DS 5110: Introduction to Data Management and Processing (Fall 2022) Dr. Roi Yehoshua
Student name: (Due) December 7, 2022

Final Project

1 Project Description

In this project you will build a database system that includes a database and an application that uses this database. The project consists of database design, data modeling and normalization, data collection, processing, and reporting. Completion of the project will include a project proposal, a presentation and a final report.

2 Teams

Teams should have 2–3 members. Teams of size 1 or 4 are not restricted, but will only be allowed per request (i.e., a reason must be provided and found reasonable). Each student in the team should work on a different part of the project and what each student will work on should be explicitly listed in the project proposal.

3 Sample Topics

This section provides some examples for systems that you may develop, but you are welcome to choose anything else that interests you.

- Movie theater reservation system.

  Design and implement a system for reserving tickets to a movie theater. Users of the system can perform tasks such as searching for a movie, viewing movie show details and schedules, booking a movie show, card registration and receiving tickets. Admins can use the system to insert, update and delete data such as movie descriptions and movie schedules, which will update the related web pages and will be accessible by the customers. Admins can also access statistics about the movie theater, such as what are the most popular movies and the monthly revenue.

- Hospital database management system.

  Design and implement an automated system that handles doctors' and patients' data in a hospital. The system enables an admin to register a patient for the hospital and store their disease details into the database. Doctors can add, view, or update their patients' data, including their subscriptions, diagnosis and lab results. Patients can search for availability of doctors and make appointments via a web or a mobile application. Admins can access statistics about the hospital such as room capacity, number of doctors/patients in each department, etc.

- Restaurant database management system.

Design and implement a system that automates the day-to-day activity of a restaurant. After a successful login to the system, customers can browse through the menu of the restaurant, and look at the various food options available along with the price of each item. Then they can select items from the menu and add them to their order. Customers should also be able to reserve tables at the restaurant or join a reservation waiting list. Chefs of the restaurant can view the current queue of orders, and update the order status to ready once it is prepared. Restaurant managers should be able to view statistics about the restaurant such as weekly sales and current inventory.

- Library database management system.

  Design and implement a system that keeps track of books and their checkouts, as well as member accounts and subscriptions. Users of the system will be able to search for books, issue and return books, and check fines (if any). Librarians can read information about any member, track the books issued by a particular member, and update the availability status of books. Admins should be able to view, update or delete all members records, and update or delete book records.

4 Project Requirements

Your database should include the following components:

- At least 12 tables. Each table should contain at least 10 rows.
- At least 2 views.
- At least 3 stored procedures and 3 functions.
- At least one trigger.

The database needs to be normalized to the Third Normal Form (at least).

In addition, you need to develop an application in a high-level programming language (e.g., Python) that demonstrates the interaction with the database. The application should allow the user to run queries on the tables, and insert/update/delete data into the tables. One of the queries should include a join of at least 3 tables.

The application can work from the command line (i.e., it does not have to include a graphical user interface).

5 Project Proposal

The project proposal is a short document (2-3 pages) that describes the system you intend to build and includes an initial design of the database. The proposal must specify all the following items:

- Project participants: Who is on the team? Is there a clear division of labor between the team members?
- System description: What are the objectives of the database system you are going to develop? Describe the system requirements and its main features.
- Database design: Initial ERD of the database that depicts the main tables and their relationships.
- Data sources: Where will the data come from? Which preprocessing steps will be needed to clean and prepare the data?
- Libraries and tools: What libraries/platforms are you going to use in order to accomplish the project? Provide references where applicable.

6 Project Presentation

Towards the end of the semester, each team will present its project to the class. The presentation should include the following items:

1. A Power Point slide deck, containing highlights, to showcase the project.
2. The final ERD.
3. A demo of the application running on some sample inputs.
4. At least two reports or graphs that show relevant information from the database.

The presentation materials should be uploaded to Canvas on the day before the presentation. The presentation should be 5 minutes long, with an additional 1-2 minutes for questions. All members of the team should take part in the presentation.

7 Project Report and Deliverables

Your final submission should include a report that describes the system you have built. The report should have the following sections:

1. Introduction: A general description of the database system and its objectives.
2. Database design: The final ERD of the database. Explain your key design decisions. Describe any normalization procedures you have taken.
3. Data collection: If you used external data to populate the database, describe how the data was acquired and from where (with proper references). Describe any processing procedures used to prepare the data (e.g., cleaning procedures, aggregating data from different sources, etc.).
4. Application description: Describe the main features provided by the application, and how the application stores and retrieves data from the database.
5. Conclusions / future directions: What have you learned from this project? If you had more time to spend on the project, what would you have liked to do next? What advice about the project would you give to future DS 5110 students?

In addition to the report, your final submission should include the following deliverables:

1. The final ERD.
2. The database schema diagram. This should be generated from the final database.
3. The SQL DDL statements for creating the database and its components (views, stored procedures, etc.).
4. Source code of the application. The source code should be well commented and organized, and run without errors.

8 Academic Integrity

The system should be built entirely by yourself and your teammates from the ground up, and must not contain any part of someone else's work (e.g., copying code from online sources is totally forbidden). Any project suspected of plagiarism will automatically receive a grade of 0 and report to the university administration (OSCCR).

9 Timeline

All deliverables must be submitted to Canvas on the due date before 11:59 PM. The submission should be made by all team members.

- The project proposal is due 10/27.
- Project presentations will take place in the final two classes on 11/28 and 12/5.
- **The final project report / deliverables is due on 12/7.**