

# Using MySQL database in the department

COMP3278B 2020

# Objectives

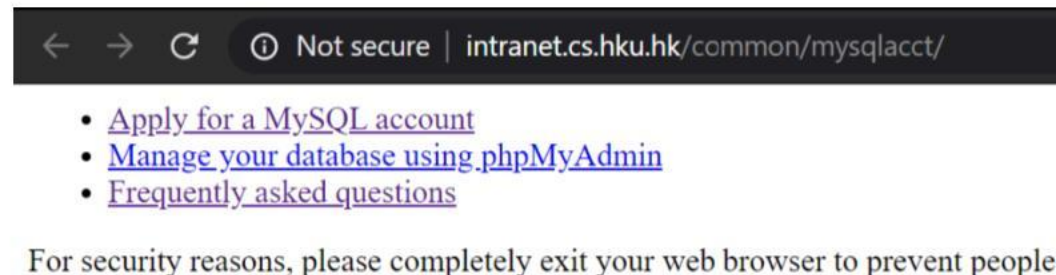
- To enable access to MySQL database in the department.
- To understand the different access method to the MySQL server in the department.

# Apply for a MySQL database account

- Before you can start using the MySQL database in the department, you must apply for an account through the link below.

<https://intranet.cs.hku.hk/common/mysqlacct/>

- Your account will be available within a few days.



# Accessing database

There are two suggested ways to access the database.

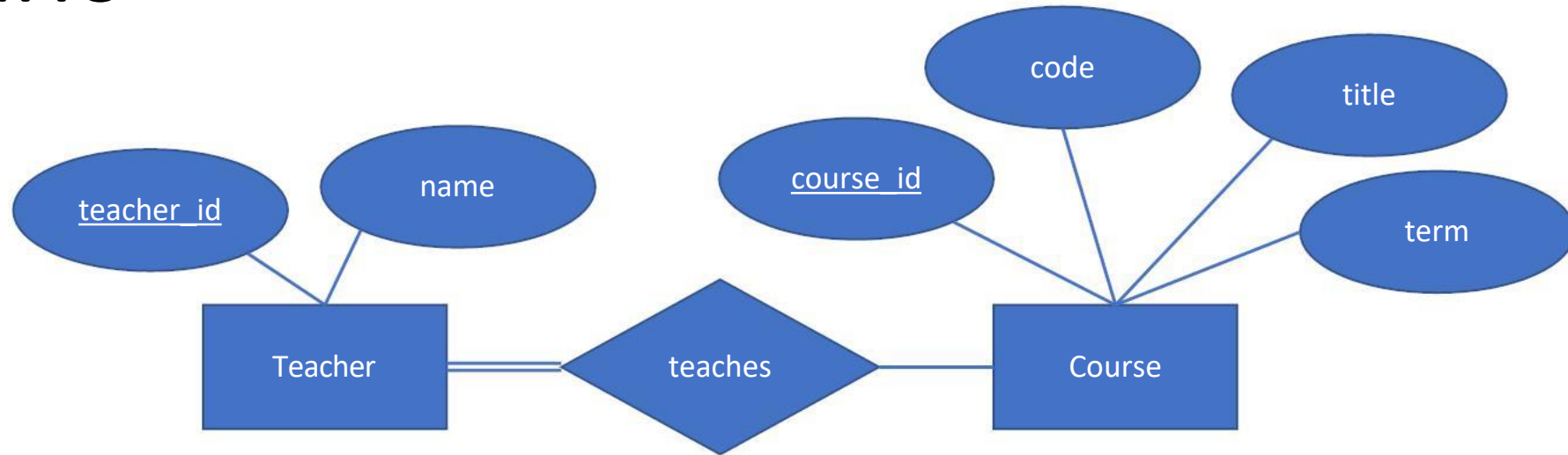
- **Web interface**

- Simple to use
- UI that allows you to work with the database without using MySQL
- Not developed by MySQL, may not be available in some system

- **MySQL client**

- Need to use SSH to connect to the department server
- Bundled with MySQL database, always available to use

# Scenario



- Teacher (teacher\_id, name)
- Course (course\_id, code, title, term)
- teaches (teacher\_id, course\_id)
  - teacher\_id REFERENCES Teacher(teacher\_id),
  - course\_id REFERENCES Course(course\_id)

In this tutorial, we are going to create the tables through the web interface, then insert data through the MySQL client.

# phpMyAdmin

- Web interface for the MySQL database in the department is accessible at the following URL.

<https://i.cs.hku.hk/phpmyadmin/>

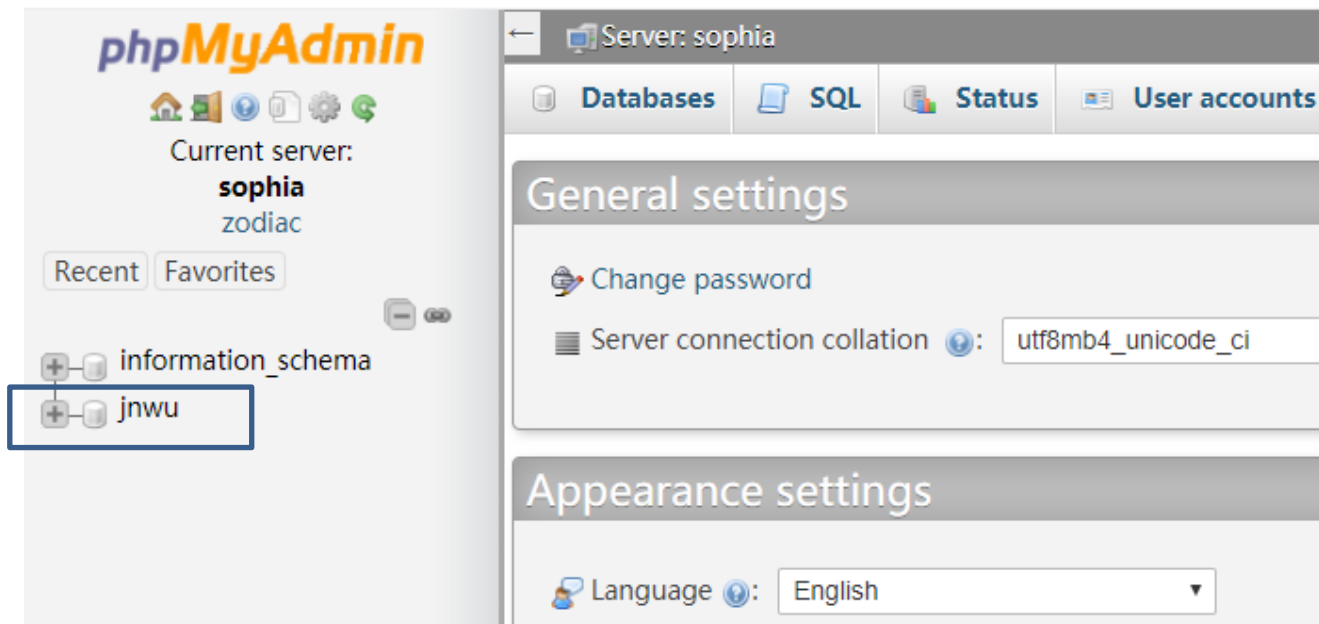
- The web interface runs the application phpMyAdmin, a very common choice of web interface for MySQL.
  - Username: your CS login
  - Password: the password you choose when you apply for a database account



The screenshot shows the phpMyAdmin login page. At the top, there is a logo with a sailboat and the text "phpMyAdmin". Below the logo, it says "Welcome to phpMyAdmin". There are two main sections: "Language" and "Log in". The "Language" section has a dropdown menu currently set to "English". The "Log in" section has three input fields: "Username:", "Password:", and "Server Choice:". The "Server Choice" dropdown is currently set to "sophia". At the bottom right of the "Log in" section, there is a "Go" button.

# Choose a database

- Once logged in, you will see a database with your CS login name.
  - This is the only database you can use.
  - **information\_schema** is a database that provide meta information of the database system, we will not use it.



# Create table - Teacher

Field	Type	Options
teacher_id	INT	not null
name	VARCHAR(100)	not null

## ***Teacher***

Table name: Teacher

Primary key: teacher\_id

1 (specify name and # of columns)

2

3 (input info)

4 (choose "PRIMARY")

5

6

pop-up

Preview SQL Save



# Check result

Check that columns are created with the correct name and type

Check NULL options

Check Primary key

Foreign keys could be added here

The screenshot displays a database management interface. At the top, there are tabs for 'Browse', 'Structure', 'SQL', 'Search', 'Insert', and 'Export'. Below these are buttons for 'Table structure' and 'Relation view'. The main area shows a table structure with two columns:

#	Name	Type	Collation	Attributes	Null	Default
1	teacher_id	int(11)			No	None
2	name	varchar(100)	utf8_unicode_ci		No	None

Below the table structure, there are buttons for 'Check all', 'With selected:', 'Browse', 'Change', and 'Drop'. There are also buttons for 'Print', 'Propose table structure', 'Track table', and 'Move column'. A section for adding columns is visible with 'Add', a text input '1', 'column(s)', a dropdown 'after name', and a 'Go' button. A button labeled '+ Indexes' is highlighted with a black box and an orange arrow pointing to the 'Indexes' section below. The 'Indexes' section has a button with a question mark icon. Below this is a table of indexes:

Action	Keyname	Type	Unique	Packed	Column	Cardinality	Collation	Null	Comment
Edit  Drop	PRIMARY	BTREE	Yes	No	teacher_id	0	A	No	

At the bottom, there is a section for creating an index with the text 'Create an index on', a text input '1', 'columns', and a 'Go' button.

# Create table - exercise

- As you can see, you can simply create a table by specifying the columns, data type, and other options.
- Now try to create the Course table using the same flow.

Field	Type	Options
course_id	INT	not null
code	VARCHAR(10)	not null
title	VARCHAR(200)	not null
term	CHAR(1)	not null

## Course

Table name: Course

Primary key: course\_id

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
<input type="checkbox"/>	1	course_id	int(11)		No	None			Change
<input type="checkbox"/>	2	code	varchar(10)	utf8_unicode_ci	No	None			Change
<input type="checkbox"/>	3	title	varchar(200)	utf8_unicode_ci	No	None			Change
<input type="checkbox"/>	4	term	char(1)	utf8_unicode_ci	No	None			Change

☐ Check all    With selected: Browse   Change   Drop   Primary   Unique

Print   Propose table structure     Track table   Move columns   Improve table structure

Add    column(s)

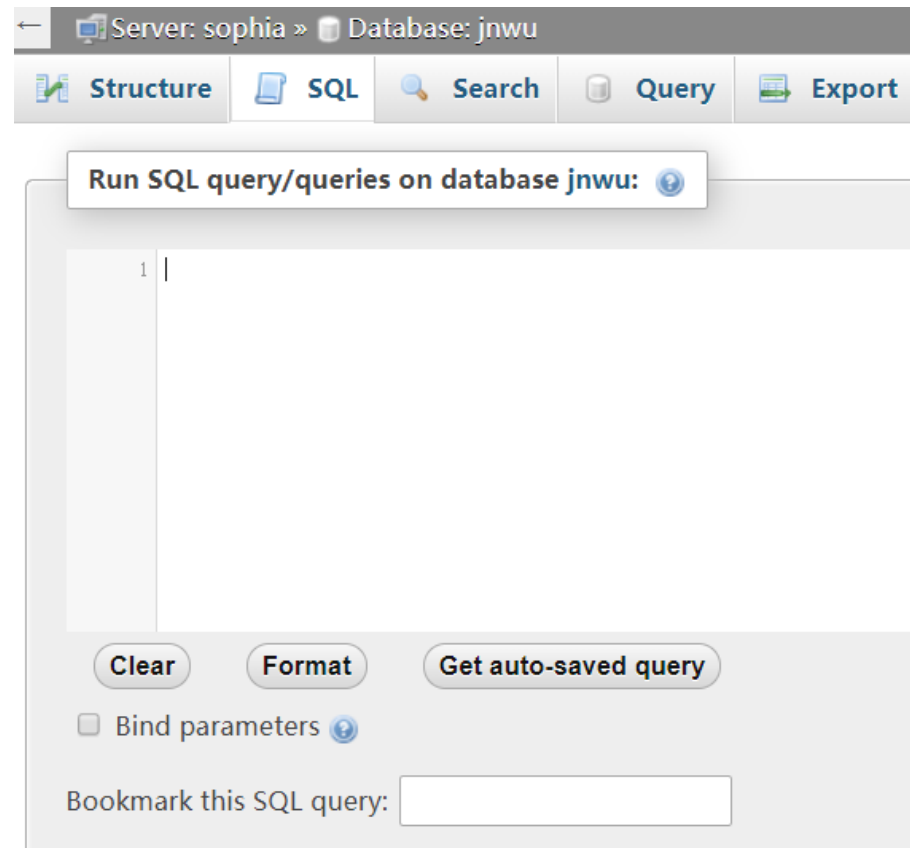
- Indexes

Indexes

Action	Keyname	Type	Unique	Packed	Column	Cardinality	Collation	Null	Comment
Edit    Drop	PRIMARY	BTREE	Yes	No	course_id	0	A	No	

# Create table (SQL)

- Alternatively, we can use the SQL tab to input SQL directly.



What is the corresponding SQL that creates this table?

Field	Type	Options
teacher_id	int	Not null
course_id	varchar(10)	Not null

## ***teaches***

Table name: teaches

Primary key: teacher\_id, course\_id

Foreign key:

teacher\_id → Teacher.teacher\_id,

course\_id → Course.cours\_id

# Create table - teaches

Field	Type	Options
teacher_id	int	Not null
course_id	varchar(10)	Not null

## *teaches*

Table name: teaches

Primary key: teacher\_id, course\_id

Foreign key:

teacher\_id → Teacher.teacher\_id,

course\_id → Course.cours\_id

Run SQL query/queries on database jnwu: ⓘ

```
1 CREATE TABLE teaches (  
2   teacher_id INT NOT NULL,  
3   course_id INT NOT NULL,  
4   PRIMARY KEY(teacher_id, course_id),  
5   FOREIGN KEY(teacher_id) REFERENCES Teacher(teacher_id),  
6   FOREIGN KEY(course_id) REFERENCES Course(course_id)  
7 );  
8
```

[Clear](#) [Format](#) [Get auto-saved query](#)

☐ Bind parameters ⓘ

Bookmark this SQL query:

[ Delimiter  ] ☒ Show this query here again [Go](#)

☐ Retain query box

☐ Rollback when finished ☒ Enable foreign key checks

```
CREATE TABLE teaches (  
    teacher_id INT NOT NULL,  
    course_id INT NOT NULL,  
    PRIMARY KEY(teacher_id, course_id),  
    FOREIGN KEY(teacher_id) REFERENCES Teacher(teacher_id),  
    FOREIGN KEY(course_id) REFERENCES Course(course_id)  
);
```

✓ MySQL returned an empty result set (i.e. zero rows). (Query took 0.0071 seconds.)

```
CREATE TABLE teaches ( teacher_id INT NOT NULL, course_id INT NOT NULL, PRIMARY  
KEY(teacher_id, course_id), FOREIGN KEY(teacher_id) REFERENCES Teacher(teacher_id),  
FOREIGN KEY(course_id) REFERENCES Course(course_id) )
```

[\[ Edit inline \]](#) [\[ Edit \]](#) [\[ Create PHP code \]](#)

# Insert data

We are going to input some data referencing from the department website.

<https://www.cs.hku.hk/programmes/course-offered>

- Let's insert for our own course. First, we insert a Teacher record.

The screenshot shows the phpMyAdmin interface for a server named 'sophia' and a database named 'jnwu'. The 'Table: Teacher' is selected. The 'Insert' tab is active, showing a form with columns 'teacher\_id' (int(11)) and 'name' (varchar(100)). The 'teacher\_id' field contains the value '1', and the 'name' field contains 'Dr. Luo Ping'. A 'Go' button is at the bottom right of the form. The sidebar on the left shows the database tree with 'information\_schema', 'jnwu', and 'New' under 'jnwu'. The 'Teacher' table is selected under 'jnwu'.

1 (select a table)

2 (choose Insert tab)

3 (input data)

4

# More insert

- Similar for Course...

phpMyAdmin

Current server:  
**sophia**  
zodiac

Recent Favorites

information\_schema  
jnwu  
New  
Course  
Teacher  
teaches

Server: sophia » Database: jnwu » Table: Course

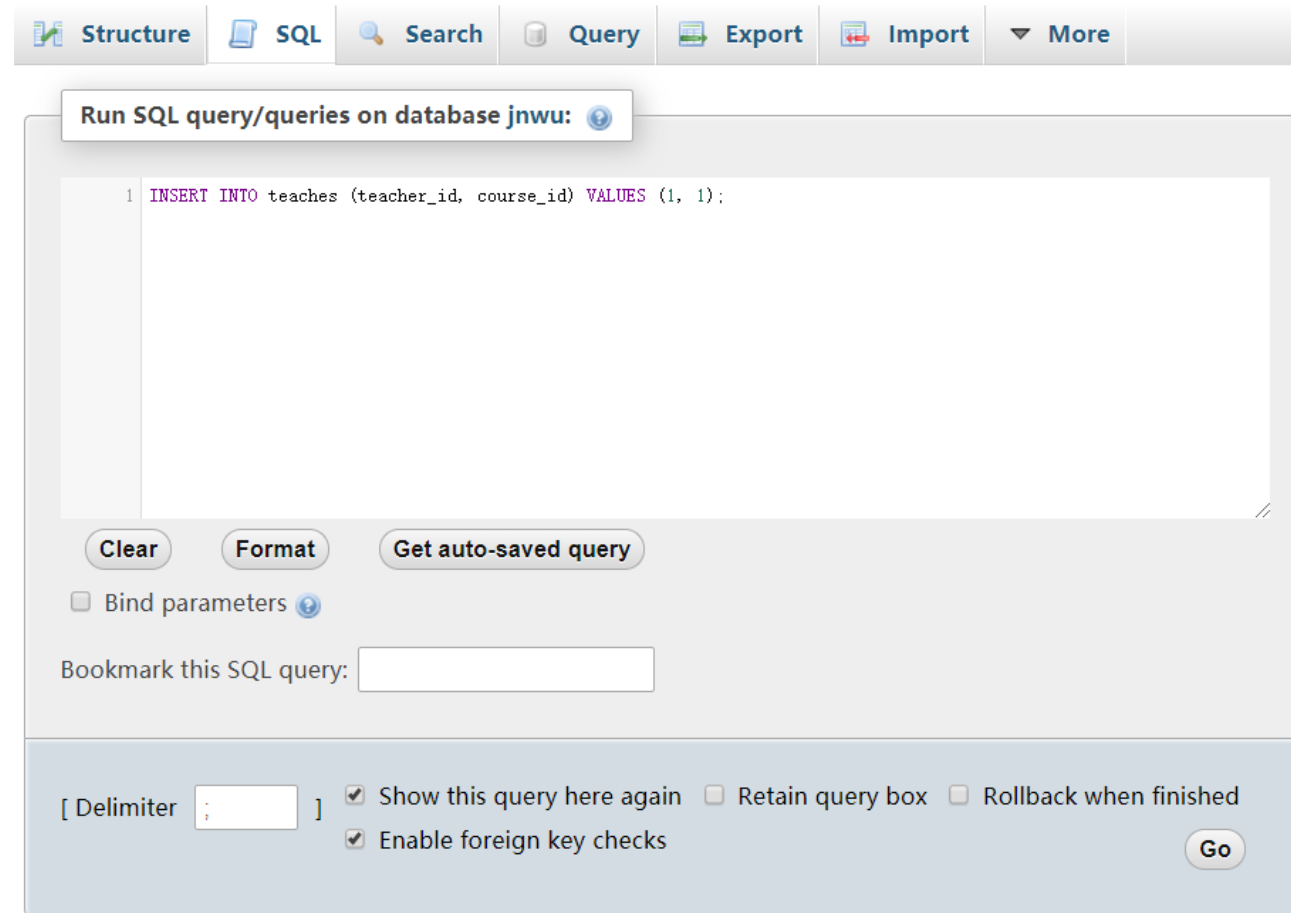
Browse Structure SQL Search Insert Export Import Privileges

Column	Type	Function	Null	Value
course_id	int(11)			1
code	varchar(10)			COMP3278B
title	varchar(200)			Intro. to Database Management Systems
term	char(1)			2

Go

# Insert by SQL

- Of course, you can simply use SQL to insert.



The screenshot shows a web-based database management tool interface. At the top, there is a navigation bar with tabs: Structure, SQL, Search, Query, Export, Import, and More. Below this, a header bar indicates the current database is 'jnwu'. The main area is a large text editor for writing SQL queries. The query entered is: `1 INSERT INTO teaches (teacher_id, course_id) VALUES (1, 1);`. Below the editor are buttons for 'Clear', 'Format', and 'Get auto-saved query'. There is a checkbox for 'Bind parameters' which is currently unchecked. Below that is a text input field for 'Bookmark this SQL query:'. At the bottom, there is a section for query execution options, including a 'Delimiter' dropdown set to semicolon, checkboxes for 'Show this query here again', 'Retain query box', 'Rollback when finished', and 'Enable foreign key checks', and a 'Go' button.

Run SQL query/queries on database jnwu: ⓘ

```
1 INSERT INTO teaches (teacher_id, course_id) VALUES (1, 1);
```

Clear Format Get auto-saved query

☐ Bind parameters ⓘ

Bookmark this SQL query:

[ Delimiter  ] ☒ Show this query here again ☐ Retain query box ☐ Rollback when finished ☒ Enable foreign key checks

# Exercise – Insert data

- Insert the necessary data for one more course listed in the department website.
  - <https://www.cs.hku.hk/programmes/course-offered>

Year 3 - Core			
COMP3230A	Principles of Operating Systems (CS)	1	Dr. Tam Anthony
COMP3230B	Principles of Operating Systems (CE, BBAIS, 2nd Major)	1	Prof. Wang C L
COMP3234	Computer and Communication Networks	2	Dr. Wu C
COMP3250A	Design and Analysis of Algorithms	2	Dr. Huang Z.Y.
COMP3250B	Design and Analysis of Algorithms (advanced class)	2	Prof. Lam T W
COMP3278A	Intro. to Database Management Systems (CS)	1	Dr. Lam Ka Man Carmen
COMP3278B	Intro. to Database Management Systems (BBAIS, CE, CDA, Dec Analytics, EEE, Minor, 2nd Major)	2	Dr. Luo Ping



# Final words on phpMyAdmin

- You can explore how to insert data into the tables using phpMyAdmin, it is straight forward.
- When using SQL, make sure you have selected your own database, otherwise it will complain that you have not selected a database.
- Try not to rely too much on the web interface. It is essential to learn how to use the client if you are going to develop applications that uses database in the future.

# Accessing MySQL client – SSH connection

- Recall how you can SSH to the department server. You could check the FAQ below.
  - <https://intranet.cs.hku.hk/csintranet/contents/technical/howto/ssh.jsp>
    - Instead of using server **academy11**, you should use **workbench4**
- In brief:
  - First SSH to **gatekeeper.cs.hku.hk**, then SSH to **workbench4**.
  - Alternatively you can use CSVPN, then you only need to SSH to **workbench4.cs.hku.hk**

# SSH connection demo 1

SSH is available in PowerShell in Windows 10 and any terminal in Linux/MacOS.

```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.
```

```
Try the new cross-platform PowerShell https://aka.ms/pscore6
```

```
PS C:\Users\kevin> ssh yklam2@gatekeeper.cs.hku.hk
```

```
The authenticity of host 'gatekeeper.cs.hku.hk (147.8.179.11)' can't be established.
```

```
ECDSA key fingerprint is SHA256:YjTJqh3reNV5lFH35YrC/e4GwzZ6uIWEhJAjR1n14P0
```

```
Are you sure you want to continue connecting (yes/no)? yes
```

```
Warning: Permanently added 'gatekeeper.cs.hku.hk,147.8.179.11' (ECDSA) to the list of known hosts.
```

```
yklam2@gatekeeper.cs.hku.hk's password: 
```

```
***** gatekeeper *****
```

```
You may also ssh to gatekeeper2.cs.hku.hk from the Internet
```

```
You may also use CSVPN to access computing facilities of the CS department.
```

```
See https://intranet.cs.hku.hk/csintranet/contents/technical/howto/csvpn
```

```
yklam2@gatekeeper:~$
```

`ssh cs_login@gatekeeper.cs.hku.hk`  
(replace cs\_login with your own login)

This will appear when you connect the first time, answer “yes”

Enter your CS login password when you see this. NOTHING will be shown when you type, just press enter after typing your password

You are now logged into gatekeeper.cs.hku.hk  
Continue in the next page

# SSH connection demo 1 (cont'd)

```
jnwu@gatekeeper:~$ ssh workbench4
Failed to add the host to the list of known hosts (/home/restricted/.ssh/known_hosts).
jnwu@workbench4's password:
Welcome to Ubuntu 18.04.5 LTS (GNU/Linux 4.15.0-130-generic)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Sun Jan 17 20:39:15 HKT 2021

System load:      1.19      Processes:         24
Usage of /home:   unknown   Users logged in:   0
Memory usage:     0%       IP address for eth0: 147.8.179.84
Swap usage:       0%

Last login: Sat Jan 16 22:16:28 2021 from 147.8.179.11
jnwu@workbench4:~$
```

ssh cs\_login@workbench4.cs.hku.hk  
(cs\_login and .cs.hku.hk could be omitted here)

Enter your CS login password again

Now you are connected!

# SSH connection demo2

PuTTY is another choice of SSH client, which is available in Windows.  
Also possible to install in Linux and MacOS.

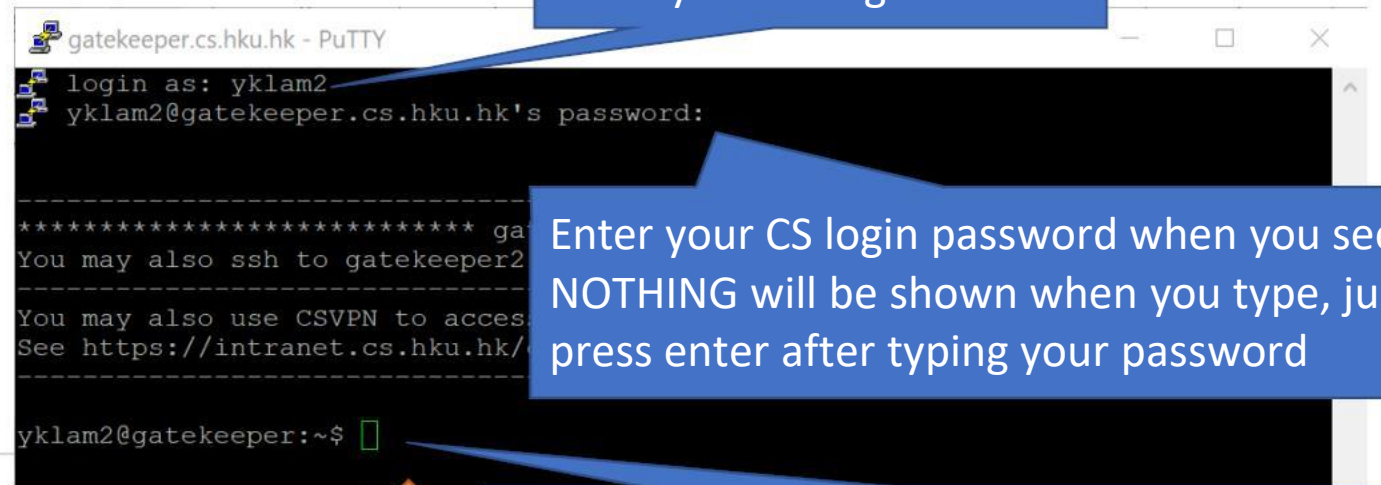
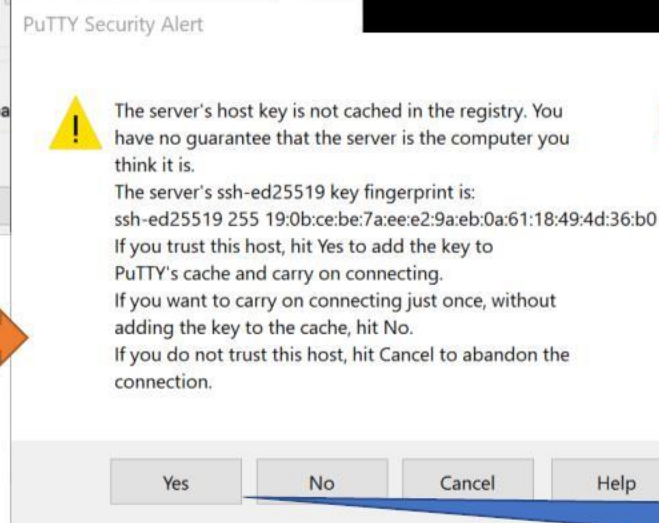
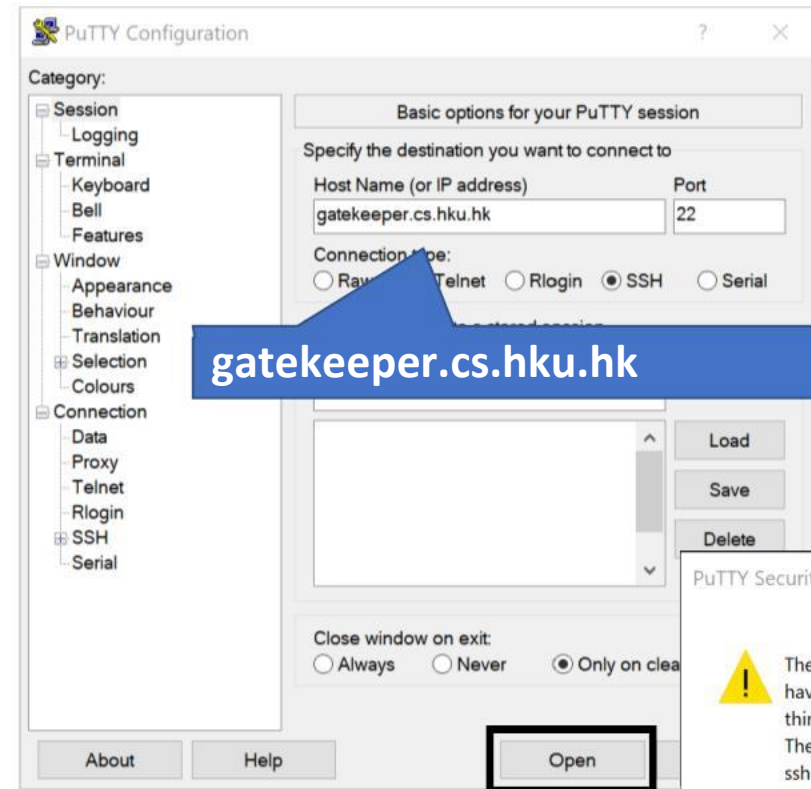
Enter your CS login name

gatekeeper.cs.hku.hk

Enter your CS login password when you see this.  
NOTHING will be shown when you type, just press enter after typing your password

At this point onwards, you can SSH to **workbench4** as in the second part of demo 1.

This will appear when you connect the first time, click "yes"



# Using the MySQL client

- Once you have logged into **workbench4**, you can start the MySQL client with the following command.

```
mysql -h sophia -u cs_login -p
```

- **-h** specify the host to connect to. **sophia** is the server hosting the MySQL database.
- **-u** specify the user name used to login.
  - Replace ***cs\_login*** with your own CS login
- **-p** specify that we want to provide a password.
- When you are asked for a password, enter your MySQL password.
- To exit from the client, use command “quit”

# MySQL client - login

Start MySQL Client

```
jnwu@workbench4:~$ mysql -h sophia -u jnwu -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 8856
Server version: 5.7.32-0ubuntu0.18.04.1 (Ubuntu)

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql>
```

Enter password  
Again, NOTHING will be shown  
when you type your password

You are now inside the client

# MySQL client – check and use database

- Once you have logged into a client, you have to select a database to work on.

**SHOW DATABASES;**

This SQL list all available databases

**USE *database\_name***

This command specify that you want to use the specific database, in this case, you should replace database\_name with your own CS login

```
mysql> SHOW DATABASES;
+-----+
| Database |
+-----+
| information_schema |
| jnwu      |
+-----+
2 rows in set (0.02 sec)
```

```
mysql> USE jnwu
Reading table information for completion of table and column names
You can turn off this feature to get a quicker start with MySQL.

Database changed
mysql>
```



# MySQL client – check tables

- We can take a look at the available tables in the database

The screenshot shows a MySQL command-line interface. The first command, `SHOW TABLES;`, is highlighted with a yellow box. A callout box points to it, stating: "SHOW TABLES; This SQL list all available tables in the current database". The output of this command is a table with one column and three rows: `Tables_in_jnwu`, `Course`, `Teacher`, and `teaches`. The second command, `DESCRIBE Teacher;`, is also highlighted with a yellow box. A callout box points to it, stating: "DESCRIBE *table\_name*; This SQL show the columns in the specific table." The output of this command is a table with seven columns: `Field`, `Type`, `Null`, `Key`, `Default`, and `Extra`. It contains two rows of data for the `Teacher` table.

```
mysql> SHOW TABLES;
```

Tables_in_jnwu
Course
Teacher
teaches

3 rows in set (0.00 sec)

```
mysql> DESCRIBE Teacher;
```

Field	Type	Null	Key	Default	Extra
teacher_id	int(11)	NO	PRI	NULL	
name	varchar(100)	NO		NULL	

2 rows in set (0.00 sec)

**SHOW TABLES;**  
This SQL list all available tables in the current database

**DESCRIBE *table\_name*;**  
This SQL show the columns in the specific table.

# MySQL client – check data

- Now we can start using SQL to query the database.

```
mysql> SELECT * FROM Teacher;
+-----+-----+
| teacher_id | name      |
+-----+-----+
|          1 | Dr. Luo Ping |
+-----+-----+
1 row in set (0.00 sec)

mysql> SELECT * FROM Course;
+-----+-----+-----+-----+
| course_id | code      | title                                     | term |
+-----+-----+-----+-----+
|          1 | COMP3278B | Intro. to Database Management Systems | 2    |
+-----+-----+-----+-----+
1 row in set (0.00 sec)

mysql> SELECT * FROM teaches;
+-----+-----+
| teacher_id | course_id |
+-----+-----+
|          1 |          1 |
+-----+-----+
1 row in set (0.00 sec)
```

# Exercise – Insert data in MySQL client

- Insert the necessary data for one more course listed in the department website.
  - <https://www.cs.hku.hk/programmes/course-offered>

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