

CPSC 304 Project Cover Page

Milestone #: 4

Date: Apr. 5

Group Number: 57

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By typing our names and student numbers in the above table, we certify that the work in the attached assignment was performed solely by those whose names and student IDs are included above. (In the case of Project Milestone 0, the main purpose of this page is for you to let us know your e-mail address, and then let us assign you to a TA for your project supervisor.)

In addition, we indicate that we are fully aware of the rules and consequences of plagiarism, as set forth by the Department of Computer Science and the University of British Columbia

Project Summary:

Our project involves developing a job application portal that serves two key user groups: employers (companies) and applicants (users). The domain of our application is recruiting for employers and job searching for general users. Users are able to create a profile, search and apply to job postings, and filter jobs based on location, salary, and posted date. Users can also view the number of applicants who have applied to a specific job, as well as search for companies based on their ratings and job posting date. The application also recommends companies with higher average ratings and salaries than others and provides a list of these "top rated companies" in a banner. Companies can post job openings, update or delete company information, and track the users who have applied to all of their jobs.

For the database, we will use Oracle, with the programming language Java. Furthermore, our frontend will be built using ReactJS as the framework, with the programming languages of JavaScript and HTML/CSS.

Final Schema vs Schema in Milestone 2:

In general, all tables/attributes have been renamed from PascalCase/camelCase to snake_case. Also, all ON UPDATE CASCADE are removed because it is not supported in Oracle.

Other changes include:

- User table renamed to USER_ACCOUNT because User is a reserved word in Oracle
- recommends attribute in SCORE table has datatype changed from BOOLEAN to INTEGER because BOOLEAN is not a supported datatype in Oracle
- score attribute in RATES table renamed to value to not clash with SCORE table
- comment attribute in RATES table renamed to r_comment because comment is a reserved word in Oracle
- Added position attribute to POSTED_JOB table to specify the job position this job posting is for
- session attribute in TRANSCRIPT_CONTAINS table renamed to year_session because session is a reserved word in Oracle




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Schema:

Note: PK = Primary Key, FK = Foreign Key, CK = Candidate Key.

- USER_ACCOUNT(email (PK): VARCHAR, address: VARCHAR, phone_number (CK - UNIQUE): VARCHAR)

	 EMAIL	 ADDRESS	 PHONE_NUMBER
1	janedoe@gmail.com	address1	1234560001
2	johnsmith@gmail.com	address2	1234560002
3	bobjohnson@gmail.com	address3	1234560003
4	tombrown@gmail.com	address4	1234560004
5	alexlee@gmail.com	address5	1234560005

- COMPANY(company_id (PK): INTEGER, name: VARCHAR)

	 COMPANY_ID	 NAME
1	1	Acme Corporation
2	2	Widget Industries
3	3	Global Enterprises
4	4	Premier Partners
5	5	Future Technologies

- SCORE(value (PK): INTEGER, recommends (NOT NULL): INTEGER)

	VALUE ↕	RECOMMENDS ↕
1	1	0
2	2	0
3	3	0
4	4	0
5	5	0
6	6	1
7	7	1
8	8	1
9	9	1
10	10	1

- RATES(email (PK, FK - ON DELETE CASCADE): VARCHAR, company_id (PK, FK - ON DELETE CASCADE): INTEGER, value (FK - ON DELETE CASCADE, NOT NULL): INTEGER, r_comment: VARCHAR)

	EMAIL ↕	COMPANY_ID ↕	VALUE ↕	R_COMMENT ↕
1	janedoe@gmail.com	1	1	This company is terrible
2	janedoe@gmail.com	2	10	Fantastic company with great culture!
3	bobjohnson@gmail.com	4	7	I enjoyed working here
4	tombrown@gmail.com	4	8	Good company
5	tombrown@gmail.com	5	7	<null>

- INDUSTRY(name (PK): VARCHAR)

	NAME ↕
1	Construction
2	Finance
3	Food Service
4	Manufacturing
5	Technology

- OPERATES_IN(industry_name (PK, FK - ON DELETE CASCADE): VARCHAR, company_id (PK, FK - ON DELETE CASCADE): INTEGER)

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	INDUSTRY_NAME	COMPANY_ID
1	Finance	3
2	Finance	4
3	Manufacturing	2
4	Technology	3
5	Technology	5

- WORKED_AT(email (PK, FK - ON DELETE CASCADE): VARCHAR, company_id (PK, FK - ON DELETE CASCADE): INTEGER, position: VARCHAR, start_date (NOT NULL): DATE, end_date (NOT NULL): DATE)

	EMAIL	COMPANY_ID	POSITION	START_DATE	END_DATE
1	janedoe@gmail.com	1	Accountant	2010-08-03	2012-01-01
2	janedoe@gmail.com	2	Accountant	2012-02-15	2018-06-10
3	bobjohnson@gmail.com	4	Software Engineer	2013-10-23	2017-03-07
4	tombrown@gmail.com	4	Janitor	2012-05-25	2016-09-01
5	tombrown@gmail.com	5	Janitor	2017-01-02	2019-08-08

- RECRUITER(email (PK): VARCHAR, name (NOT NULL): VARCHAR)

	EMAIL	NAME
1	jasonmiller@gmail.com	Jason Miller
2	lisawilson@gmail.com	Lisa Wilson
3	kevinjones@gmail.com	Kevin Jones
4	mikedavis@gmail.com	Mike Davis
5	andrewwilliams@gmail.com	Andrew Williams

- POSTED_JOB(job_id (PK): INTEGER, company_id (FK, NOT NULL, ON DELETE CASCADE): INTEGER, posted_date (NOT NULL): DATE, position (NOT NULL): VARCHAR, location (NOT NULL): VARCHAR, description (NOT NULL): VARCHAR, salary: INTEGER, recruiter_email (FK - ON DELETE SET NULL): VARCHAR)

	JOB_ID	COMPANY_ID	POSTED_DATE	POSITION	LOCATION	DESCRIPTION	SALARY	RECRUITER_EMAIL
1	1	2	2019-01-01	Accountant	Vancouver	We are seeking a highly motivated and exper...	130000	jasonmiller@gmail.com
2	2	3	2019-01-02	Investment Banker	Burnaby	The investment banker will be responsible f...	200000	lisawilson@gmail.com
3	3	3	2019-01-03	Software Engineer	Burnaby	The ideal candidate will have strong progra...	93000	lisawilson@gmail.com
4	4	4	2019-01-04	Software Engineer	Richmond	The software engineer will be responsible f...	65000	mikedavis@gmail.com
5	5	5	2019-01-05	Software Engineer	Vancouver	We are looking for a talented and passionat...	150000	andrewwilliams@gmail.com

- CATEGORY(name (PK): VARCHAR)

	NAME
1	Contract
2	Freelance
3	Full time
4	Internship
5	Part time

- JOB_BELONGS_IN(category_name (PK, FK - ON DELETE CASCADE): VARCHAR, job_id (PK, FK - ON DELETE CASCADE): INTEGER)

	JOB_ID	CATEGORY_NAME
1	1	Full time
2	2	Full time
3	3	Full time
4	4	Full time
5	5	Full time

- SKILL(name (PK): VARCHAR)

	NAME
1	Java
2	JavaScript
3	Microsoft Office
4	Python
5	SQL

- JOB_REQUIRES(skill_name (PK, FK - ON DELETE CASCADE): VARCHAR, job_id (PK, FK - ON DELETE CASCADE): INTEGER, proficiency: INTEGER)

	JOB_ID	SKILL_NAME	PROFICIENCY
1	1	Microsoft Office	8
2	3	Java	9
3	3	SQL	5
4	4	JavaScript	10
5	5	Python	8

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- USER_APPLIES_TO(email (PK, FK - ON DELETE CASCADE): VARCHAR, job_id (PK, FK - ON DELETE CASCADE): INTEGER, applied_date: DATE)

	EMAIL	JOB_ID	APPLIED_DATE
1	janedoe@gmail.com	1	2019-01-03
2	tombrown@gmail.com	2	2019-01-03
3	bobjohnson@gmail.com	3	2019-01-07
4	bobjohnson@gmail.com	4	2019-01-07
5	bobjohnson@gmail.com	5	2019-01-07
6	janedoe@gmail.com	5	2019-01-08

- RESUME(email (PK, FK - ON DELETE CASCADE): VARCHAR, document_id (PartialK): INTEGER, url (CK - UNIQUE): VARCHAR)

	EMAIL	DOCUMENT_ID	URL
1	janedoe@gmail.com	1	https://www.example.com/1
2	johnsmith@gmail.com	2	https://www.example.com/2
3	bobjohnson@gmail.com	3	https://www.example.com/3
4	tombrown@gmail.com	4	https://www.example.com/4
5	alexlee@gmail.com	5	https://www.example.com/5

- SCHOOL(name (PK): VARCHAR, address: VARCHAR)

	NAME	ADDRESS
1	UBC	Vancouver
2	SFU	Burnaby
3	UofT	Toronto
4	UCalgary	Calgary
5	UWaterloo	Waterloo

- TRANSCRIPT(email (PK, FK - ON DELETE CASCADE): VARCHAR, document_id (PartialK): INTEGER, school_name (FK - ON DELETE CASCADE, NOT NULL): VARCHAR)

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	EMAIL	DOCUMENT_ID	SCHOOL_NAME
1	janedoe@gmail.com	6	UWaterloo
2	johnsmith@gmail.com	7	UBC
3	bobjohnson@gmail.com	8	UBC
4	tombrown@gmail.com	9	UofT
5	alexlee@gmail.com	10	SFU

- COURSE(course_id (PK): INTEGER, course_name (CK - UNIQUE): VARCHAR, department: VARCHAR)

	COURSE_ID	COURSE_NAME	DEPARTMENT
1	1	CPSC304	Computer Science
2	2	COMM101	Commerce
3	3	CPSC310	Computer Science
4	4	ECON101	Economics
5	5	ENGL112	English

- GRADE(percentage (PK): INTEGER, letter_grade (NOT NULL): VARCHAR)

	PERCENTAGE	LETTER_GRADE
1	95	A+
2	80	A-
3	73	B
4	65	C+
5	52	D

- TRANSCRIPT_CONTAINS(course_id (FK, PK - ON DELETE CASCADE): INTEGER, documentId (FK, PK - ON DELETE CASCADE): email (FK, PK - ON DELETE CASCADE): VARCHAR, percentage (FK - ON DELETE CASCADE, NOT NULL): INTEGER, year_session: VARCHAR)

	EMAIL	DOCUMENT_ID	COURSE_ID	PERCENTAGE	YEAR_SESSION
1	bobjohnson@gmail.com	8	1	95	2015W
2	bobjohnson@gmail.com	8	2	80	2014W
3	bobjohnson@gmail.com	8	3	95	2015W
4	bobjohnson@gmail.com	8	4	73	2013W
5	bobjohnson@gmail.com	8	5	80	2013W

A list of all SQL queries used and where it can be found in the code (i.e., file name and line number(s)). For SQL query requirements, check the rubric listed on Canvas for Milestone 4

1. INSERT Operation

```
INSERT INTO POSTED_JOB VALUES (?, ?, ?, ?, ?, ?, ?, ?, ?)
```

PostedJobDao.java, Line 30

2. DELETE Operation

```
DELETE FROM COMPANY WHERE COMPANY_ID = ?
```

CompanyDao.java, Line 44

3. UPDATE Operation

```
StringBuilder sql = new StringBuilder("UPDATE POSTED_JOB SET ");
for (UpdatePostedJob.toUpdateFields field : updatePostedJob.toUpdate()) {
    if (field.attribute().equals("job_id")) {
        throw new IllegalArgumentException("Cannot update job_id");
    }
    sql.append(field.attribute()).append(" = ?, ");
}
sql.delete(sql.length() - 2, sql.length());
sql.append(" WHERE job_id = ?");
```

PostedJobDao.java, Line 123-131

4. Selection

```
String query = "SELECT * FROM POSTED_JOB WHERE " + attribute;
if (attribute.equals("salary") || attribute.equals("posted_date")) {
    query = query + " >= ?";
} else {
    query = query + " = ?";
}
```

PostedJobDao.java, Line 72-77

5. Projection

```
String query = "SELECT " + String.join( delimiter: ", ", columns.stream().map(String::toUpperCase).toList()) +  
              " FROM " + tableName.toUpperCase();
```

MigrationHandler.java, Line 73-74

6. Join

```
"SELECT DISTINCT C.COMPANY_ID, NAME, AVG_VALUE FROM " +  
"(SELECT COMPANY_ID, AVG(VALUE) AS AVG_VALUE " +  
"FROM Rates " +  
"GROUP BY COMPANY_ID) T " +  
"RIGHT OUTER JOIN COMPANY C ON T.COMPANY_ID = C.COMPANY_ID " +  
"INNER JOIN (SELECT COMPANY_ID FROM POSTED_JOB WHERE POSTED_DATE >= ?) P " +  
"ON C.COMPANY_ID = P.COMPANY_ID ";
```

CompanyDao.java, Line 86-92

7. Aggregation with GROUP BY

```
"SELECT P.JOB_ID AS JOB_ID, COMPANY_ID, POSTED_DATE, " +  
"POSITION, LOCATION, DESCRIPTION, SALARY, RECRUITER_EMAIL, NUM_APPLICANTS FROM " +  
"(SELECT JOB_ID, COUNT(email) AS NUM_APPLICANTS " +  
"FROM USER_APPLIES_TO " +  
"GROUP BY JOB_ID) T RIGHT OUTER JOIN POSTED_JOB P ON T.JOB_ID = P.JOB_ID " +  
"WHERE P.JOB_ID = ?";
```

PostedJobDao.java Line 95-100

8. Aggregation with HAVING

```
"SELECT C.COMPANY_ID, NAME, AVG_VALUE FROM " +  
"(SELECT COMPANY_ID, AVG(VALUE) AS AVG_VALUE " +  
"FROM Rates " +  
"GROUP BY COMPANY_ID " +  
"HAVING AVG(VALUE) >= ?) T INNER JOIN COMPANY C ON T.COMPANY_ID = C.COMPANY_ID";
```

CompanyDao.java Line 106-110

9. Nested Aggregation with GROUP BY

```
"SELECT COMPANY_ID, NAME, AVG_VALUE, AVG_SALARY FROM " +  
"(SELECT R.COMPANY_ID AS COMPANY_ID, AVG(R.VALUE) AS AVG_VALUE, AVG(P.SALARY) AS AVG_SALARY " +  
"FROM RATES R, POSTED_JOB P " +  
"WHERE R.COMPANY_ID = P.COMPANY_ID " +  
"GROUP BY R.COMPANY_ID " +  
"HAVING AVG(R.VALUE) > (SELECT AVG(R2.VALUE) FROM RATES R2) " +  
"AND AVG(R.VALUE) > ? " +  
"AND AVG(P.SALARY) > (SELECT AVG(P2.SALARY) FROM POSTED_JOB P2)) NATURAL JOIN COMPANY";
```

CompanyDao.java, Line 124-131

10. Division

```
"SELECT * FROM USER_ACCOUNT U " +  
"WHERE NOT EXISTS " +  
"((SELECT JOB_ID FROM POSTED_JOB WHERE COMPANY_ID = ?) " +  
"MINUS " +  
"(SELECT JOB_ID FROM USER_APPLIES_TO UA WHERE UA.EMAIL = U.EMAIL)) " +  
"AND EXISTS (SELECT COMPANY_ID FROM POSTED_JOB WHERE COMPANY_ID = ?)";
```

UserAccountDao.java, Line 23-28

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Screenshots demonstrating the functionality of each query using the GUI

1. INSERT Operation

- We choose to insert to the table POSTED_JOB. This is the DB before:

LOCATION	POSITION	JOB_ID	SALARY	DESCRIPTION	POSTED_DATE	RECRUITER_EMAIL	COMPANY_ID
Toronto	Chef	532000046	25000	Make some amazing food!	2023-04-04 00:00:00		5
Vancouver	Accountant	1	130000	We are seeking a highly motivated and experienced accountant to join our finance team.	2019-01-01 00:00:00	jasonmiller@gmail.com	2
Burnaby	Investment Banker	2	200000	Investment bankers will be responsible for providing strategic financial advice to clients.	2019-01-02 00:00:00	lisawilson@gmail.com	3
Burnaby	Software Engineer	3	93000	The ideal candidate will have strong programming skills.	2019-01-03 00:00:00	lisawilson@gmail.com	3
Vancouver	Software Engineer	5	150000	We are looking for a talented and passionate software engineer to join our development team.	2019-01-05 00:00:00	andrewwilliams@gmail.com	5
Burnaby	Career Coach	351569472	40000	You will help students get into their dream college!	2023-04-04 00:00:00	mikedavis@gmail.com	5
Alberta	QA Engineer	663816590	40000	You will help test code and validate it!	2023-04-04 00:00:00		3
Vancouver	UI/UX Designer	101310597	30000	Help us create beautiful frontends	2023-04-04 00:00:00		3

- This is achieved through the GUI by visiting the Post Job page in the Company View, inputting values and pressing the SUBMIT button.

MyJobPortal USER COMPANY ADMIN Future Technologies CompanyProfile Post a Job

Create New Job Posting

Position:

Salary:

Location:

Recruiter Email:

Description:

- POSTED_JOB after. Inserted value can be seen:

LOCATION	POSITION	JOB_ID	SALARY	DESCRIPTION	POSTED_DATE	RECRUITER_EMAIL	COMPANY_ID
Toronto	Chef	532000046	25000	Make some amazing food!	2023-04-04 00:00:00		5
Vancouver	Accountant	1	130000	We are seeking a highly motivated and experienced accountant to join our finance team.	2019-01-01 00:00:00	jasonmiller@gmail.com	2
Burnaby	Investment Banker	2	200000	Investment bankers will be responsible for providing strategic financial advice to clients.	2019-01-02 00:00:00	lisawilson@gmail.com	3
Burnaby	Software Engineer	3	93000	The ideal candidate will have strong programming skills.	2019-01-03 00:00:00	lisawilson@gmail.com	3
Vancouver	Software Engineer	5	150000	We are looking for a talented and passionate software engineer to join our development team.	2019-01-05 00:00:00	andrewwilliams@gmail.com	5
Burnaby	Career Coach	351569472	40000	You will help students get into their dream college!	2023-04-04 00:00:00	mikedavis@gmail.com	5
Alberta	QA Engineer	663816590	40000	You will help test code and validate it!	2023-04-04 00:00:00		3
Vancouver	UI/UX Designer	101310597	30000	Help us create beautiful frontends	2023-04-04 00:00:00		3
Vancouver	Course Instructor	798090673	70000	You will teach students	2023-04-04 00:00:00	kevinjones@gmail.com	5

2. DELETE Operation

- We choose to delete a company from the COMPANY table, which cascades deleting any job posted by the company in the POSTED_JOB table. This is the DB before:

COMPANY -

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COMPANY_ID	NAME
1	Acme Corporation
2	Widget Industries
3	Global Enterprises
5	Future Technologies

POSTED_JOB -

LOCATION	POSITION	JOB_ID	SALARY	DESCRIPTION	POSTED_DATE	RECRUITER_EMAIL	COMPANY_ID
Toronto	Chef	532000046	25000	Make some amazing food!	2023-04-04 00:00:00		5
Vancouver	Accountant	1	130000	We are seeking a highly motivated and experienced accountant to join our finance team.	2019-01-01 00:00:00	jasonmiller@gmail.com	2
Burnaby	Investment Banker	2	200000	Investment bankers will be responsible for providing strategic financial advice to clients.	2019-01-02 00:00:00	lisawilson@gmail.com	3
Burnaby	Software Engineer	3	93000	The ideal candidate will have strong programming skills.	2019-01-03 00:00:00	lisawilson@gmail.com	3
Vancouver	Software Engineer	5	150000	We are looking for a talented and passionate software engineer to join our development team.	2019-01-05 00:00:00	andrewwilliams@gmail.com	5
Burnaby	Career Coach	351569472	40000	You will help students get into their dream college!	2023-04-04 00:00:00	mikedavis@gmail.com	5
Alberta	QA Engineer	663816590	40000	You will help test code and validate it!	2023-04-04 00:00:00		3
Burnaby	UI/UX Designer	101310597	30000	Help us create beautiful frontends	2023-04-04 00:00:00	andrewwilliams@gmail.com	3
Vancouver	Course Instructor	798090673	70000	You will teach students	2023-04-04 00:00:00	kevinjones@gmail.com	5

- Before, in the GUI, from the User View you can see the Company in the Companies Page and its Jobs on the Jobs page

MyJobPortal

USERCOMPANYADMIN

JobsCompanies

Posted Jobs

Posted After: yyyy-mm-ddLocation: Select an optionMinimum Salary: Apply FiltersClear Filters

1	532000046 Chef	Posted: 2023-04-04	Location: Toronto	Salary: 25000
2	1 Accountant	Posted: 2019-01-01	Location: Vancouver	Salary: 130000
3	2 Investment Banker	Posted: 2019-01-02	Location: Burnaby	Salary: 200000
4	3 Software Engineer	Posted: 2019-01-03	Location: Burnaby	Salary: 93000
5	5 Software Engineer	Posted: 2019-01-05	Location: Vancouver	Salary: 150000
6	351569472 Career Coach	Posted: 2023-04-04	Location: Burnaby	Salary: 40000
7	663816590 QA Engineer	Posted: 2023-04-04	Location: Alberta	Salary: 40000
8	101310597 UI/UX Designer	Posted: 2023-04-04	Location: Burnaby	Salary: 30000
9	798090673 Course Instructor	Posted: 2023-04-04	Location: Vancouver	Salary: 70000

MyJobPortal USER COMPANY ADMIN

Jobs Companies

Companies

Posted After: Minimum Avg Rating: Apply Filters Clear Filters

Top Companies: Widget Industries

1	2.Widget Industries	Rating: 10/10
2	5.Future Technologies	Rating: 7/10
3	1.Acme Corporation	Rating: 1/10
4	3.Global Enterprises	Rating: 0/10

- Now let us delete COMPANY Future Technologies with COMPANY_ID 5. This can be achieved by visiting the Company Profile page through the Company View, selecting this company (see the dropdown in the menu bar). The query can be run by selecting the Delete Company button.

MyJobPortal USER COMPANY ADMIN

Future Technologies CompanyProfile Post a Job

MyCompanyProfile

Delete Company

ID: 5

Name: Future Technologies

EDIT

View Company Information

Posted Jobs

Ratings

- After the query is run, the Company Profile page will contain blank info till another company is selected in the dropdown. The company can no longer be seen on the Companies Page and all its jobs vanish from the Jobs page.

MyJobPortal USER COMPANY ADMIN

Select a company to use for the view CompanyProfile Post a Job

MyCompanyProfile

Delete Company

ID:

Name:

EDIT

View Company Information

Posted Jobs

Ratings

MyJobPortal

USERCOMPANYADMIN

JobsCompanies

Companies

Posted After: Minimum Avg Rating:

Apply FiltersClear Filters

Top Companies: Widget Industries

1	2.Widget Industries	Rating: 10/10
2	1.Acme Corporation	Rating: 1/10
3	3.Global Enterprises	Rating: 0/10

MyJobPortal

USERCOMPANYADMIN

JobsCompanies

Posted Jobs

Posted After: Location:

Select an option

 Minimum Salary:

Apply FiltersClear Filters

1	1.Accountant	Posted: 2019-01-01	Location: Vancouver	Salary: 130000
2	2.Investment Banker	Posted: 2019-01-02	Location: Burnaby	Salary: 200000
3	3.Software Engineer	Posted: 2019-01-03	Location: Burnaby	Salary: 93000
4	663816590 QA Engineer	Posted: 2023-04-04	Location: Alberta	Salary: 40000
5	101310597 UI/UX Designer	Posted: 2023-04-04	Location: Burnaby	Salary: 30000

- Here is the DB After
- COMPANY -

COMPANY_ID	NAME
1	Acme Corporation
2	Widget Industries
3	Global Enterprises

POSTED_JOB -

LOCATION	POSITION	JOB_ID	SALARY	DESCRIPTION	POSTED_DATE	RECRUITER_EMAIL	COMPANY_ID
Vancouver	Accountant	1	130000	We are seeking a highly motivated and experienced accountant to join our finance team.	2019-01-01 00:00:00	jasonmiller@gmail.com	2
Burnaby	Investment Banker	2	200000	Investment bankers will be responsible for providing strategic financial advice to clients.	2019-01-02 00:00:00	lisawilson@gmail.com	3
Burnaby	Software Engineer	3	93000	The ideal candidate will have strong programming skills.	2019-01-03 00:00:00	lisawilson@gmail.com	3
Alberta	QA Engineer	663816590	40000	You will help test code and validate it!	2023-04-04 00:00:00		3
Burnaby	UI/UX Designer	101310597	30000	Help us create beautiful frontends	2023-04-04 00:00:00	andrewwilliams@gmail.com	3

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3. UPDATE Operation

- We choose to update a POSTED_JOB. This is the DB before:

LOCATION	POSITION	JOB_ID	SALARY	DESCRIPTION	POSTED_DATE	RECRUITER_EMAIL	COMPANY_ID
Toronto	Chef	532000046	25000	Make some amazing food!	2023-04-04 00:00:00		5
Vancouver	Accountant	1	130000	We are seeking a highly motivated and experienced accountant to join our finance team.	2019-01-01 00:00:00	jasonmiller@gmail.com	2
Burnaby	Investment Banker	2	200000	Investment bankers will be responsible for providing strategic financial advice to clients.	2019-01-02 00:00:00	lisawilson@gmail.com	3
Burnaby	Software Engineer	3	93000	The ideal candidate will have strong programming skills.	2019-01-03 00:00:00	lisawilson@gmail.com	3
Vancouver	Software Engineer	5	150000	We are looking for a talented and passionate software engineer to join our development team.	2019-01-05 00:00:00	andrewwilliams@gmail.com	5
Burnaby	Career Coach	351569472	40000	You will help students get into their dream college!	2023-04-04 00:00:00	mikedavis@gmail.com	5
Alberta	QA Engineer	663816590	40000	You will help test code and validate it!	2023-04-04 00:00:00		3
Vancouver	UI/UX Designer	101310597	30000	Help us create beautiful frontends	2023-04-04 00:00:00		3
Vancouver	Course Instructor	798090673	70000	You will teach students	2023-04-04 00:00:00	kevinjones@gmail.com	5

- This is achieved through the GUI by visiting the Open Posting Page from the Company View. A user will press the Edit button to edit the details. On pressing submit, the query is run

MyJobPortal USER COMPANY ADMIN Global Enterprises CompanyProfile Post a Job

101310597:UI/UX Designer

[GO BACK](#)

Posted: 2023-04-04
Number of Applicants: 0

Position:

Salary:

Location:

Recruiter Email:

Description:

[EDIT](#)

MyJobPortal USER COMPANY ADMIN Global Enterprises CompanyProfile Post a Job

101310597:UI/UX Designer

[GO BACK](#)

Posted: 2023-04-04
Number of Applicants: 0

Position:

Salary:

Location:

Recruiter Email:

Description:

[SAVE](#)

- This is POSTED_JOB DB After. Notice the change of location to 'Burnaby' and recruiter email to 'andrewwilliams@gmail.com' for the UI/UX Designer job.

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LOCATION	POSITION	JOB_ID	SALARY	DESCRIPTION	POSTED_DATE	RECRUITER_EMAIL	COMPANY_ID
Toronto	Chef	532000046	25000	Make some amazing food!	2023-04-04 00:00:00		5
Vancouver	Accountant	1	130000	We are seeking a highly motivated and experienced accountant to join our finance team.	2019-01-01 00:00:00	jasonmiller@gmail.com	2
Burnaby	Investment Banker	2	200000	Investment bankers will be responsible for providing strategic financial advice to clients.	2019-01-02 00:00:00	lisawilson@gmail.com	3
Burnaby	Software Engineer	3	93000	The ideal candidate will have strong programming skills.	2019-01-03 00:00:00	lisawilson@gmail.com	3
Vancouver	Software Engineer	5	150000	We are looking for a talented and passionate software engineer to join our development team.	2019-01-05 00:00:00	andrewwilliams@gmail.com	5
Burnaby	Career Coach	351569472	40000	You will help students get into their dream college!	2023-04-04 00:00:00	mikedavis@gmail.com	5
Alberta	QA Engineer	663816590	40000	You will help test code and validate it!	2023-04-04 00:00:00		3
Burnaby	UI/UX Designer	101310597	30000	Help us create beautiful frontends	2023-04-04 00:00:00	andrewwilliams@gmail.com	3
Vancouver	Course Instructor	798090673	70000	You will teach students	2023-04-04 00:00:00	kevinjones@gmail.com	5

4. Selection

- We choose to select from POSTED_JOB. This is the DB:

LOCATION	POSITION	JOB_ID	SALARY	DESCRIPTION	POSTED_DATE	RECRUITER_EMAIL	COMPANY_ID
Toronto	Chef	532000046	25000	Make some amazing food!	2023-04-04 00:00:00		5
Vancouver	Accountant	1	130000	We are seeking a highly motivated and experienced accountant to join our finance team.	2019-01-01 00:00:00	jasonmiller@gmail.com	2
Burnaby	Investment Banker	2	200000	Investment bankers will be responsible for providing strategic financial advice to clients.	2019-01-02 00:00:00	lisawilson@gmail.com	3
Burnaby	Software Engineer	3	93000	The ideal candidate will have strong programming skills.	2019-01-03 00:00:00	lisawilson@gmail.com	3
Vancouver	Software Engineer	5	150000	We are looking for a talented and passionate software engineer to join our development team.	2019-01-05 00:00:00	andrewwilliams@gmail.com	5
Burnaby	Career Coach	351569472	40000	You will help students get into their dream college!	2023-04-04 00:00:00	mikedavis@gmail.com	5
Alberta	QA Engineer	663816590	40000	You will help test code and validate it!	2023-04-04 00:00:00		3
Burnaby	UI/UX Designer	101310597	30000	Help us create beautiful frontends	2023-04-04 00:00:00	andrewwilliams@gmail.com	3
Vancouver	Course Instructor	798090673	70000	You will teach students	2023-04-04 00:00:00	kevinjones@gmail.com	5

- GUI before the query is called

MyJobPortal USER COMPANY ADMIN Jobs Companies

Posted Jobs

Posted After: Location: Minimum Salary: Apply FiltersClear Filters

1	532000046: Chef	Posted: 2023-04-04	Location: Toronto	Salary: 25000
2	1:Accountant	Posted: 2019-01-01	Location: Vancouver	Salary: 130000
3	2:Investment Banker	Posted: 2019-01-02	Location: Burnaby	Salary: 200000
4	3:Software Engineer	Posted: 2019-01-03	Location: Burnaby	Salary: 93000
5	5:Software Engineer	Posted: 2019-01-05	Location: Vancouver	Salary: 150000
6	351569472: Career Coach	Posted: 2023-04-04	Location: Burnaby	Salary: 40000
7	663816590: QA Engineer	Posted: 2023-04-04	Location: Alberta	Salary: 40000
8	101310597: UI/UX Designer	Posted: 2023-04-04	Location: Burnaby	Salary: 30000
9	798090673: Course Instructor	Posted: 2023-04-04	Location: Vancouver	Salary: 70000

- To select where POSTED_DATE > 2022-06-04. Press the Apply Filters button to run the query.

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MyJobPortal USER COMPANY ADMIN Jobs Companies

Posted Jobs

Posted After: Location: Minimum Salary: Apply Filters Clear Filters

1	53200046 Chef	Posted: 2023-04-04	Location: Toronto	Salary: 25000
2	351569472 Career Coach	Posted: 2023-04-04	Location: Burnaby	Salary: 40000
3	663816590 QA Engineer	Posted: 2023-04-04	Location: Alberta	Salary: 40000
4	101310597 UI/UX Designer	Posted: 2023-04-04	Location: Burnaby	Salary: 30000
5	798090673 Course Instructor	Posted: 2023-04-04	Location: Vancouver	Salary: 70000

- On selecting where Location = "Vancouver". Press the Apply Filters button to run the query.

MyJobPortal USER COMPANY ADMIN Jobs Companies

Posted Jobs

Posted After: Location: Minimum Salary: Apply Filters Clear Filters

1	1:Accountant	Posted: 2019-01-01	Location: Vancouver	Salary: 130000
2	5:Software Engineer	Posted: 2019-01-05	Location: Vancouver	Salary: 150000
3	798090673 Course Instructor	Posted: 2023-04-04	Location: Vancouver	Salary: 70000

- On selecting where SALARY >= 50000. Press the Apply Filters button to run the query.

MyJobPortal USER COMPANY ADMIN Jobs Companies

Posted Jobs

Posted After: Location: Minimum Salary: Apply Filters Clear Filters

1	1:Accountant	Posted: 2019-01-01	Location: Vancouver	Salary: 130000
2	2:Investment Banker	Posted: 2019-01-02	Location: Burnaby	Salary: 200000
3	3:Software Engineer	Posted: 2019-01-03	Location: Burnaby	Salary: 93000
4	5:Software Engineer	Posted: 2019-01-05	Location: Vancouver	Salary: 150000
5	798090673 Course Instructor	Posted: 2023-04-04	Location: Vancouver	Salary: 70000

5. Projection

- For this example, we will use the POSTED_JOB relation for demonstration. This is the table before

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LOCATION	POSITION	JOB_ID	SALARY	DESCRIPTION	POSTED_DATE	RECRUITER_EMAIL	COMPANY_ID
Toronto	Chef	532000046	25000	Make some amazing food!	2023-04-04 00:00:00		5
Vancouver	Accountant	1	130000	We are seeking a highly motivated and experienced accountant to join our finance team.	2019-01-01 00:00:00	jasonmiller@gmail.com	2
Burnaby	Investment Banker	2	200000	Investment bankers will be responsible for providing strategic financial advice to clients.	2019-01-02 00:00:00	lisawilson@gmail.com	3
Burnaby	Software Engineer	3	93000	The ideal candidate will have strong programming skills.	2019-01-03 00:00:00	lisawilson@gmail.com	3
Vancouver	Software Engineer	5	150000	We are looking for a talented and passionate software engineer to join our development team.	2019-01-05 00:00:00	andrewwilliams@gmail.com	5
Burnaby	Career Coach	351569472	40000	You will help students get into their dream college!	2023-04-04 00:00:00	mikedavis@gmail.com	5
Alberta	QA Engineer	663816590	40000	You will help test code and validate it!	2023-04-04 00:00:00	mikedavis@gmail.com	3
Burnaby	UI/UX Designer	101310597	30000	Help us create beautiful frontends	2023-04-04 00:00:00	andrewwilliams@gmail.com	3
Vancouver	Course Instructor	798090673	70000	You will teach students	2023-04-04 00:00:00	kevinjones@gmail.com	5

- This is the GUI with all attributes selected. The user can choose which attributes of the table to select. This can be accessed through the Admin View. The query is run on clicking the run button

MyJobPortal

[USER](#)[COMPANY](#)[ADMIN](#)

Admin View

Please select the tables you wish to get FROM:

POSTED_JOB

Please select the attributes you wish to SELECT:

[JOB_ID](#) [COMPANY_ID](#) [POSTED_DATE](#) [POSITION](#) [LOCATION](#) [DESCRIPTION](#) [SALARY](#) [RECRUITER_EMAIL](#) [Select](#)

[RUN](#)

LOCATION	POSITION	JOB_ID	SALARY	DESCRIPTION	POSTED_DATE	RECRUITER_EMAIL	COMPANY_ID
Toronto	Chef	532000046	25000	Make some amazing food!	2023-04-04 00:00:00		5
Vancouver	Accountant	1	130000	We are seeking a highly motivated and experienced accountant to join our finance team.	2019-01-01 00:00:00	jasonmiller@gmail.com	2
Burnaby	Investment Banker	2	200000	Investment bankers will be responsible for providing strategic financial advice to clients.	2019-01-02 00:00:00	lisawilson@gmail.com	3
Burnaby	Software Engineer	3	93000	The ideal candidate will have strong programming skills.	2019-01-03 00:00:00	lisawilson@gmail.com	3
Vancouver	Software Engineer	5	150000	We are looking for a talented and passionate software engineer to join our development team.	2019-01-05 00:00:00	andrewwilliams@gmail.com	5
Burnaby	Career Coach	351569472	40000	You will help students get into their dream college!	2023-04-04 00:00:00	mikedavis@gmail.com	5
Alberta	QA Engineer	663816590	40000	You will help test code and validate it!	2023-04-04 00:00:00	mikedavis@gmail.com	3
Burnaby	UI/UX Designer	101310597	30000	Help us create beautiful frontends	2023-04-04 00:00:00	andrewwilliams@gmail.com	3
Vancouver	Course Instructor	798090673	70000	You will teach students	2023-04-04 00:00:00	kevinjones@gmail.com	5

- This is the GUI with fewer than all attributes selected.

MyJobPortal

[USER](#)[COMPANY](#)[ADMIN](#)

Admin View

Please select the tables you wish to get FROM:

POSTED_JOB

Please select the attributes you wish to SELECT:

[JOB_ID](#) [COMPANY_ID](#) [POSITION](#) [LOCATION](#) [SALARY](#) [Select](#)

[RUN](#)

LOCATION	POSITION	JOB_ID	SALARY	COMPANY_ID
Toronto	Chef	532000046	25000	5
Vancouver	Accountant	1	130000	2
Burnaby	Investment Banker	2	200000	3
Burnaby	Software Engineer	3	93000	3
Vancouver	Software Engineer	5	150000	5
Burnaby	Career Coach	351569472	40000	5
Alberta	QA Engineer	663816590	40000	3
Burnaby	UI/UX Designer	101310597	30000	3
Vancouver	Course Instructor	798090673	70000	5

6. Join

- We join COMPANY and POSTED_JOB to select which companies have posted a job after a user inputted date. Here are the COMPANY and POSTED_JOB DBs before

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COMPANY -

COMPANY_ID	NAME
1	Acme Corporation
2	Widget Industries
3	Global Enterprises
5	Future Technologies

POSTED_JOB -

LOCATION	POSITION	JOB_ID	SALARY	DESCRIPTION	POSTED_DATE	RECRUITER_EMAIL	COMPANY_ID
Toronto	Chef	532000046	25000	Make some amazing food!	2023-04-04 00:00:00		5
Vancouver	Accountant	1	130000	We are seeking a highly motivated and experienced accountant to join our finance team.	2019-01-01 00:00:00	jasonmiller@gmail.com	2
Burnaby	Investment Banker	2	200000	Investment bankers will be responsible for providing strategic financial advice to clients.	2019-01-02 00:00:00	lisawilson@gmail.com	3
Burnaby	Software Engineer	3	93000	The ideal candidate will have strong programming skills.	2019-01-03 00:00:00	lisawilson@gmail.com	3
Vancouver	Software Engineer	5	150000	We are looking for a talented and passionate software engineer to join our development team.	2019-01-05 00:00:00	andrewwilliams@gmail.com	5
Burnaby	Career Coach	351569472	40000	You will help students get into their dream college!	2023-04-04 00:00:00	mikedavis@gmail.com	5
Alberta	QA Engineer	663816590	40000	You will help test code and validate it!	2023-04-04 00:00:00		3
Burnaby	UI/UX Designer	101310597	30000	Help us create beautiful frontends	2023-04-04 00:00:00	andrewwilliams@gmail.com	3
Vancouver	Course Instructor	798090673	70000	You will teach students	2023-04-04 00:00:00	kevinjones@gmail.com	5

- The GUI contains a Posted After filter on the Companies page in the User View. GUI Before:

MyJobPortal USER COMPANY ADMIN Jobs Companies

Companies

Posted After: Minimum Avg Rating: Apply Filters Clear Filters

Top Companies: Widget Industries

1	2.Widget Industries	Rating: 10/10
2	5.Future Technologies	Rating: 7/10
3	1.Acme Corporation	Rating: 1/10
4	3.Global Enterprises	Rating: 0/10

- The query is run on clicking the Apply Filters Button. GUI after.

MyJobPortal USER COMPANY ADMIN Jobs Companies

Companies

Posted After: Minimum Avg Rating: Apply Filters Clear Filters

Top Companies: Widget Industries

1	5.Future Technologies	Rating: 7/10
2	3.Global Enterprises	Rating: 0/10

7. Aggregation with GROUP BY

- We run the query on the table USER_APPLIES_TO grouped by jobId to get the count or number of users that have applied to a given jobId. This is the table.

JOB_ID	EMAIL	APPLIED_DATE
1	janedoe@gmail.com	2019-01-03 00:00:00
2	tombrown@gmail.com	2019-01-03 00:00:00
3	bobjohnson@gmail.com	2019-01-07 00:00:00
5	bobjohnson@gmail.com	2019-01-07 00:00:00
5	janedoe@gmail.com	2019-01-08 00:00:00

- In the GUI this query is automatically run when the page is rendered. It can be viewed on the job posting page from the Company View. Please notice the “Number of Applicants” text for the jobId 5 shown below.

MyJobPortal USER COMPANY ADMIN Future Technologies CompanyProfile Post a Job

5:Software Engineer

[GO BACK](#)

Posted: 2019-01-05
Number of Applicants: 2

Position:

Salary:

Location:

Recruiter Email:

Description:

[EDIT](#)

8. Aggregation with HAVING

- We run the query on the table RATES grouped by COMPANY_ID having an avg(score) higher than the user inputted value. Here is the RATES table.

VALUE	EMAIL	COMPANY_ID	R_COMMENT
1	janedoe@gmail.com	1	This company is terrible
10	janedoe@gmail.com	2	Fantastic company with great culture!
7	tombrown@gmail.com	5	

- This query can be accessed on the Companies page of the User View by using the Minimum Avg Rating Filter. The query is run on pressing the Apply Filters button. Here is the GUI before.

MyJobPortal USER COMPANY ADMIN Jobs Companies

Companies

Posted After: Minimum Avg Rating:

Apply Filters Clear Filters

Top Companies: Widget Industries

1	2.Widget Industries	Rating: 10/10
2	5.Future Technologies	Rating: 7/10
3	1.Acme Corporation	Rating: 1/10
4	3.Global Enterprises	Rating: 0/10

- This is the GUI after running the query

MyJobPortal USER COMPANY ADMIN Jobs Companies

Companies

Posted After: Minimum Avg Rating:

Apply Filters Clear Filters

Top Companies: Widget Industries

1	2.Widget Industries	Rating: 10/10
2	5.Future Technologies	Rating: 7/10

9. Nested Aggregation with GROUP BY

- We choose to obtain the companies with avg(rating value) higher than the avg of all companies, and also have jobs with avg(salary) higher than avg(salary) of all jobs. For this we use the COMPANY, RATES and POSTED_JOB tables.

COMPANY -

COMPANY_ID	NAME
1	Acme Corporation
2	Widget Industries
3	Global Enterprises
5	Future Technologies

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RATES -

VALUE	EMAIL	COMPANY_ID	R_COMMENT
1	janedoe@gmail.com	1	This company is terrible
10	janedoe@gmail.com	2	Fantastic company with great culture!
7	tombrown@gmail.com	5	

POSTED_JOB-

LOCATION	POSITION	JOB_ID	SALARY	DESCRIPTION	POSTED_DATE	RECRUITER_EMAIL	COMPANY_ID
Toronto	Chef	532000046	25000	Make some amazing food!	2023-04-04 00:00:00		5
Vancouver	Accountant	1	130000	We are seeking a highly motivated and experienced accountant to join our finance team.	2019-01-01 00:00:00	jasonmiller@gmail.com	2
Burnaby	Investment Banker	2	200000	Investment bankers will be responsible for providing strategic financial advice to clients.	2019-01-02 00:00:00	lisawilson@gmail.com	3
Burnaby	Software Engineer	3	93000	The ideal candidate will have strong programming skills.	2019-01-03 00:00:00	lisawilson@gmail.com	3
Vancouver	Software Engineer	5	150000	We are looking for a talented and passionate software engineer to join our development team.	2019-01-05 00:00:00	andrewwilliams@gmail.com	5
Burnaby	Career Coach	351569472	40000	You will help students get into their dream college!	2023-04-04 00:00:00	mikedavis@gmail.com	5
Alberta	QA Engineer	663816590	40000	You will help test code and validate it!	2023-04-04 00:00:00		3
Burnaby	UI/UX Designer	101310597	30000	Help us create beautiful frontends	2023-04-04 00:00:00	andrewwilliams@gmail.com	3
Vancouver	Course Instructor	798090673	70000	You will teach students	2023-04-04 00:00:00	kevinjones@gmail.com	5

- In the GUI this query is automatically run when the page is rendered. It can be viewed on the companies page from the User View. Please notice the “Top Companies” banner shown below.

MyJobPortal

[USER](#)[COMPANY](#)[ADMIN](#)[Jobs](#) [Companies](#)

Companies

Posted After: Minimum Avg Rating: [Apply Filters](#)[Clear Filters](#)

Top Companies: Widget Industries

1	2:Widget Industries	Rating: 10/10
2	5:Future Technologies	Rating: 7/10
3	1:Acme Corporation	Rating: 1/10
4	3:Global Enterprises	Rating: 0/10

10. Division

- We choose to find all users that have applied to all jobs in a company. For this we use the POSTED_JOB and USER_APPLIES_TO tables

POSTED_JOB -

University of British Columbia, Vancouver

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LOCATION	POSITION	JOB_ID	SALARY	DESCRIPTION	POSTED_DATE	RECRUITER_EMAIL	COMPANY_ID
Toronto	Chef	532000046	25000	Make some amazing food!	2023-04-04 00:00:00		5
Vancouver	Accountant	1	130000	We are seeking a highly motivated and experienced accountant to join our finance team.	2019-01-01 00:00:00	jasonmiller@gmail.com	2
Burnaby	Investment Banker	2	200000	Investment bankers will be responsible for providing strategic financial advice to clients.	2019-01-02 00:00:00	lisawilson@gmail.com	3
Burnaby	Software Engineer	3	93000	The ideal candidate will have strong programming skills.	2019-01-03 00:00:00	lisawilson@gmail.com	3
Vancouver	Software Engineer	5	150000	We are looking for a talented and passionate software engineer to join our development team.	2019-01-05 00:00:00	andrewwilliams@gmail.com	5
Burnaby	Career Coach	351569472	40000	You will help students get into their dream college!	2023-04-04 00:00:00	mikedavis@gmail.com	5
Alberta	QA Engineer	663816590	40000	You will help test code and validate it!	2023-04-04 00:00:00		3
Burnaby	UI/UX Designer	101310597	30000	Help us create beautiful frontends	2023-04-04 00:00:00	andrewwilliams@gmail.com	3
Vancouver	Course Instructor	798090673	70000	You will teach students	2023-04-04 00:00:00	kevinjones@gmail.com	5

USER_APPLIES_TO -

JOB_ID	EMAIL	APPLIED_DATE
1	janedoe@gmail.com	2019-01-03 00:00:00
2	tombrown@gmail.com	2019-01-03 00:00:00
3	bobjohnson@gmail.com	2019-01-07 00:00:00
5	bobjohnson@gmail.com	2019-01-07 00:00:00
5	janedoe@gmail.com	2019-01-08 00:00:00

- In the GUI this query is automatically run when the page is rendered. It can be viewed on the Open Posting page from the Company View. Please notice the “Users that have applied to all jobs” banner shown below. The current company who’s account we are viewing the portal through is Widget Industries with a COMPANY_ID of 2

MyJobPortal

USER

COMPANY

ADMIN

Widget Industries

CompanyProfile

Post a Job

Company Posted Jobs

Users that have applied to all jobs: janedoe@gmail.com

1

1:Accountant

2019-01-01

Vancouver