ICT2103: Information Management
Lab 1: Python-based Database

Objectives
To learn the basic database operations via Python and SQLAlchemy.

Deliverables
You are required to finish the lab tasks listed below and submit your code file. All tasks shall be completed.

Format: **ONE (1) IPYNB file** (ONE cell per task, in total **EIGHT (8) cells**).
Filename: <lab id>_<student id>_<name>_Lab1.ipynb.
            (i.e., **P0_2002103_ZhangWei_Lab1.ipynb**)
Venue: Dropbox in xSiTe.
Deadline: the end of the week (Sunday, 11:30pm) when the lab is conducted.
Penalty: A penalty of 20% for wrong format or filename and 10% per day for late submission will be imposed. A penalty of 100% for this lab will be imposed for the 1st time plagiarism and a penalty of 100% for ALL the labs for the 2nd time plagiarism.

Software and References
Jupyter Notebook.
SQLAlchemy tutorials are available online.

Background
We not yet introduce the technical detail, i.e., SQL coding, of a database system in the first week. In this week's lab, we aim to understand the basic database operations, based on our existing skillset, Python. Specifically, there is a Python library, called SQLAlchemy, which allows us to bypass the SQL statements and perform the database operations in Python. We will learn how to create a database and a table with SQLAlchemy first. Accordingly, we perform the basic CRUD (create, read, update, and delete) operations. After the lab, you would be well prepared for the next week's lecture on SQL.
(Note: You are allowed to work on team projects during the lab hours and discuss with the lab instructors about your project.)
(Note: You are **strongly encouraged to go beyond** our lecture materials to explore the latest and advanced database technologies.)

Tasks:

Q1. Please import the necessary libraries, define a database table as a class, and create the table in the database. The class name is 'CLS2122T1', and the table name is 'TB2103'. The table has 3 columns, namely sid (for student identifier as an integer and **primary key**), name (for the name of a student), and grade (for the grade of a student).
(Hint: Resources are available online and it is unnecessary to reinvent the wheel.)

Q2. Perform the 1st **read** operation in the table 'TB2103' just created. Display all the rows, if any, in the table and check if the table is empty.
(Note: Every display operation in our tasks is a read operation.)

Q3. Perform the 1st **insert** operation by adding you as a new student (e.g., with sid 2002103, name 'ZHANG Wei', and grade 'NA') into the table 'TB2103'. Display all the rows in the latest table.
(Note: Shall be your own info, not the info of the instructors.)

Q4. Perform the 2nd and 3rd **insert** operations by adding a new student (with sid 2002345, name 'Sansa Stark', and grade 'NA') and another new student (with sid 2003456, name 'Jon Snow', and grade 'NA') into the table 'TB2103'. Display all the rows in the latest table.

Q5. Perform the 1st **update** operation by updating the grade of Jon Snow to 'A-'. Display all the rows in the latest table.

Q6. Perform the 2nd **update** operation by updating the grade of yourself to 'A+'. Display all the rows in the latest table.

Q7. Perform the 1st **delete** operation by deleting the student 'Sansa Stark'. Display all the rows in the latest table.

Q8. Perform the 2nd **delete** operation by deleting all the students in the table 'TB2103'. Display all the rows in the latest table.

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