CUHKSZ-Overflow

-an online forum database design

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Contents

1.

Introduction

A forum database designed for CUHKSZ programmers as a problem-solving tool

MAIN FUNCTION

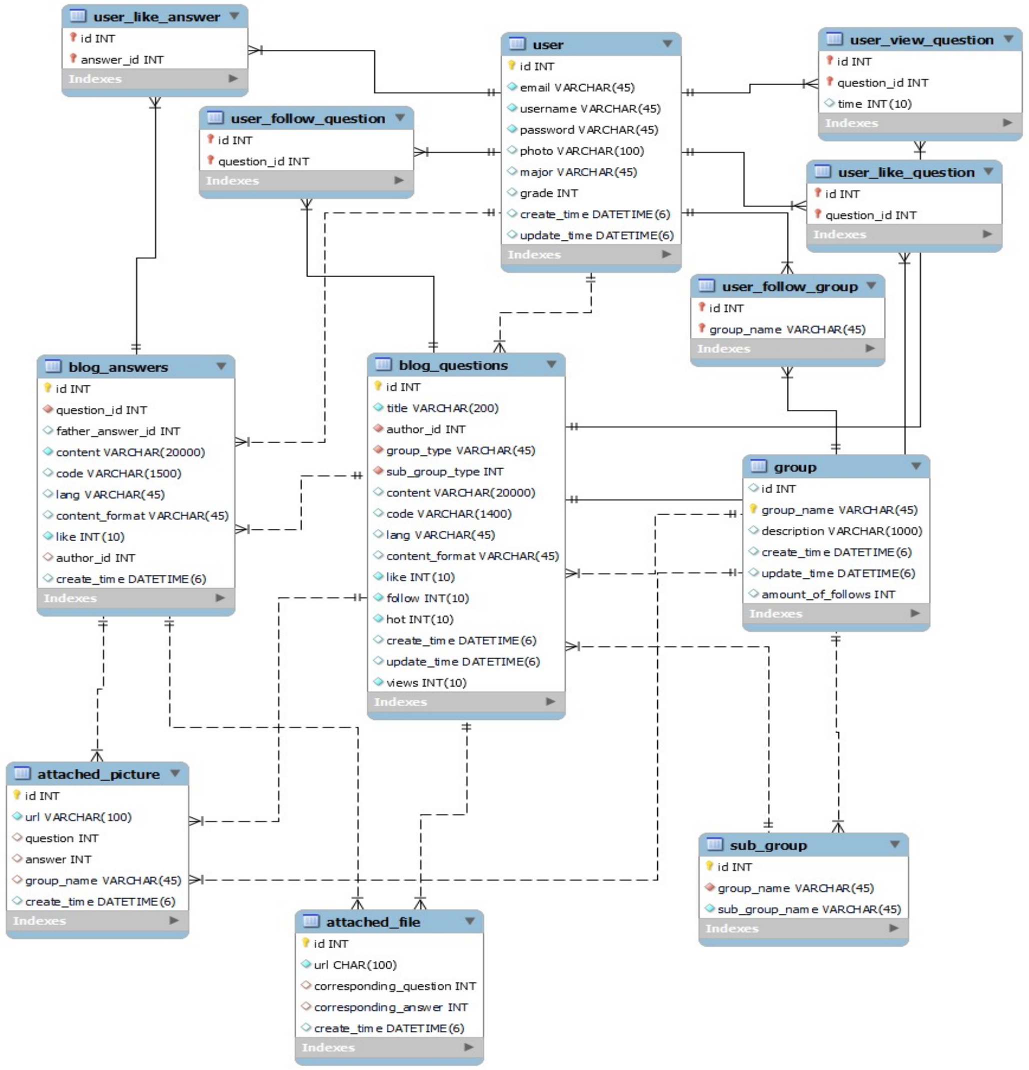
Link the question to its correct answer

User	Login, Register, Upload profile...
Blog	Post, Like, Follow, Answer...

2.

ER-diagram & Relational Schema & Normalization

E-R diagram


user_like_answer
id INT
answer_id INT
Indexes
user_follow_question
id INT
question_id INT
Indexes
user
id INT
email VARCHAR(45)
username VARCHAR(45)
password VARCHAR(45)
photo VARCHAR(100)
major VARCHAR(45)
grade INT
create_time DATETIME(6)
update_time DATETIME(6)
Indexes
user_view_question
id INT
question_id INT
time INT(10)
Indexes
user_like_question
id INT
question_id INT
Indexes
user_follow_group
id INT
group_name VARCHAR(45)
Indexes
blog_answers
id INT
question_id INT
father_answer_id INT
content VARCHAR(20000)
code VARCHAR(1500)
lang VARCHAR(45)
content_format VARCHAR(45)
like INT(10)
author_id INT
create_time DATETIME(6)
Indexes
blog_questions
id INT
title VARCHAR(200)
author_id INT
group_type VARCHAR(45)
sub_group_type INT
content VARCHAR(20000)
code VARCHAR(1400)
lang VARCHAR(45)
content_format VARCHAR(45)
like INT(10)
follow INT(10)
hot INT(10)
create_time DATETIME(6)
update_time DATETIME(6)
views INT(10)
Indexes
group
id INT
group_name VARCHAR(45)
description VARCHAR(1000)
create_time DATETIME(6)
update_time DATETIME(6)
amount_of_follows INT
Indexes
attached_picture
id INT
url VARCHAR(100)
question INT
answer INT
group_name VARCHAR(45)
create_time DATETIME(6)
Indexes
attached_file
id INT
url CHAR(100)
corresponding_question INT
corresponding_answer INT
create_time DATETIME(6)
Indexes
sub_group
id INT
group_name VARCHAR(45)
sub_group_name VARCHAR(45)
Indexes

Schema

user(id, email, username, password, photo, major, grade, create_time, update_time)
group(id, group_name, description, create_time, update_time, amount_of_follows)
sub_group(id, group_name, sub_group_name)
blog_questions(id, title, author_id, group_type, sub_group_type, content, code, lang, content_format, like, follow, hot, create_time, update_time, views)
blog_answers(id, question_id, father_answer_id, content, code, lang, content_format, like, author_id, create_time)
file(id, url, corresponding_question, corresponding_answer, create_time)
picture(id, url, question, answer, group_name, create_time)
…

Normalization

group(id, group_name, sub_group_name, description, create_time, update_time, amount_of_follows)

id	group_name	sub_group_name	description	create_time	update_time	amount_of_follows
1	CSC3170	{Assignment1, Assignment2, …}	Database System	2022-04-30	null	100

group(id, group_name, description, create_time, update_time, amount_of_follows)

id	group_name	description	create_time	update_time	Amount_of_follows
1	CSC3170	Database System	2020-04-30	Null	100

sub_group(id, group_name, sub_group_name)

id	group_name	sub_group_name
1	CSC3170	Assignment1
2	CSC3170	Assignment2

1NF

Normalization

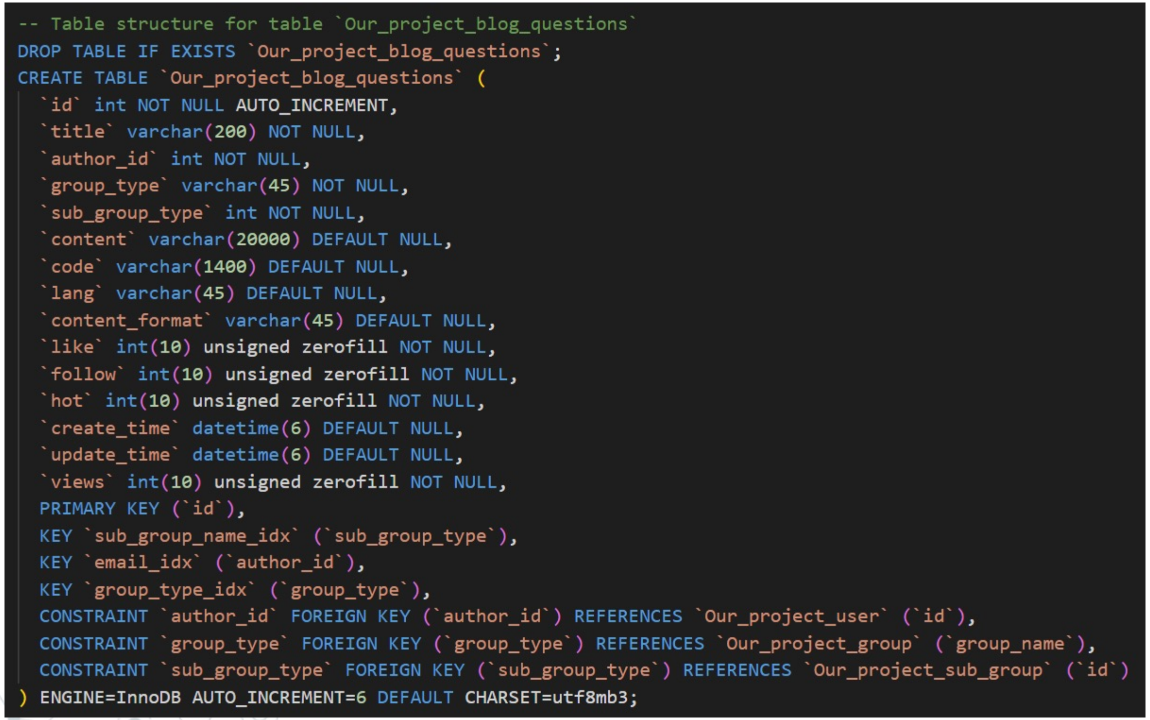
$$\text{Unique id} \longrightarrow \left\{ \begin{array}{l} \text{Nonprime attributes are fully functionally dependent on the primary key (id)} \\ \\ \text{No nonprime attributes are transitively dependent on the primary key (id)} \end{array} \right.$$

2NF & 3NF

3.

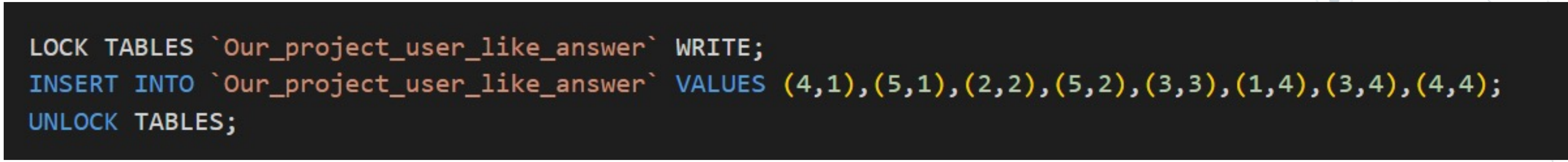
Sample Queries

DDL: Definition with integrity constraints



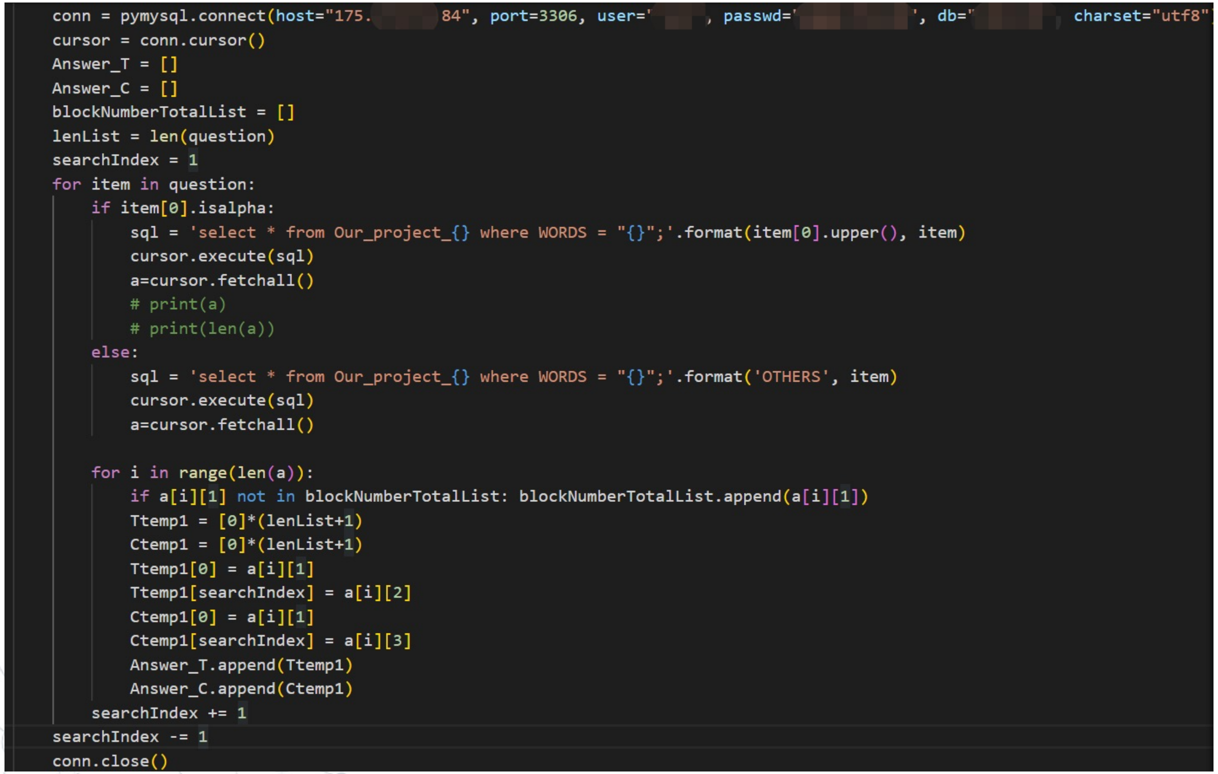
```sql
-- Table structure for table `Our_project_blog_questions`
DROP TABLE IF EXISTS `Our_project_blog_questions`;
CREATE TABLE `Our_project_blog_questions` (
  `id` int NOT NULL AUTO_INCREMENT,
  `title` varchar(200) NOT NULL,
  `author_id` int NOT NULL,
  `group_type` varchar(45) NOT NULL,
  `sub_group_type` int NOT NULL,
  `content` varchar(20000) DEFAULT NULL,
  `code` varchar(1400) DEFAULT NULL,
  `lang` varchar(45) DEFAULT NULL,
  `content_format` varchar(45) DEFAULT NULL,
  `like` int(10) unsigned zerofill NOT NULL,
  `follow` int(10) unsigned zerofill NOT NULL,
  `hot` int(10) unsigned zerofill NOT NULL,
  `create_time` datetime(6) DEFAULT NULL,
  `update_time` datetime(6) DEFAULT NULL,
  `views` int(10) unsigned zerofill NOT NULL,
  PRIMARY KEY (`id`),
  KEY `sub_group_name_idx` (`sub_group_type`),
  KEY `email_idx` (`author_id`),
  KEY `group_type_idx` (`group_type`),
  CONSTRAINT `author_id` FOREIGN KEY (`author_id`) REFERENCES `Our_project_user` (`id`),
  CONSTRAINT `group_type` FOREIGN KEY (`group_type`) REFERENCES `Our_project_group` (`group_name`),
  CONSTRAINT `sub_group_type` FOREIGN KEY (`sub_group_type`) REFERENCES `Our_project_sub_group` (`id`)
) ENGINE=InnoDB AUTO_INCREMENT=6 DEFAULT CHARSET=utf8mb3;
```

# Query 1: directly interacts with database



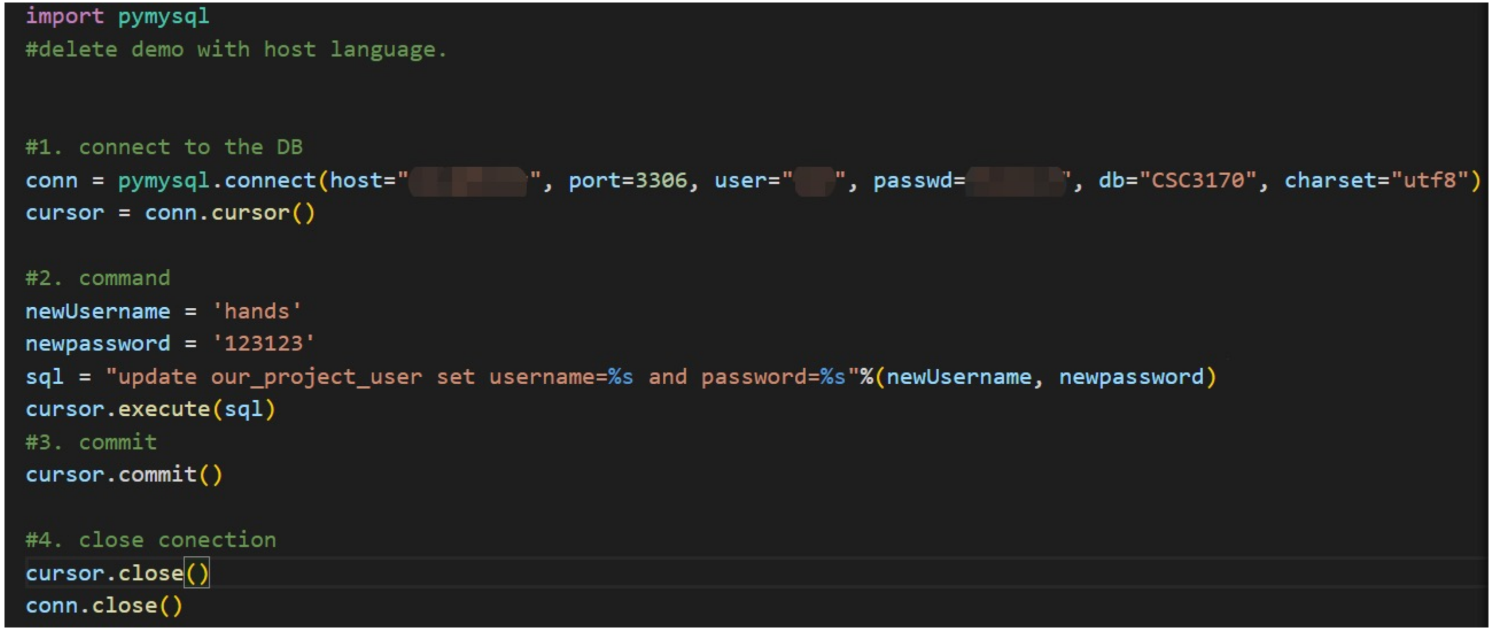
```
LOCK TABLES `Our_project_user_like_answer` WRITE;
INSERT INTO `Our_project_user_like_answer` VALUES (4,1),(5,1),(2,2),(5,2),(3,3),(1,4),(3,4),(4,4);
UNLOCK TABLES;
```

# Query 2: Query within python: **SELECT**



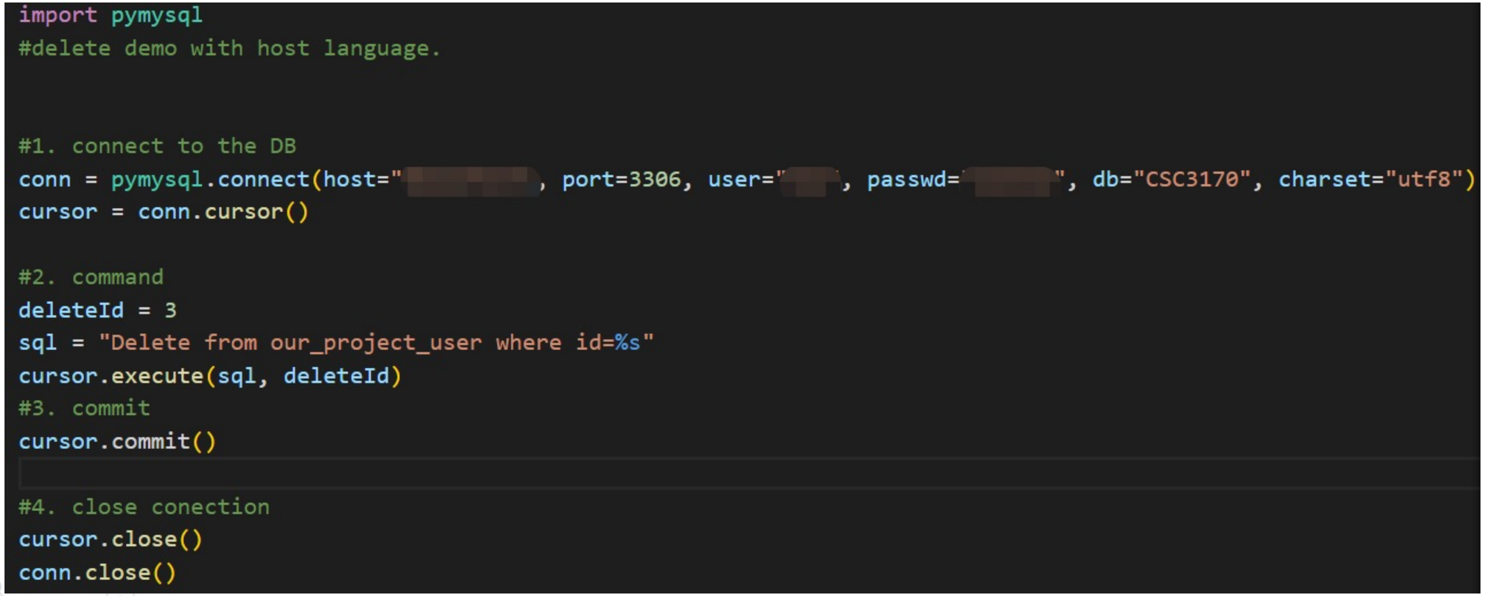
```
conn = pymysql.connect(host="175.[redacted]84", port=3306, user='[redacted], passwd='[redacted]', db="[redacted] charset="utf8"
cursor = conn.cursor()
Answer_T = []
Answer_C = []
blockNumberTotalList = []
lenList = len(question)
searchIndex = 1
for item in question:
    if item[0].isalpha:
        sql = 'select * from Our_project_{} where WORDS = "{}";'.format(item[0].upper(), item)
        cursor.execute(sql)
        a=cursor.fetchall()
        # print(a)
        # print(len(a))
    else:
        sql = 'select * from Our_project_{} where WORDS = "{}";'.format('OTHERS', item)
        cursor.execute(sql)
        a=cursor.fetchall()

    for i in range(len(a)):
        if a[i][1] not in blockNumberTotalList: blockNumberTotalList.append(a[i][1])
        Ttemp1 = [0]*(lenList+1)
        Ctemp1 = [0]*(lenList+1)
        Ttemp1[0] = a[i][1]
        Ttemp1[searchIndex] = a[i][2]
        Ctemp1[0] = a[i][1]
        Ctemp1[searchIndex] = a[i][3]
        Answer_T.append(Ttemp1)
        Answer_C.append(Ctemp1)
    searchIndex += 1
searchIndex -= 1
conn.close()
```

# Query 3: Query within python: **UPDATE**



```
import pymysql
#delete demo with host language.


#1. connect to the DB
conn = pymysql.connect(host="[redacted]", port=3306, user="[redacted]", passwd=[redacted]", db="CSC3170", charset="utf8")
cursor = conn.cursor()

#2. command
newUsername = 'hands'
newpassword = '123123'
sql = "update our_project_user set username=%s and password=%s"%(newUsername, newpassword)
cursor.execute(sql)
#3. commit
cursor.commit()

#4. close conection
cursor.close()
conn.close()
```

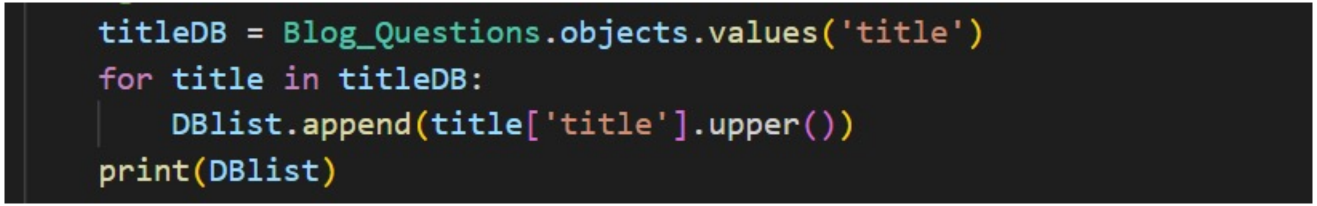
# Query 3: Query within python: **DELETE**



```
import pymysql
#delete demo with host language.


#1. connect to the DB
conn = pymysql.connect(host="[redacted], port=3306, user="[redacted], passwd=[redacted]", db="CSC3170", charset="utf8")
cursor = conn.cursor()

#2. command
deleteId = 3
sql = "Delete from our_project_user where id=%s"
cursor.execute(sql, deleteId)
#3. commit
cursor.commit()

#4. close conection
cursor.close()
conn.close()
```

Other Ways

Alternative Method: Query set



```
titleDB = Blog_Questions.objects.values('title')
for title in titleDB:
    DBlist.append(title['title'].upper())
print(DBlist)
```

It is less comprehensive than SQL, but still a way to interact with the database.

4.

Improve with index

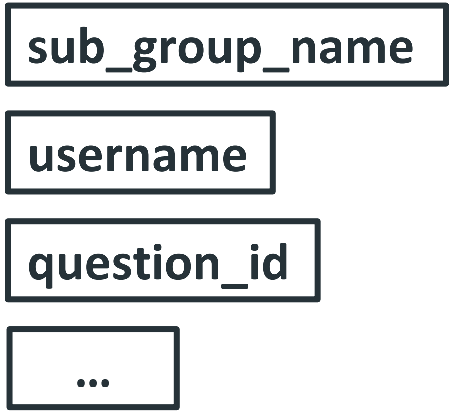
Hash Index

- **Advantage:** faster when searching for a specific row (e.g. user id,)

- **Disadvantage**: Use “memory” engine, volatile, not secure (are gone when dataset restart)

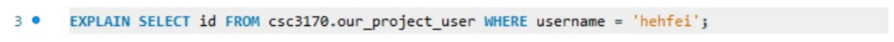
B-Tree Index

Advantage: can improve speed on searching for a range of values

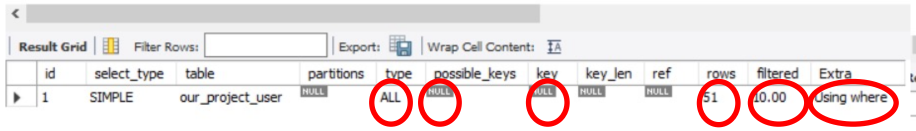


username

before

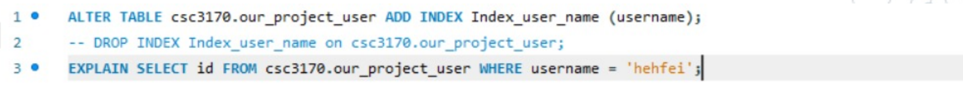


```
EXPLAIN SELECT id FROM csc3170.our_project_user WHERE username = 'hehfei';
```

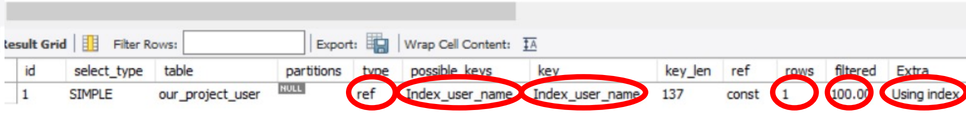


id	select_type	table	partitions	type	possible_keys	key	key_len	ref	rows	filtered	Extra
1	SIMPLE	our_project_user	NULL	ALL	NULL	NULL	NULL	NULL	51	10.00	Using where

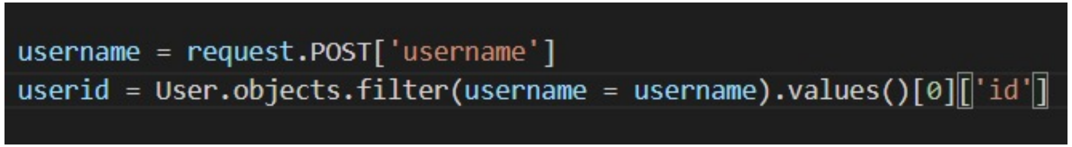
after



```
ALTER TABLE csc3170.our_project_user ADD INDEX Index_user_name (username);
-- DROP INDEX Index_user_name on csc3170.our_project_user;
EXPLAIN SELECT id FROM csc3170.our_project_user WHERE username = 'hehfei';
```



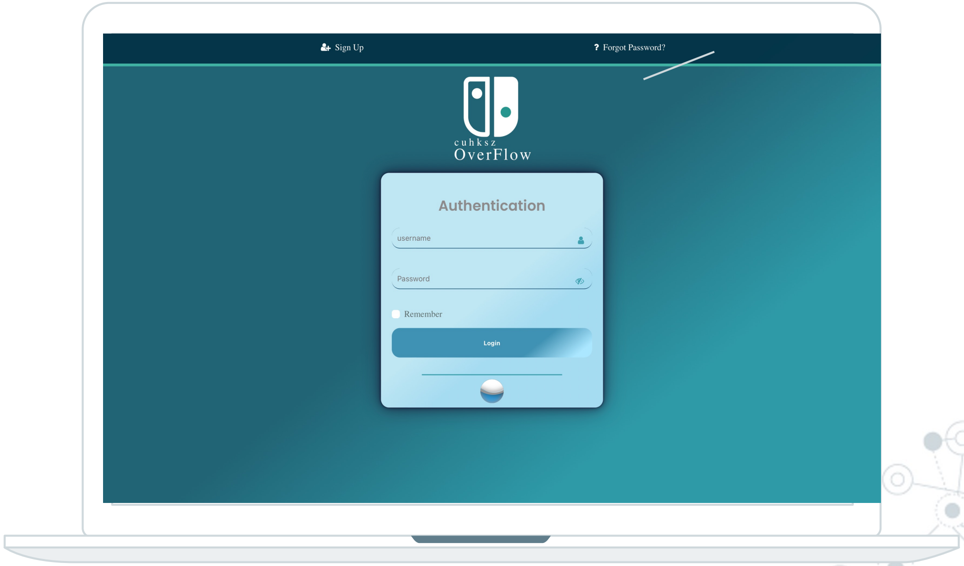
id	select_type	table	partitions	type	possible_keys	key	key_len	ref	rows	filtered	Extra
1	SIMPLE	our_project_user	NULL	ref	Index_user_name	Index_user_name	137	const	1	100.0	Using index



```
username = request.POST['username']
userid = User.objects.filter(username = username).values()[0]['id']
```

5.

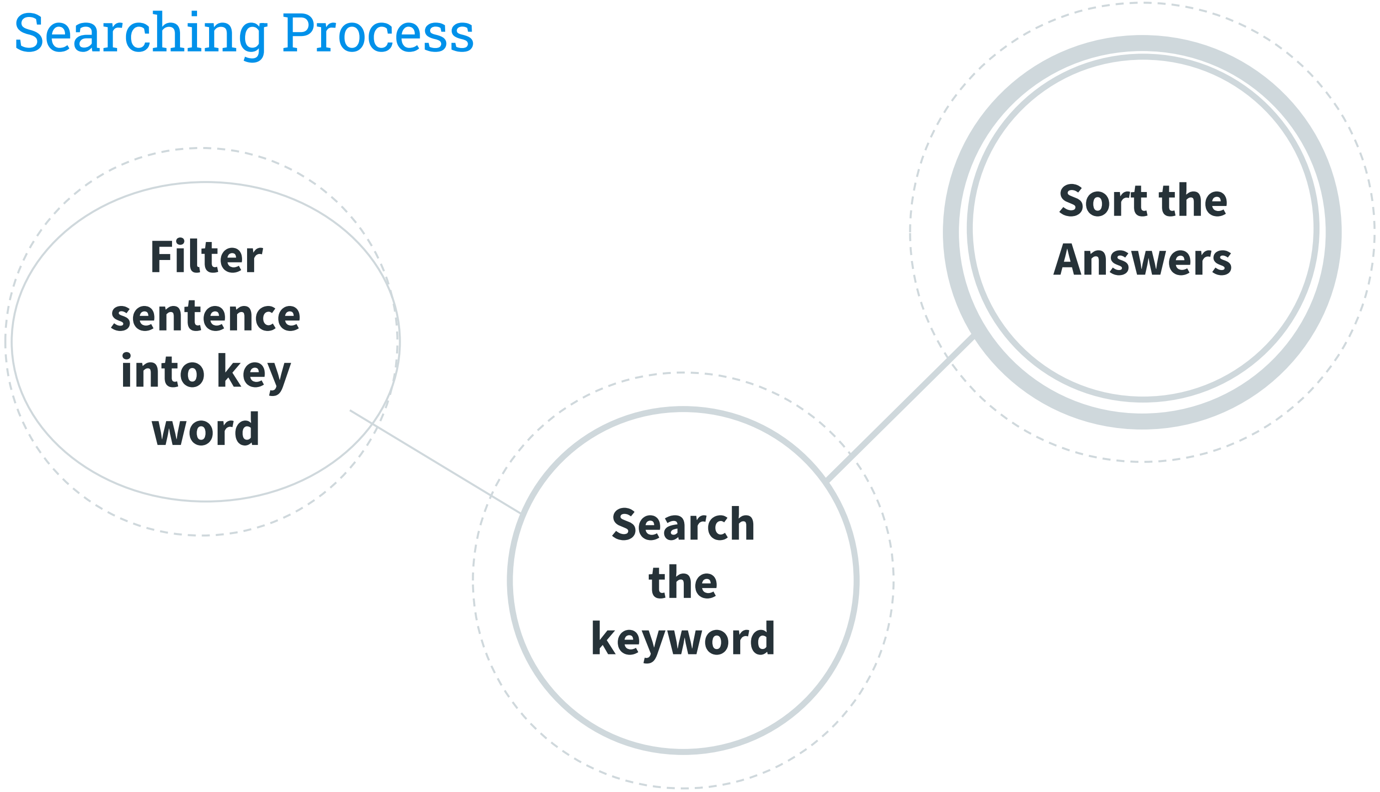
Web Demo


Sign Up
Forgot Password?
cuhksz
OverFlow
Authentication
username
Password
Remember
Login

6.

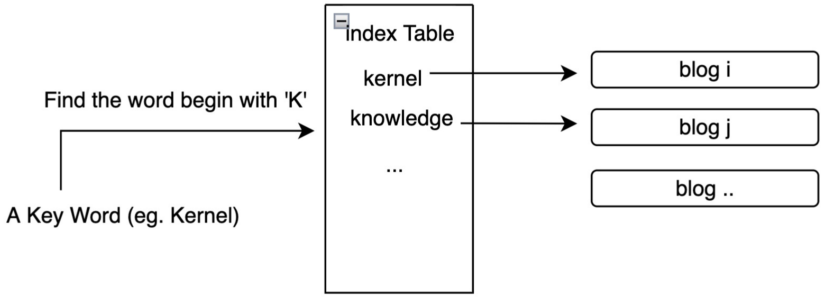
Data Mining

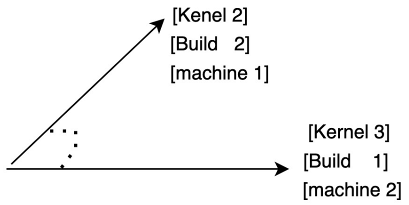
Searching Process



Search Engine

- **Key word tokenized:** Natural Language processing (filter the stop word, tense identify, upper letter)
- **Searching Speed:** inverted index table
- **Similarity Comparision:** TF-IDF, key word vector projection





Thanks!

If you have any questions, feel free to raise up!