CSCI 440. Database Systems

3 Credits. (3 Lec) MWF

PREREQUISITE: CSCI 232. Data Base Management System (DBMS) architecture; major database models; relational algebra fundamentals; SQL query language; index file structures, data modeling and management, entity relationship diagrams. CSCI 366 is recommended.

Overview

CS440 is designed to familiarize you with databases, a key component of modern computing. Databases are typically (though not always) how data is stored persistently, particularly in cloud-based systems, and have many useful and interesting tools and techniques associated with them.

The class itself will consist of an introduction to ER Diagrams (a graphical representation of data models) and then proceed to introduce SQL, the standard query language used in databases. We will then look at how to connect a web application to a database, which is one of the standard, core setups in most modern cloud environments today.

After that we will discuss some more advanced database techniques, including concurrency, then look at some “NoSQL” data stores that do away with the relational model. Finally, we will finish up with some cloud-specific techniques.

This class is not designed to be a killer, but to give you practical tools you can use in your career. There will be three homeworks and a project. The majority of your grades will be derived from tests that we will automatically run: you fix the tests by implementing functionality properly.

Logistics

Lectures

Lectures are at 1:30PM, MWF in RIED 105.

Rather than a midterm or final, the class will have quizzes every other Friday, starting the second week. The quizzes will be available via D2L.

All lectures will be live streamed via YouTube. There is an active Discord for the server.

Office Hours

Office hours are MWF, 2-3PM in my office, 364 Barnard, or on Discord

Course Grading

The course grading will be broken down as follows:

- Individual Programming Assignments - 70%
- Quizzes - 10%
- Homework - 20%

The project is the major focus of the class, and will be done individually and graded mainly via automated tests:

- 70% - The automated test suite (if the test suite passes, you are guaranteed to get a C on the project)
- 15% - A recorded demo, demonstrating the following functionality
  - Navigating the core entities in the database
  - CRUD operations on the Employee entity
  - Track search
  - Paging implemented in the Track main view
  - A Group By based report page
- 15% - Code quality and satisfaction of the Redis cache, determined by manual inspection

Book

The book for this course is "Database Systems: The Complete Book"

Class Schedule

Week	Topics	Assigned	Due
Week 1	Class Introduction	Github Repo Setup (Assignment 0)	
Week 2	ER Diagrams		Quiz 1, Github Repo Setup (Assignment 0)
Week 3	The Relational Model		
Week 4	SQL 1	Homework 1	Quiz 2
Week 5	SQL 2		Homework 1
Week 6	SQL 3		Quiz 3
Week 7	Web Programming & Databases	Project	
Week 8	Project Overview		Quiz 4
Week 9	DDL	Homework 2	
Week 10	Concurrency		Quiz 5, Homework 2
Week 11	Object Relational Mapping	Homework 3	
Week 12	Database Theory & Implementation		Quiz 6, Homework 3
Week 13	NoSQL: Redis & Mongo		
Week 14	Databases In The Cloud		Quiz 7
Week 15	Clustering & Sharding		
Week 16	Review		Quiz 8, Project