

HOMEWORK 3 -- Question 2

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Folder Structure

- **commands.sql** contains sql script for questions (a) - (c)
- **/data** contains data input file *emp* and *course*
- **/image** contains screenshots

Add Indexes

I added BTREE index to both tables using the sql commands below (also included in **commands.sql**)

```
CREATE INDEX course_index ON Course (EmpID) USING BTREE;  
CREATE INDEX emp_index ON Employee (ID) USING BTREE;
```

Timings and Results BEFORE and AFTER adding index

(a)

- BEFORE: it was an outrageous 20 mins and more!

```
MySQL [hw3]> SELECT COUNT(emp1.ID)  
-> FROM Employee emp1, Employee emp2  
-> WHERE emp1.Salary >= 50 + emp2.Salary and emp1.Manager = emp2.ID;  
  
+-----+  
| COUNT(emp1.ID) |  
+-----+  
|          32880 |  
+-----+  
1 row in set (20 min 45.91 sec)
```

- AFTER:

```
MySQL [hw3]> SELECT COUNT(emp1.ID)  
-> FROM Employee emp1, Employee emp2  
-> WHERE emp1.Salary >= 50 + emp2.Salary and emp1.Manager = emp2.ID;  
  
+-----+  
| COUNT(emp1.ID) |  
+-----+  
|          32880 |  
+-----+  
1 row in set (0.73 sec)
```

- SPEEDUP:
 - Believe it or not, speedup ($t_{\text{before}}/t_{\text{after}}$) is **1706.8!**

(b)

- BEFORE:

```
department76      155.6485
department77      164.9613
department78      151.0306
department79      153.2150
department8       160.7820
department80      161.1196
department81      160.8498
department83      167.3116
department84      162.6217
department85      155.2185
department87      154.1187
department88      159.4594
department89      160.0377
department9       162.7380
department90      168.6446
department91      158.3869
department92      154.9692
department93      165.2550
department94      157.3524
department95      160.2337
department96      156.2618
department98      158.2899
department99      160.1209
+-----+-----+
94 rows in set (1 min 25.17 sec)
```

- AFTER:

```
department79      153.2150
department8       160.7820
department80      161.1196
department81      160.8498
department83      167.3116
department84      162.6217
department85      155.2185
department87      154.1187
department88      159.4594
department89      160.0377
department9       162.7380
department90      168.6446
department91      158.3869
department92      154.9692
department93      165.2550
department94      157.3524
department95      160.2337
department96      156.2618
department98      158.2899
department99      160.1209
+-----+-----+
94 rows in set (0.52 sec)
```

- SPEEDUP:

- 163.79

(c)

- BEFORE:

```
MySQL [hw3]> SELECT AVG(e.Salary)
-> FROM Employee e, Course c
-> WHERE e.ID = c.EmpID and c.Prof = 'prof1038';
+-----+
| AVG(e.Salary) |
+-----+
|      157.3182 |
+-----+
1 row in set (0.34 sec)
```

- AFTER:

```
MySQL [hw3]> SELECT AVG(e.Salary)
-> FROM Employee e, Course c
-> WHERE e.ID = c.EmpID and c.Prof = 'prof1038';
+-----+
| AVG(e.Salary) |
+-----+
|      157.3182 |
+-----+
1 row in set (0.02 sec)
```

- SPEEDUP:

- 17

Results

- (a) Find the number of employees who earn at least 50 more than their managers.

```
+-----+
| COUNT(emp1.ID) |
+-----+
|          32880 |
+-----+
```

- (b) For those departments in which more than one person takes courses, find the average salary by department.

```
+-----+-----+
| Department | AVG(emp.Salary) |
+-----+-----+
| department1 | 160.5860 |
| department10 | 154.6738 |
| department100 | 163.2644 |
| department11 | 158.2832 |
| department13 | 157.5294 |
| department14 | 157.9805 |
| department15 | 163.4443 |
| department16 | 165.4646 |
| department17 | 166.0363 |
| department18 | 158.0898 |
| department19 | 161.2179 |
| department2 | 161.6110 |
| department20 | 161.6498 |
| department21 | 161.4905 |
| department22 | 158.3385 |
| department24 | 160.6976 |
| department25 | 158.3143 |
| department26 | 154.7959 |
| department27 | 160.9370 |
| department28 | 158.2989 |
| department29 | 159.4878 |
| department3 | 161.9690 |
| department30 | 155.0152 |
| department31 | 166.1477 |
| department32 | 159.2785 |
| department33 | 162.3730 |
| department34 | 171.4965 |
| department35 | 170.0661 |
| department36 | 162.6129 |
| department37 | 156.0226 |
| department38 | 159.7906 |
| department39 | 162.8597 |
| department4 | 155.6012 |
| department40 | 155.9432 |
| department41 | 165.8314 |
| department42 | 166.3449 |
```

department43	163.9291
department44	161.9389
department45	166.3354
department46	161.5209
department47	157.8337
department48	162.9153
department5	158.5402
department50	156.7714
department51	167.2863
department52	156.9207
department53	160.3990
department54	161.1351
department55	160.2930
department56	160.9630
department57	165.9737
department58	160.3978
department59	156.4767
department6	164.6999
department60	162.0474
department61	161.7849
department62	158.8541
department63	160.4190
department64	158.6670
department65	159.2012
department66	161.5722
department67	161.8793
department68	162.7086
department69	158.6913
department7	159.3139
department70	159.3875
department71	163.8369
department72	159.7276
department73	160.5437
department74	160.0744
department75	153.8161
department76	155.6485
department77	164.9613
department78	151.0306
department79	153.2150
department8	160.7820
department80	161.1196
department81	160.8498
department83	167.3116
department84	162.6217
department85	155.2185
department87	154.1187
department88	159.4594
department89	160.0377
department9	162.7380
department90	168.6446
department91	158.3869
department92	154.9692
department93	165.2550
department94	157.3524
department95	160.2337

department96	156.2618	
department98	158.2899	
department99	160.1209	
+-----+		

- (c) Find the average salary earned by people taking the course of prof1038.

+-----+		
AVG(e.Salary)		
+-----+		
157.3182		
+-----+		