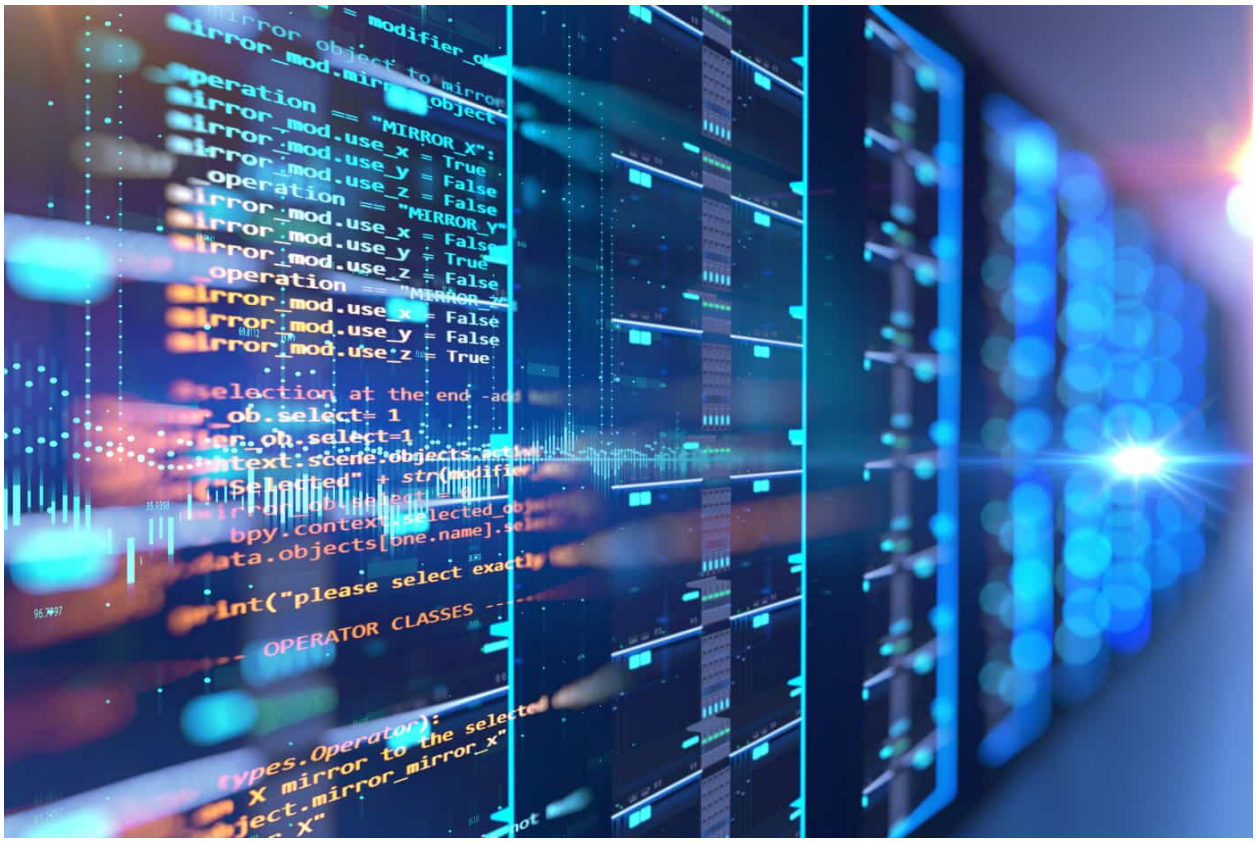
College Dublin
Computing • IT • Business

# Data Manipulation and Validation

*Integrated CA2, Databases, Aldana Louzan*

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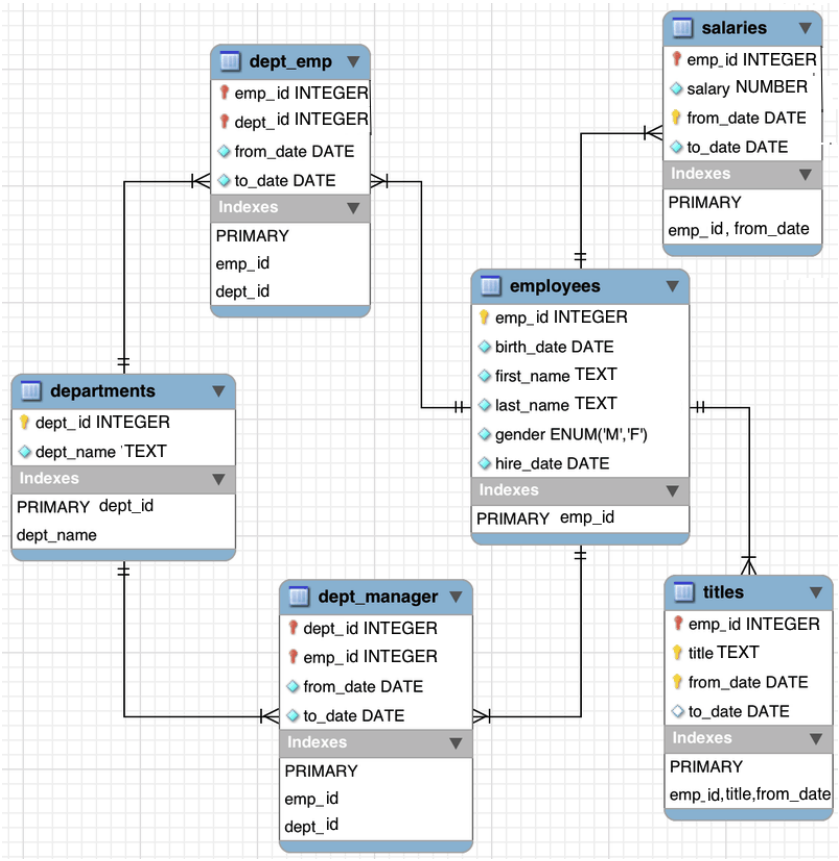
01.12.2022

Higher Diploma in Science in Computing

# INTRODUCTION

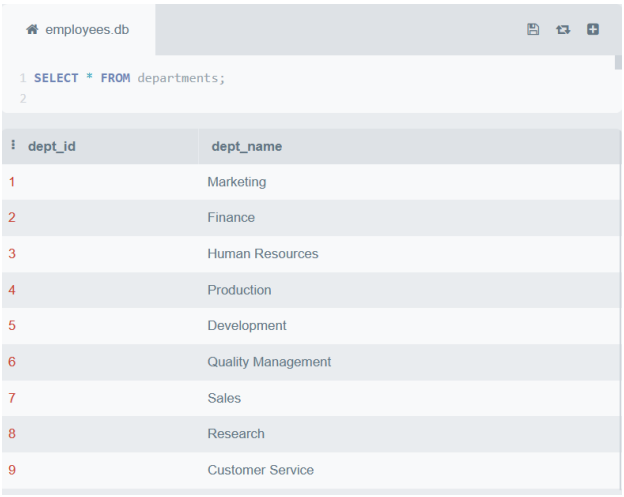
In this assignment, the employees sample database (created by Fusheng Wang and Carlo Zaniolo at Siemens Corporate Research), a large base of data spread over six separate tables and consisting of 4 million records in total that was created for system testing purposes. The following diagram provides an overview of the structure of the employees.db:



## 1.1 Databases CA Part 1

### 1.1.1 List all attributes present in the **departments** TABLE.

**CODE:** SELECT * FROM departments;



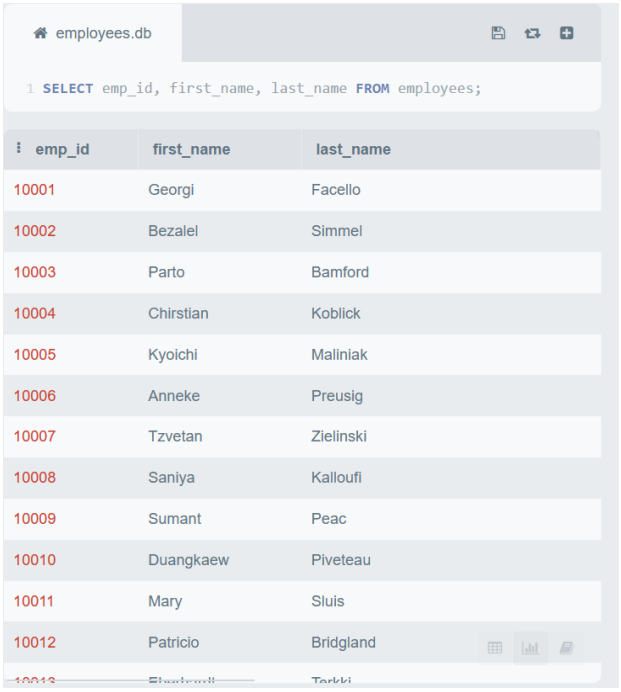
employees.db

```
1 SELECT * FROM departments;
2
```

| dept_id | dept_name |
|---|---|
| 1 | Marketing |
| 2 | Finance |
| 3 | Human Resources |
| 4 | Production |
| 5 | Development |
| 6 | Quality Management |
| 7 | Sales |
| 8 | Research |
| 9 | Customer Service |

### 1.1.2. List all **employee IDs** of all past/current employees, their **first** and **last names**.

**CODE:** SELECT emp_id, first_name, last_name FROM employees;



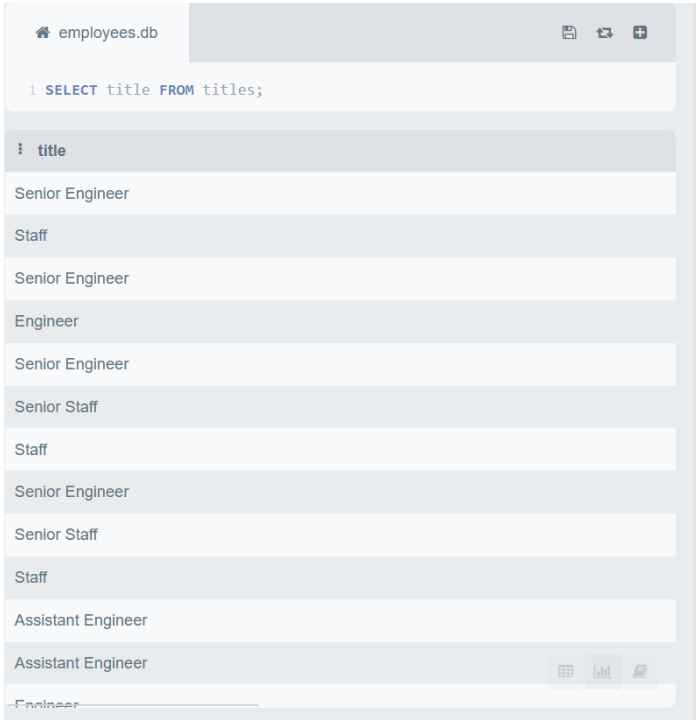
employees.db

```
1 SELECT emp_id, first_name, last_name FROM employees;
```

| emp_id | first_name | last_name |
|---|---|---|
| 10001 | Georgi | Facello |
| 10002 | Bezalel | Simmel |
| 10003 | Parto | Bamford |
| 10004 | Chirstian | Koblick |
| 10005 | Kyoichi | Maliniak |
| 10006 | Anneke | Preusig |
| 10007 | Tzvetan | Zielinski |
| 10008 | Saniya | Kalloufi |
| 10009 | Sumant | Peac |
| 10010 | Duangkaew | Piveteau |
| 10011 | Mary | Sluis |
| 10012 | Patricio | Bridgland |

### 1.1.3. List all department **titles** present in the database.

**CODE:** SELECT title FROM titles;

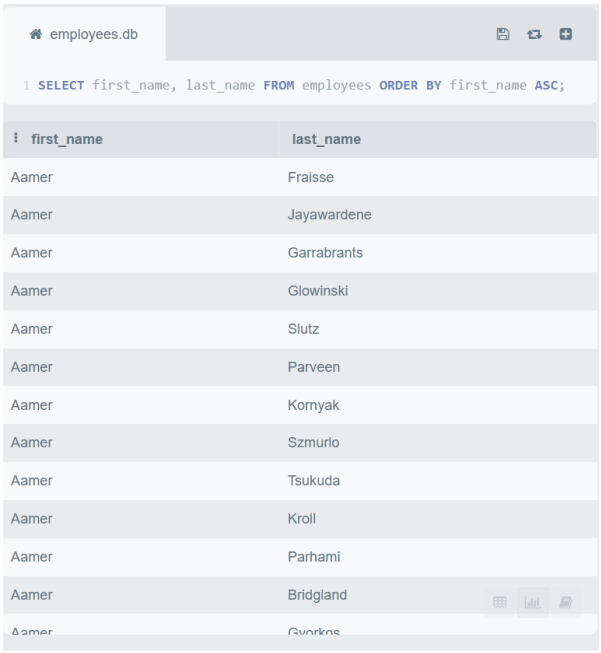



### 1.1.4. List all **unique job titles** found in the database, and **order them alphabetically**.

**CODE:** SELECT DISTINCT title FROM titles ORDER BY title ASC;

### 1.1.5. List all past/current **employees' names ordered alphabetically** in ascending order, i.e. first name and last name in alphabetical order.

**CODE:** SELECT first_name, last_name FROM employees ORDER BY first_name ASC;

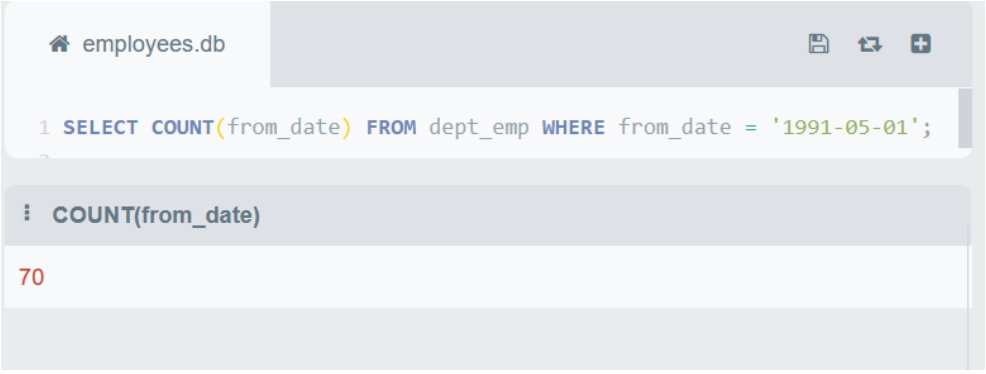



| first_name | last_name |
|---|---|
| Aamer | Fraisse |
| Aamer | Jayawardene |
| Aamer | Garrabrants |
| Aamer | Glowinski |
| Aamer | Slutz |
| Aamer | Parveen |
| Aamer | Kornyak |
| Aamer | Szmurlo |
| Aamer | Tsukuda |
| Aamer | Kroll |
| Aamer | Parhami |
| Aamer | Bridgland |
| Aamer | Gvorkos |

## 1.2 Database CA Part 2

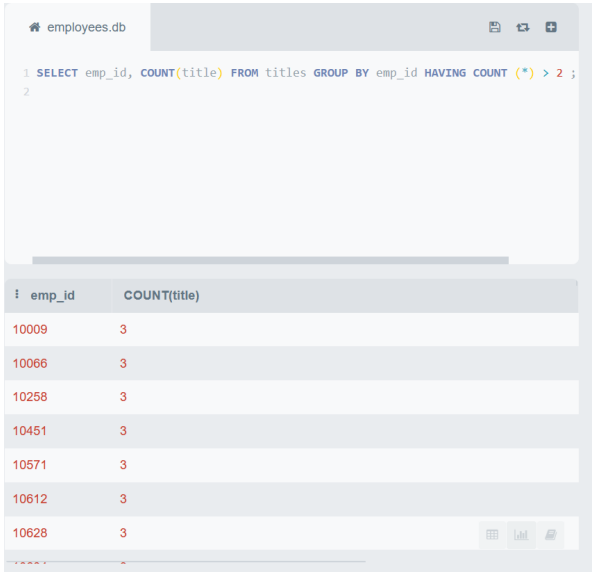
### 1.2.1 The number of all employees that started on **1991-05-01**.

**CODE:** SELECT COUNT(from_date) FROM dept_emp WHERE from_date = '1991-05-01';



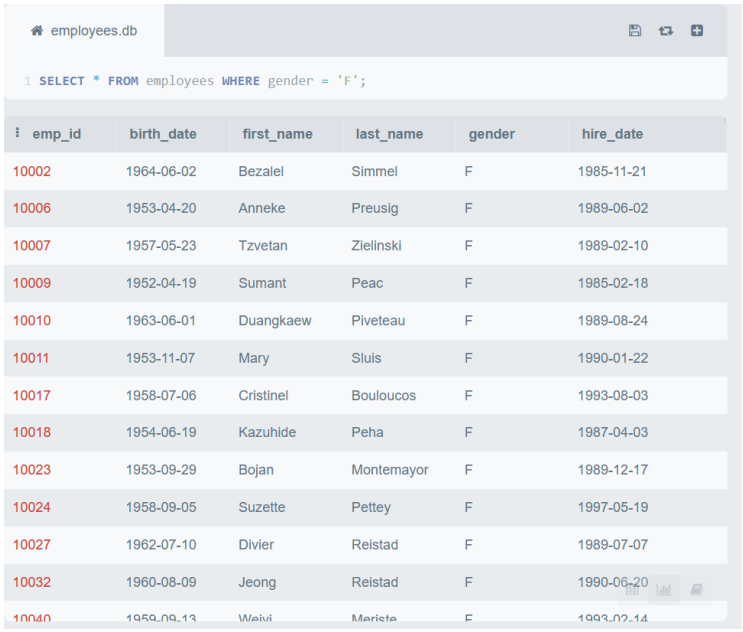
### 1.2.2 List all **emp_no** who have had strictly **more than 2 titles** and display **the total number of the titles** they have had.

**CODE:** SELECT emp_id, COUNT(title) FROM titles GROUP BY emp_id HAVING COUNT (*) > 2 ;



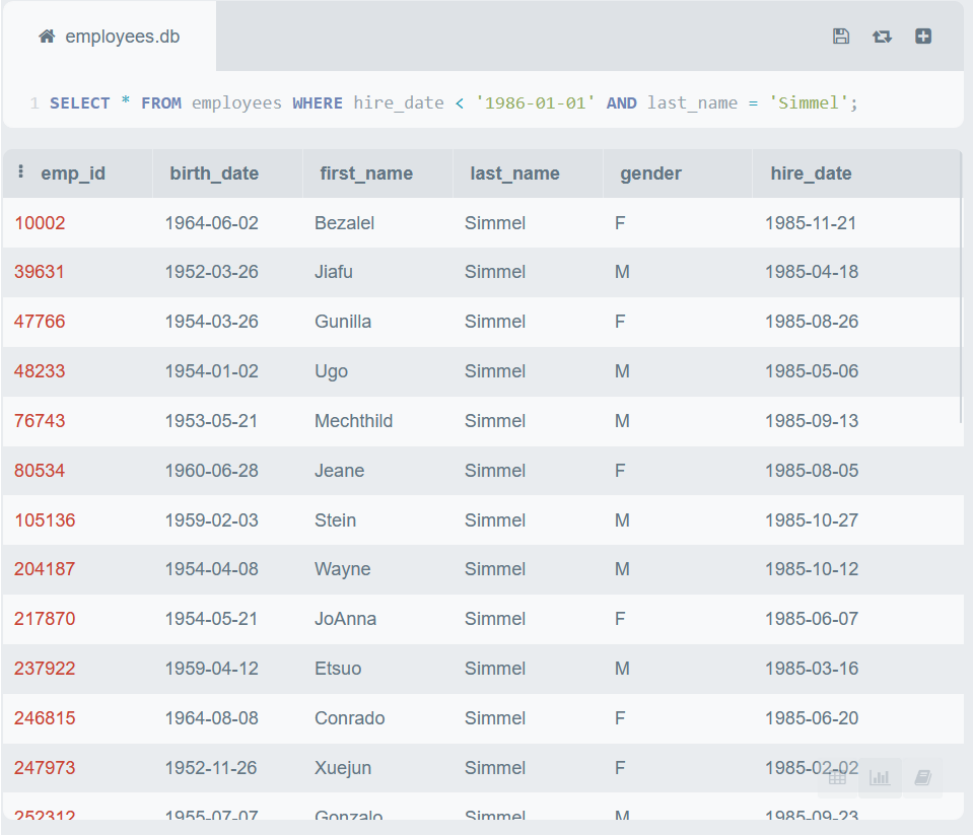

### 1.2.3 List **female employees** (past/current) together with all other relation attributes.

**CODE:** SELECT * FROM employees WHERE gender = 'F';



### 1.2.4 List past/current **employees** hired prior to **1986-01-01** with the surname **Simmel**.

**CODE:** SELECT * FROM employees WHERE hire_date < '1986-01-01' AND last_name = 'Simmel';

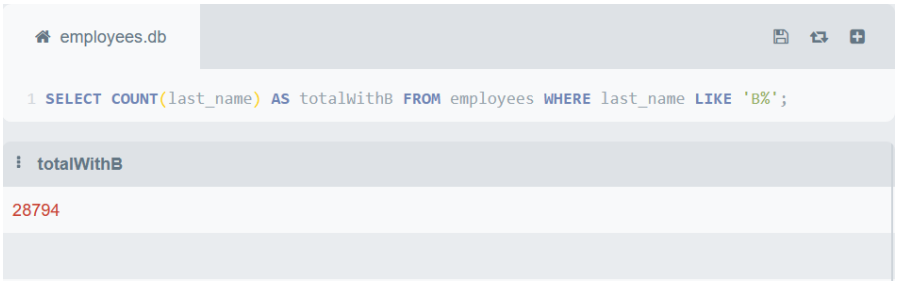



| emp_id | birth_date | first_name | last_name | gender | hire_date |
|---|---|---|---|---|---|
| 10002 | 1964-06-02 | Bezalel | Simmel | F | 1985-11-21 |
| 39631 | 1952-03-26 | Jiafu | Simmel | M | 1985-04-18 |
| 47766 | 1954-03-26 | Gunilla | Simmel | F | 1985-08-26 |
| 48233 | 1954-01-02 | Ugo | Simmel | M | 1985-05-06 |
| 76743 | 1953-05-21 | Mechthild | Simmel | M | 1985-09-13 |
| 80534 | 1960-06-28 | Jeane | Simmel | F | 1985-08-05 |
| 105136 | 1959-02-03 | Stein | Simmel | M | 1985-10-27 |
| 204187 | 1954-04-08 | Wayne | Simmel | M | 1985-10-12 |
| 217870 | 1954-05-21 | JoAnna | Simmel | F | 1985-06-07 |
| 237922 | 1959-04-12 | Etsuo | Simmel | M | 1985-03-16 |
| 246815 | 1964-08-08 | Conrado | Simmel | F | 1985-06-20 |
| 247973 | 1952-11-26 | Xuejun | Simmel | F | 1985-02-02 |
| 252312 | 1955-07-07 | Gonzalo | Simmel | M | 1985-09-23 |

### 1.2.5 How many past/current **employees' last names** begin with the capital letter B?

Use a column alias **total with B** to output your results.

**CODE:** SELECT COUNT(last_name) AS totalWithB FROM employees WHERE last_name LIKE 'B%';




| totalWithB |
|---|
| 28794 |

### 1.2.6 Create a new table called **emp_training** with 3 columns:

• **trainer_no:** this should be the primary key and is of type integer and is an auto-increment.

• **first_name:** this data type is **varchar(30)** and should not be NULL

• **last_name:** this data type is **varchar(30)** and should not be NULL

• **t_module:** this data type is **varchar(20)**

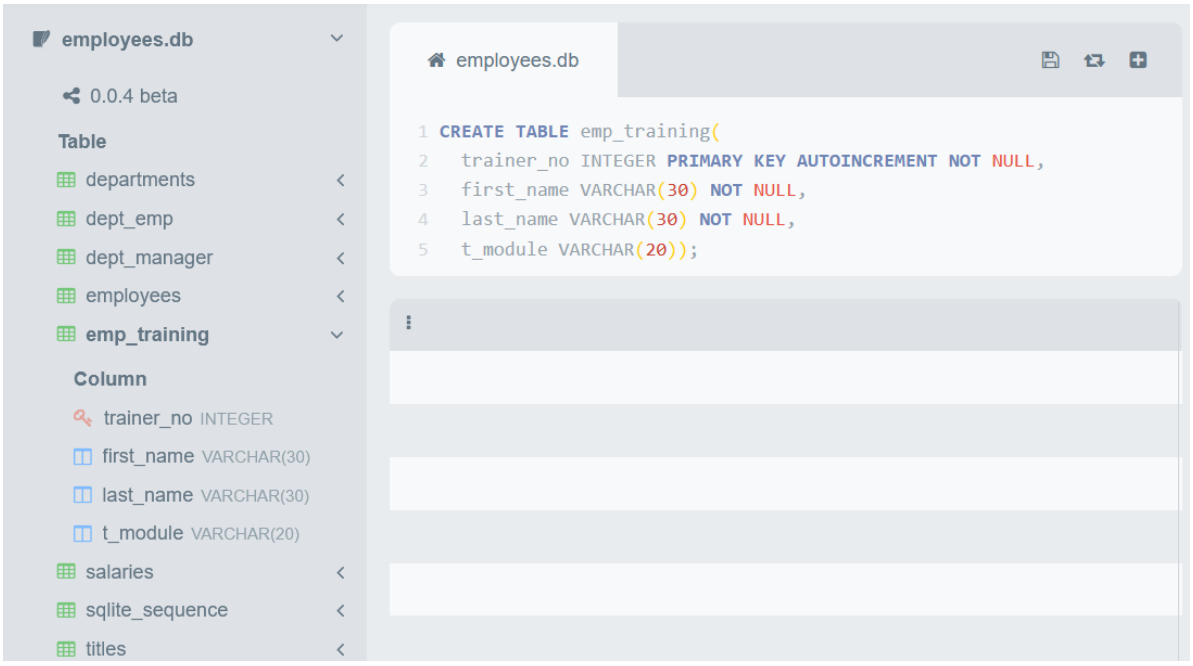
**CODE:** CREATE TABLE emp_training (

trainer_no INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,

first_name VARCHAR(30) NOT NULL,

last_name VARCHAR(30) NOT NULL,

t_module VARCHAR(20) );



### 1.2.7 Insert 2 new rows into the **emp_training** table:

**Row 1:** fname: **Joe**

lname: **Bloggs**

module: **Google Docs**

**Row 2:** fname: **Fred**

lname: **Bloggs**

module: **Google Sheets**

**CODE:**

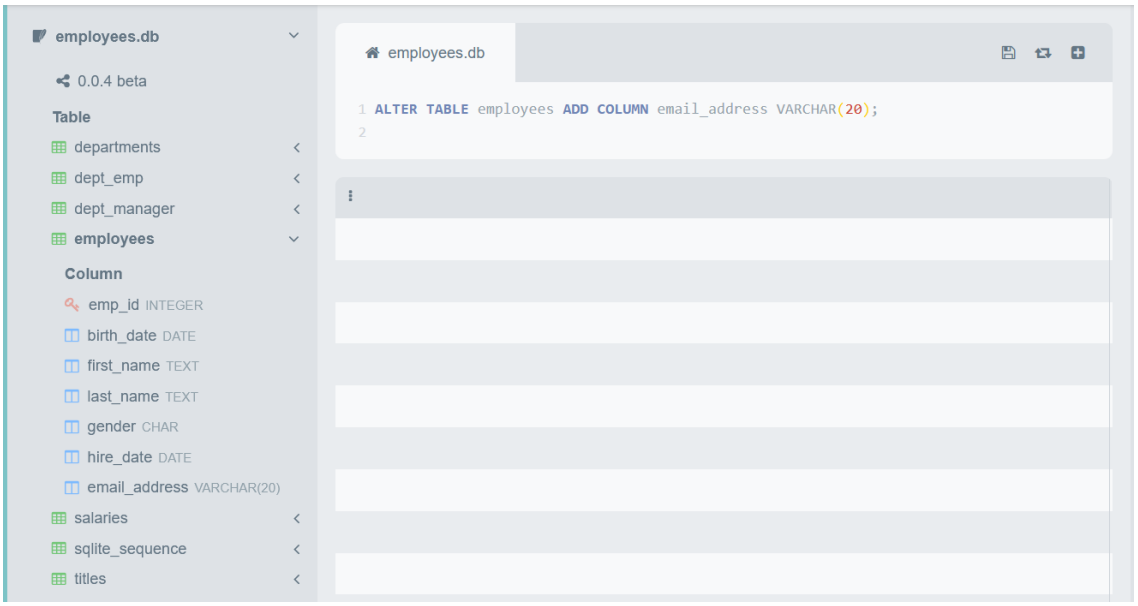
```
INSERT INTO emp_training (first_name, last_name, t_module) VALUES ('Joe', 'Bloggs', 'Google Docs');

INSERT INTO emp_training (first_name, last_name, t_module) VALUES ('Fred', 'Bloggs', 'Google Sheets');
```


### 1.2.8 The organisation no longer wishes to record the employees training within the database. Therefore, delete the newly created **emp_training** table.

**CODE:** DROP TABLE IF EXISTS emp_training;

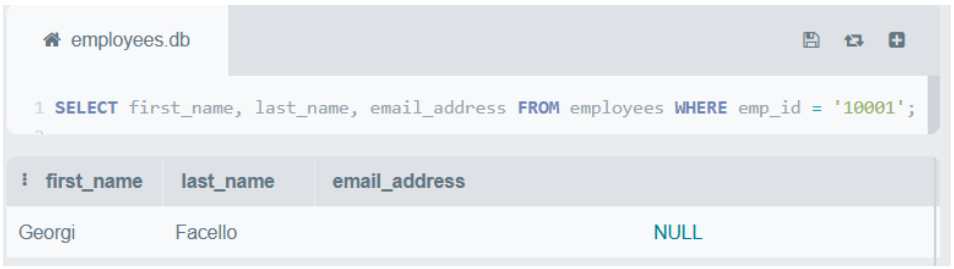
1.2.9 Alter the **employees** table to include an **email_address** field of type **varchar(20)**.

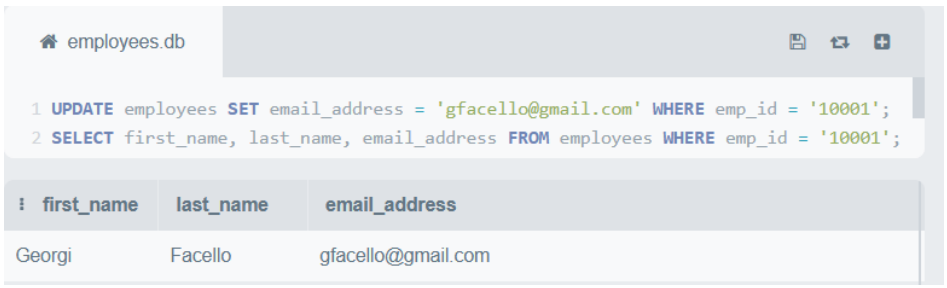
**CODE:** ALTER TABLE employees ADD COLUMN email_address VARCHAR(20);




1.2.10 Update the email address of **Georgi Facello** to **gfacello@gmail.com**, where **emp_no** equals to **10001**.

**CODE:** UPDATE employees SET email_address = 'gfacello@gmail.com' WHERE emp_id = '10001';



## 1.3 Database CA Part 3

### 1.3.1 List the number of male managers and female managers who work for each department. Make sure to display the gender, the number of employees (renamed as num_empGender) and dept_no, ordered by department number in an ascendant order.

**CODE:**

```
SELECT dept_id,
    sum( gender = 'F' ) AS num_empFemale,
    sum( gender = 'M' ) AS num_empMale
FROM dept_manager dm INNER JOIN employees e ON dm.emp_id = e.emp_id
GROUP BY dept_id ORDER BY dept_id ASC;
```

employees.db

```
1 SELECT dept_id,
2     sum( gender = 'F' ) AS num_empFemale,
3     sum( gender = 'M' ) AS num_empMale
4 FROM dept_manager dm INNER JOIN employees e ON dm.emp_id = e.emp_id
5 GROUP BY dept_id ORDER BY dept_id ASC;
```

| dept_id | num_empFemale | num_empMale |
|---|---|---|
| 1 | 0 | 2 |
| 2 | 1 | 1 |
| 3 | 2 | 0 |
| 4 | 2 | 2 |
| 5 | 1 | 1 |
| 6 | 3 | 1 |
| 7 | 0 | 2 |
| 8 | 1 | 1 |
| 9 | 3 | 1 |

1.3.2 List the average salary of male and female employees whose title is "Technique Leader". In your result table should appear, gender, average salary named as avg_salary and title.

**CODE:**

SELECT gender, AVG(salary) AS avg_salary, title FROM titles tile INNER JOIN employees e, salaries sal ON tile.emp_id = e.emp_id

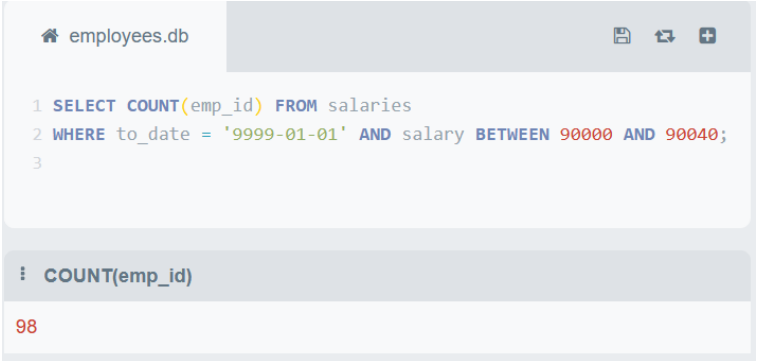
AND tile.emp_id = sal.emp_id AND e.emp_id = sal.emp_id

WHERE title = 'Technique Leader' GROUP BY gender;


1.3.3 The number of employees that have a current salary (i.e., **to_date** equals to **9999-01-01**) between **90000** and **90040**.

**CODE:** SELECT COUNT(emp_id) FROM salaries

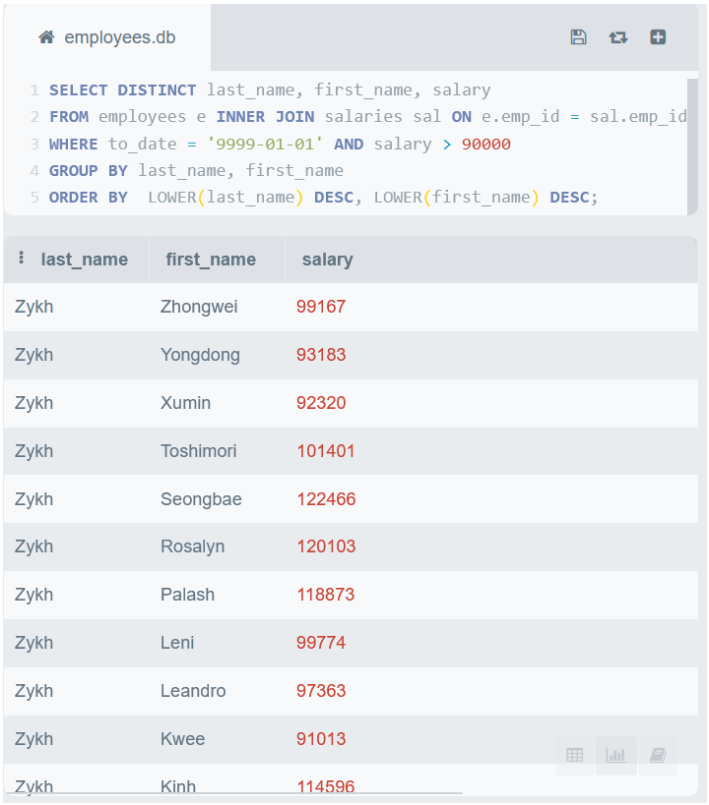
WHERE to_date = '9999-01-01' AND salary BETWEEN 90000 AND 90040;



1.3.4 List all unique employees' last and first names (using **GROUP BY** method) that have a current salary (i.e., **to_date** equals to **9999-01-01**) greater than **90000**, outputting both names in descending order (sort by the last name first and then the first name) and also displaying their current salaries (using the **INNER JOIN** method).

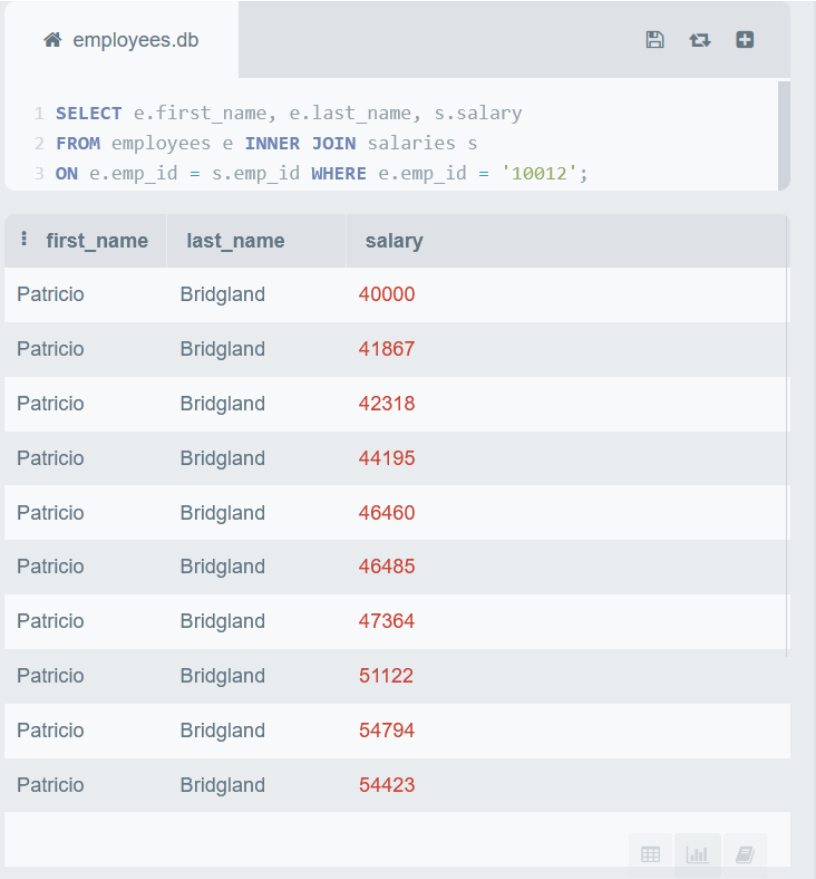
**CODE:**

```
SELECT DISTINCT last_name, first_name, salary

FROM employees e INNER JOIN salaries sal ON e.emp_id = sal.emp_id

WHERE to_date = '9999-01-01' AND salary > 90000

GROUP BY last_name, first_name

ORDER BY  LOWER(last_name) DESC, LOWER(first_name) DESC;

/* Lower should be used since there are people with the surname called " dAstous" which basically starts with a lowercase letter*/
```



### 1.3.5 First name, last name, all salary dates and related amounts for the employee with employee number **10012**.

**CODE:** SELECT e.first_name, e.last_name, s.salary FROM employees e INNER JOIN salaries s ON e.emp_id = s.emp_id WHERE e.emp_id = '10012';




| first_name | last_name | salary |
|---|---|---|
| Patricio | Bridgland | 40000 |
| Patricio | Bridgland | 41867 |
| Patricio | Bridgland | 42318 |
| Patricio | Bridgland | 44195 |
| Patricio | Bridgland | 46460 |
| Patricio | Bridgland | 46485 |
| Patricio | Bridgland | 47364 |
| Patricio | Bridgland | 51122 |
| Patricio | Bridgland | 54794 |
| Patricio | Bridgland | 54423 |

### 1.3.6 In relation to the table named salaries in **Figure 1** above. Answer in text:

a) What is the **degree** of this table?

- The table named salaries has four degrees, which are emp_id, salary, from_date and to_date, at total.

b) What column(s), if any, make(s) up the **primary key**?

-emp_id and from_date are the primary keys in this table.

c) What column(s), if any, make(s) up the **foreign key**?

-emp_id is the only foreign key in this table.

1.3.7 In the given schema, the tables dept_emp, dept_manager, salaries, titles have composite keys.

Explain for each relation why this is the case? Support your answer with appropriate references.

-TABLE **dept_emp**: This table has a composite key, consists of **emp_id** FOREIGN KEY and **dept_id** FOREIGN KEY . This composite key uses the combination of the PRIMARY KEY of the **employees** TABLE and **departments** TABLE, thus one can identify an employee, retrieve the data of the department an employee works in, and the date an employee starts and ends working in that department.

-TABLE **dept_manager**: This table has a composite key, consists of **emp_id** FOREIGN KEY (also a PRIMARY KEY in this table) and **dept_id** FOREIGN KEY . This composite key uses the combination of the PRIMARY KEY of the **employees** TABLE and **departments** TABLE, and therefore one can identify an employee, who is a manager, retrieve the data of the department a manager manages, and the managing period of a department.

-TABLE **salaries**: This table has a composite key, consists of **emp_id** FOREIGN KEY and **from_date** PRIMARY KEY. This is a composite key, but also a compound key since it consists of one primary and one foreign key. This composite key uses the combination of the PRIMARY KEY of the **employees** TABLE and its own PRIMARY KEY so that one can identify an employee, retrieve the data of the salary an employee gets, and the period an employee gets a salary. However

-TABLE **titles**: This table has a composite key, which is also a compound key, which consists of **emp_id** FOREIGN KEY (also a PRIMARY KEY in this table), **title** PRIMARY KEY and **from_date** PRIMARY KEY. This composite key uses the combination of the PRIMARY KEY of the **employees** TABLE and its own PRIMARY KEYs so that one can identify an employee, retrieve the data of a title of an employee, and the period an employee holds the title.

## SQL QUERIES SUMMARY:

1.1.1 SELECT * FROM departments;

1.1.2 SELECT emp_id, first_name, last_name FROM employees;

1.1.3 SELECT title FROM titles;

1.1.4 SELECT DISTINCT title FROM titles ORDER BY title ASC;

1.1.5 SELECT first_name, last_name FROM employees ORDER BY first_name ASC;

1.2.1 SELECT COUNT(from_date) FROM dept_emp WHERE from_date = '1991-05-01';

1.2.2 SELECT emp_id, COUNT(title) FROM titles GROUP BY emp_id HAVING COUNT (*) > 2 ;

1.2.3 SELECT * FROM employees WHERE gender = 'F';

1.2.4 SELECT * FROM employees WHERE hire_date < '1986-01-01' AND last_name = 'Simmel';

1.2.5 SELECT COUNT(last_name) AS totalWithB FROM employees WHERE last_name LIKE 'B%';

1.2.6 CREATE TABLE emp_training(trainer_no INTEGER

PRIMARY KEY AUTOINCREMENT NOT NULL, first_name

VARCHAR(30) NOT NULL, last_name VARCHAR(30) NOT

NULL, t_module VARCHAR(20));

1.2.7 INSERT INTO emp_training (first_name, last_name, t_module) VALUES ('Joe', 'Bloggs', 'Google Docs');

INSERT INTO emp_training (first_name, last_name, t_module) VALUES ('Fred', 'Bloggs', 'Google Sheets');

1.2.8 DROP TABLE IF EXISTS emp_training;

1.2.9 ALTER TABLE employees ADD COLUMN email_address VARCHAR(20);

1.2.10 UPDATE employees SET email_address = 'gfacello@gmail.com' WHERE emp_id = '10001';

1.3.1 SELECT dept_id, sum( gender = 'F' ) AS num_empFemale, sum( gender = 'M' ) AS num_empMale FROM dept_manager dm INNER JOIN employees e ON dm.emp_id = e.emp_id GROUP BY dept_id ORDER BY dept_id ASC;

1.3.2 SELECT gender, AVG(salary) AS avg_salary, title FROM titles tile INNER JOIN employees e, salaries sal ON tile.emp_id = e.emp_id AND tile.emp_id = sal.emp_id AND e.emp_id = sal.emp_id WHERE title = 'Technique Leader' GROUP BY gender;

1.3.3 SELECT COUNT(emp_id) FROM salaries WHERE to_date = '9999-01-01' AND salary BETWEEN 90000 AND 90040;

1.3.4 SELECT DISTINCT last_name, first_name, salary FROM employees e INNER JOIN salaries sal ON e.emp_id = sal.emp_id WHERE to_date = '9999-01-01' AND salary > 90000 GROUP BY last_name, first_name ORDER BY LOWER(last_name) DESC, LOWER(first_name) DESC;

1.3.5 SELECT e.first_name, e.last_name, s.salary FROM employees e INNER JOIN salaries s ON e.emp_id = s.emp_id WHERE e.emp_id = '10012';

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