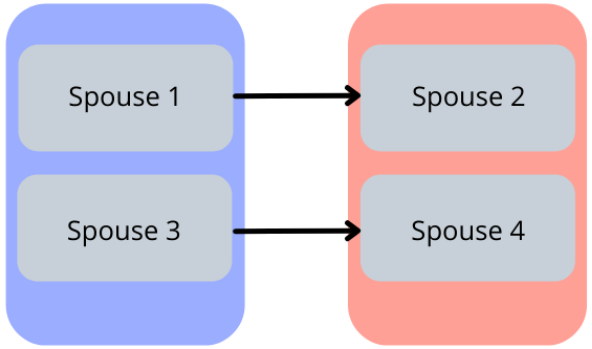
Foreign key

Job code	Job
6535	Optical Engineer
2466	Mechanical Engineer
2357	Manager

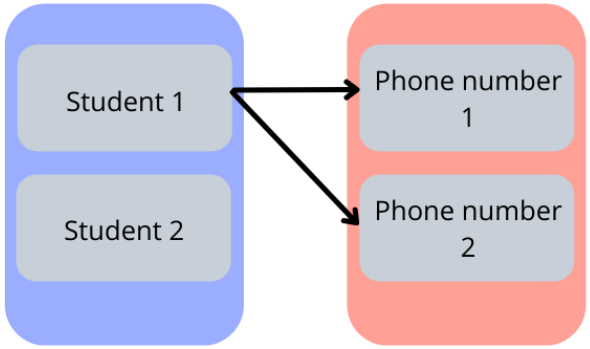
Employee ID	Name	Surname	email	telephone	Job code
34567-8	Dan	Madden	excessive1822@example.com	1-433-819-5293	6535
98767-9	Clora	Morton	jewellery1915@example.com	1-485-863-5763	7466
23456-3	Anisa	Cook	micro1958@example.com	1-489-801-5083	2357

RELATIONSHIPS

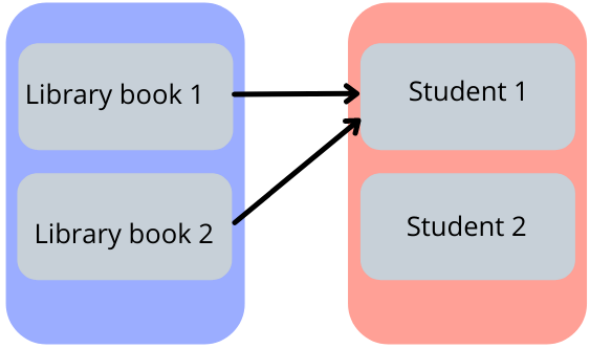
One to one



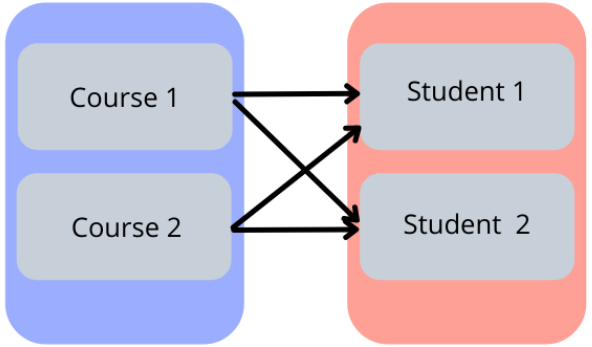
One to many



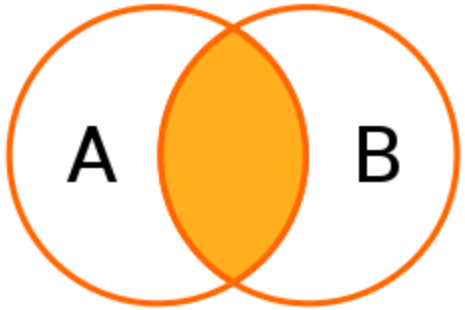
Many to one



Many to many



Inner Join – "What department are my employees assigned to, excluding unassigned employees and empty departments?"



Employee table

LastName	DepartmentID
Rafferty	31
Jones	33
Heisenberg	33
Robinson	34
Smith	34
Williams	NULL

Department table

DepartmentID	DepartmentName
31	Sales
33	Engineering
34	Clerical
35	Marketing

In an inner join, there will only be a row in the output if the `ON` condition is satisfied for both the left and the right tables.

```
1  SELECT *
2  FROM employee
3  INNER JOIN department
4  ON employee.DepartmentID = department.DepartmentID;
```

The above query produces the following output:

Employee.LastName	Employee.DepartmentID	Department.DepartmentName	Department.DepartmentID
Jones	33	Engineering	33
Rafferty	31	Sales	31
Robinson	34	Clerical	34
Smith	34	Clerical	34
Heisenberg	33	Engineering	33

LEFT JOIN

Everything on the left
+
anything on the right that matches

```
SELECT *
FROM TABLE_1
LEFT JOIN TABLE_2
ON TABLE_1.KEY = TABLE_2.KEY
```

ANTI LEFT JOIN

Everything on the left
that is NOT on the right

```
SELECT *
FROM TABLE_1
LEFT JOIN TABLE_2
ON TABLE_1.KEY = TABLE_2.KEY
WHERE TABLE_2.KEY IS NULL
```

RIGHT JOIN

Everything on the right
+
anything on the left that matches

```
SELECT *
FROM TABLE_1
RIGHT JOIN TABLE_2
ON TABLE_1.KEY = TABLE_2.KEY
```

ANTI RIGHT JOIN

Everything on the right
that is NOT on the left

```
SELECT *
FROM TABLE_1
RIGHT JOIN TABLE_2
ON TABLE_1.KEY = TABLE_2.KEY
WHERE TABLE_1.KEY IS NULL
```

OUTER JOIN

Everything on the right
+
Everything on the left

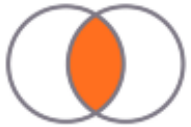
```
SELECT *
FROM TABLE_1
OUTER JOIN TABLE_2
ON TABLE_1.KEY = TABLE_2.KEY
```

ANTI OUTER JOIN

Everything on the left and right
that is unique to each side

```
SELECT *
FROM TABLE_1
OUTER JOIN TABLE_2
ON TABLE_1.KEY = TABLE_2.KEY
WHERE TABLE_1.KEY IS NULL
OR TABLE_2.KEY IS NULL
```

INNER JOIN



Only the things that match on the left AND the right

```
SELECT *
FROM TABLE_1
INNER JOIN TABLE_2
ON TABLE_1.KEY = TABLE_2.KEY
```

CROSS JOIN

All combination of rows from the right and the left (cartesean product)

```
SELECT *
FROM TABLE_1
CROSS JOIN TABLE_2
```


Source: towardsdatascience.com

TERMINOLOGY

- Schema: database's schema includes the information about the layout of tables and other information about the data base itself.
- Keys: Fields that contain unique identifiers. Foreign keys are used to relate tables.
- Relationships: one-to-one, one-to-many, many-to-many. Defines the relationship among tables.

REFERENCES

- W3schools.com. 2022. *SQL Tutorial*. [online] Available at: https://www.w3schools.com/sql/default.asp
- Linkedin.com. 2022. *Programming Foundations: Databases*. [online] Available at: <https://www.linkedin.com/learning-login/share?account=50251009&forceAccount=false&redirect=https%3A%2F%2Fwww.linkedin.com%2Flearning%2Fprogramming-foundations-databases-2%3Ftrk%3Dshare_ent_url%26shareId%3DV2qyFOcVQvyGtLSj3iv8jA%253D%253D>