INF385M: Database Management

Semester: Fall 2024 (27780)
Time and Location: Tuesday 9:30-12:30PM at UTA1.208
Instructor: Ying Ding, ying.ding@ischool.utexas.edu, UTA5.432
Office Hours: Tuesday 12:30-1:30PM at UTA5.432 or via zoom by appointment
https://utexas.zoom.us/j/5128555388

Course Description

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Database is the foundation of Data Science. It provides the unique design to store, retrieve, and manage data. How to model data, encode context, enforce business rules, and achieve efficiency are critical for database management. This course provides the introductory understanding of relational database management with the focus on three parts. The first part is centered around the database management lifecycle by introducing business rules, ER diagram, and normalization. The second part talks about database query language SQL by explaining concepts and providing examples. The third part gives you the forward introduction of XML database which is the commonly used NoSQL database. The learning content will be delivered in the variety of exercises including lectures, tutorials, class activities, individual assignments, and group projects. This course empathizes peer learning, hands-on practices, forward exploring, and risk taking.

Pre-Requisites

No pre-requisites for this course.

Learning Outcomes

After attending this course, you should be able to achieve the following goals:

- Have the basic understanding of database management lifecycle
- Be familiar with relational database concepts
- Gain sufficient practices on SQL
- Grasp the brief introduction of XML database as one example of NoSQL database

How Will You Learn?

Statement of Learning Success

Your success in this class is important to me. We all learn differently, and everyone struggles sometimes. You are not, ever, the only one having difficulty! If there are aspects of this course that prevent you from learning or exclude you, please let me know as soon as possible. Together we will develop strategies to meet both your needs and the requirements of the course. I also encourage you to reach

out to the student resources available through UT and I am happy to connect you with a person or Center if you would like.

Teaching Modality Information
Classes will be in-person which requires in-person attendance.

Communication
The course Canvas site can be found at utexas.instructure.com. Please email me through Canvas or using my email above (the preferred way). You are responsible for ensuring that the primary email address you have recorded with the university is the one you will check for course communications because that is the email address that Canvas uses.

Asking for Help
You can reach me anytime by just sending me an email using my UT email address above. If you have specific coding issues with SQL or python, please feel free to reach out to our TA using the email above. I will host the office hours each week either at my zoom or in my office. There is no formality, simply drop by if you have any questions to discuss or simply just want to chat. All are welcome. TA will host his/her office hours each week as well. If you have any specific questions about data, coding, and homework, please feel free to talk to TA.

Services for Students with Disabilities
The university is committed to creating an accessible and inclusive learning environment consistent with university policy and federal and state law. Please let me know if you experience any barriers to learning so I can work with you to ensure you have equal opportunity to participate fully in this course. If you are a student with a disability, or think you may have a disability, and need accommodations please contact Services for Students with Disabilities (SSD). Please refer to SSD's website for contact and more information: http://diversity.utexas.edu/disability/. If you are already registered with SSD, please deliver your Accommodation Letter to me as early as possible in the semester so we can discuss your approved accommodations and needs in this course.

Course Requirements

Course Materials

Recommended books
Carlos Coronel and Steven Morris (2018). Database Systems: Design, Implementation, & Management (13th Edition). CenGage (ISBN10: 1337627909)

Avi Silberschatz, Henry F. Korth, S. Sudarshan (2019). Database System Concepts: Face The Real World of Database Systems Fully Equipped (Seventh Edition). McGraw-Hill (ISBN 9780078022159): https://www.db-book.com/

Anthony DeBarros (2018). Practical SQL: A beginner's guide to storytelling with data. No Starch Press (ISBN 1593278276)

Recommended Resources:

Data
Kaggle Datasets: https://www.kaggle.com/datasets

UC Irvine ML Datasets: https://archive.ics.uci.edu/

Government Data: https://data.gov/

Awesome-Text2SQL (dataset): https://github.com/eosphoros-ai/Awesome-Text2SQL (dataset section)

CMU database course dataset: https://www.db-book.com/university-lab-dir/sample_tables-dir/index.html

Software
MySQL: https://www.mysql.com/products/workbench/

Python Coding using Google Colab: https://colab.research.google.com/

Oxygen: https://www.oxygenxml.com/

Required Devices
A laptop is required and should be brought to the classroom.

Classroom Expectations
Class attendance and participation are important to build a welcoming and engaging learning environment for all of us. They are required and count 10% of your final grade. If you cannot attend a class, please send me your written excuse via email.

Course Outline
All instructions, assignments, readings, rubrics, and essential information will be on the Canvas website at utexas.instructure.com. Check Canvas regularly. Changes to the schedule may be made at my discretion if circumstances require. I will announce any such changes in class and will also communicate them via a Canvas announcement.

Schedule (tentative)

Date	Lecture (60mins)	Class Activities (45mins)	Lab/Tutorial (60mins)	Notes
L1-8/27	Introduction; Database History;		Course Overview	Expert group (1-LangChain+SQL, 2-Python SQL-SQLite, 3-Text2SQL, 4-SQL Storytelling)
L2- 9/3	Business Rule	MySQL Set Up T1: Create Tables	T2: Business Rule and ER Diagram (Ex1-2)	Form Expert Group
L3- 9/10	E-R Modeling	T0: SQL I Announce weekly SQL exercises	T2: Business Rule and ER Diagram (Ex3-6) Weekly SQL 1	**Business Rule and ER Diagram Due (Friday)**
L4- 9/17	SQL – Northwind I	Group 1 – LangChain+SQL	T0: SQL II, Weekly SQL 2	Form Group for final group project

L5- 9/24	Relational Database	Group 2 – Python SQLite	T0: SQL III, Weekly SQL 3	Send the group project title and team to TA
L6- 10/1	Normalization SQL – Northwind II	Group 3 – Text2SQL LLM Tutorial: Prompt Engineering I	T3: Normalization, Weekly SQL 4	**Relational Algebra and Normalization Due (Friday);**
L7- 10/8	Chatbot and TrustLLM (invited talk: Junyuan Hong, ECE)	Group 4 – SQL Storytelling	T4: MySQL-IVL Weekly SQL 5	Group project
L8- 10/15	Mid-term feedback (group project idea)	Group 1 – LangChain+SQL	T4: MySQL-MIMIC	**MySQL Due (Friday)**
L9- 10/22	SQL – Northwind III	Group 2 – Python SQLite LLM Tutorial: Prompt Engineering II	T5: SQL in Python, Weekly SQL 6	Group project
L10- 10/29	SQL Advanced	Group 3 – Text2SQL	T5: SQL in Python, Weekly SQL 7	**SQL in Python Due (Friday)**
L11- 11/5	Indexing	Group 4 – SQL Storytelling LLM Tutorial: Rag I	Weekly SQL 8	Group project
L12- 11/12	XML Database	Group project LLM Tutorial: Rag II	Group project	Group project
L13- 11/19	XQuery	Group project	Group project	**XQuery Assignment Due (Friday)**
11/26	Fall break			
L14-12/3	Final Presentation			
L15-12/10				**Final Group Report Due**

Expert Groups:

- G1: LangChain+SQL: https://python.langchain.com/v0.2/docs/tutorials/Links to an external site.
- G2: Python SQLite + visualization: https://docs.python.org/3/library/sqlite3.htmlLinks to an external site.
- G3: Text2SQL (advanced): https://github.com/eosphoros-ai/Awesome-Text2SQLLinks to an external site.
- G4: SQL Storytelling (no coding): https://www.amazon.com/Practical-SQL-Beginners-Guide-Storytelling/dp/1593278276

Course Assignments and Grading

Assignments

Individual Assignments (50%)

1. Business Rule and ER Diagram (10%):

2. Relational Algebra and Normalization (15%):

3. MySQL (10%): Build a database and Develop 10 SQL queries in MySQL (powerpoint slides showing SQL queries, meaning of each query, screenshots for results)

4. SQL in Python (10%): Load datasets and develop 10 SQL queries using Python (powerpoint slides showing SQL queries, meaning of each query, python code, screenshots of results).

5. XQuery (5%): Generate 5 XQueries on one XML document using Oxygen (powerpoint slides showing XQuery queries, meaning of each query, screenshots of results)

Group Project (40%): For a team with no more than 3 members to work on an interesting topic related to database management (powerpoint slides, code, and video). Some examples are (but not limited to):

- Large Language Model and SQL (e.g., Text2SQL)
- Digital storytelling using python visualization and databases
- Database application in specific domains (e.g., healthcare)
- Using SQL to prepare data or analyze features for machine learning tasks
- machine learning or deep learning methods using databases for storytelling (e.g., TabTransformer),
- ChatGPT and database (e.g., pgvector, vector database), or more.

Output: A report with less than 5 pages (aiming for a workshop paper using ACM template: https://www.acm.org/publications/taps/word-template-workflow), powerpoint slides, code, presentation/demo

Class presentations, participations, and final presentation (10%)

Late Work and Making Up Missed Work

Late work without proper excuse is not accepted. Each late work is subject to a 1-point grade reduction for every one hour late.

Absences

Each absence in class without proper excuse will get 1-point grade reduction from your final grade.

Equitable Accommodation

If you want to improve your grade, adding extra work to your assignments can be considered. Please discuss this with your instructor.

Grade Breaks

Grade	Cutoff
A	94%

A-	90%
B+	87%
B	84%
B-	80%
C+	77%
C	74%
C-	70%
D+	67%
D	64%
D-	60%
F	<60%

Course Policies and Disclosures

Academic Integrity Expectations

Students who violate University rules on academic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since such dishonesty harms the individual, all students, and the integrity of the University, policies on academic dishonesty will be strictly enforced. For further information, please visit the Student Conduct and Academic Integrity website at: http://deanofstudents.utexas.edu/conduct.

Getting Help with Technology

Students needing help with technology in this course should contact the ITS Service Desk or email iSchool Helpdesk <help@ischool.utexas.edu> for software, hardware, or other technology available at our iSchool.

Content Warning

Our classroom provides an open space for the critical and civil exchange of ideas. Some readings and other content in this course will include topics that some students may find offensive and/or traumatizing. I'll aim to forewarn students about potentially disturbing content and I ask all students to help to create an atmosphere of mutual respect and sensitivity.

Religious Holy Days

By UT Austin policy, you must notify me of your pending absence as far in advance as possible of the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence.

Names and Pronouns

Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender, gender variance, and nationalities. I will gladly honor your request to address you by your chosen name and by the gender pronouns you use. Class rosters are provided to the instructor with the student's chosen (not legal) name, if you have provided one. If you wish to provide or update a chosen name, that can be done easily at this page, and you can add your pronouns to Canvas.

Land Acknowledgment

I would like to acknowledge that we are meeting on the Indigenous lands of Turtle Island, the ancestral name for what now is called North America. Moreover, I would like to acknowledge the Alabama-Coushatta, Caddo, Carrizo/Comecrudo, Coahuiltecan, Comanche, Kickapoo, Lipan Apache, Tonkawa and Ysleta Del Sur Pueblo, and all the American Indian and Indigenous Peoples and communities who have been or have become a part of these lands and territories in Texas.

University Resources for Students

SERVICES FOR STUDENTS WITH DISABILITIES (SSD)

The university is committed to creating an accessible and inclusive learning environment consistent with university policy and federal and state law. Please let me know if you experience any barriers to learning so I can work with you to ensure you have equal opportunity to participate fully in this course. If you are a student with a disability, or think you may have a disability, and need accommodations please contact Services for Students with Disabilities (SSD). Please refer to SSD's website for contact and more information: http://diversity.utexas.edu/disability/. If you are already registered with SSD, please deliver your Accommodation Letter to me as early as possible in the semester so we can discuss your approved accommodations and needs in this course.

COUNSELING AND MENTAL HEALTH CENTER (CMHC)

All of us benefit from support during times of struggle. Know you are not alone. If you or anyone you know is experiencing symptoms of stress, anxiety, depression, academic concerns, loneliness, difficulty sleeping, or any other concern impacting your wellbeing – you are strongly encouraged to connect with CMHC. The Counseling and Mental Health Center provides a wide variety of mental health services to all UT students including crisis services, counseling services with immediate support and well-being resources. Additionally, CARE Counselors are located within the academic schools and colleges. These counselors get to know the concerns that are unique to their college's students. For more information on CMHC, visit https://cmhc.utexas.edu or call 512-471-3515.

UNIVERSITY HEALTH SERVICES (UHS)

Your physical health and wellness are a priority. University Health Services is an on-campus high-quality medical facility providing care to all UT students. Services offered by UHS include general medicine, urgent care, a 24/7 nurse advice line, women's health, sports medicine, physical therapy, lab and radiology services, COVID-19 testing and vaccinations and much more. For additional information, visit https://healthyhorns.utexas.edu or call 512-471-4955.

SANGER LEARNING CENTER

Did you know that more than one-third of UT undergraduate students use the Sanger Learning Center each year to improve their academic performance? All students are welcome to take advantage of Sanger Center's classes and workshops, private learning specialist appointments, peer academic coaching, and tutoring for more than 70 courses in 15 different subject areas. For more information, please visit https://ugs.utexas.edu/slc or call 512-471-3614 (JES A332)."

STUDENT EMERGENCY SERVICES (SES)

Student Emergency Services in the Office of the Dean of Students helps students and their families during difficult or emergency situations. Assistance includes outreach, advocacy, intervention, support,

and referrals to relevant campus and community resources. If you need to be absent from class due to a family emergency, medical or mental health concern, or academic difficulty due to crisis or an emergency situation, you can work with Student Emergency Services. SES will document your situation and notify your professors. If immediate mental health assistance is needed, call the Counseling and Mental Health Center (CMHC) at 512-471-3515 or you may also contact Bryce Moffett, LCSW (iSchool CARE counselor) at 512-232-2983. Outside CMHC business hours (8a.m.-5p.m., Monday-Friday), contact the CMHC 24/7 Crisis Line at 512-471-2255. Additional information is available at https://deanofstudents.utexas.edu/emergency/ or by calling 512-471-5017.

Important Safety Information

If you have concerns about the safety or behavior of fellow students, TAs or professors, contact BCCAL (the Behavior Concerns and COVID-19 Advice Line) at https://safety.utexas.edu/behavior-concerns-advice-line or by calling 512-232-5050. Confidentiality will be maintained as much as possible, however the university may be required to release some information to appropriate parties.

CLASSROOM SAFETY AND COVID-19

To help preserve our in-person learning environment, the university recommends the following.

- Adhere to university mask guidance. Masks are strongly recommended, but optional, inside university buildings for vaccinated and unvaccinated individuals, except when alone in a private office or single-occupant cubicle.
- Vaccinations are widely available, free and not billed to health insurance. The vaccine will help protect against the transmission of the virus to others and reduce serious symptoms in those who are vaccinated.
- Proactive Community Testing remains an important part of the university's efforts to protect our community. Tests are fast and free.
- We encourage the use of the Protect Texas App each day prior to coming to campus.
- If you develop COVID-19 symptoms or feel sick, stay home and contact the University Health Services' Nurse Advice Line at 512-475-6877. If you need to be absent from class, contact Student Emergency Services and they will notify your professors. In addition, to help understand what to do if you have been had close contact with someone who tested positive for COVID-19, see this University Health Services link.
- Behavior Concerns and COVID-19 Advice Line (BCCAL) remains available as the primary tool to address questions or concerns from the university community about COVID-19.
- Students who test positive should contact BCCAL or self-report (if tested off campus) to University Health Services.
- Visit Protect Texas Together for more information.

TITLE IX DISCLOSURE

Beginning January 1, 2020, TexasSenate Bill 212 requires all employees of Texas universities, including faculty, to report any information to theTitle IX Office regarding sexual harassment, sexual assault, dating violence and stalking that is disclosed to them. Texas law requires that all employees who witness or receive any information of this type (including, but not limited to, writing assignments, class discussions, or one-on-one conversations) must be report it. If you would liketo speak with someone who can provide support or remedies without making an official report to the university, please email advocate@austin.utexas.edu. For more information about reporting options and resources, visit

http://www.titleix.utexas.edu/, contact the Title IX Office via email at titleix@austin.utexas.edu, or call 512-471-0419. Although graduate teaching and research assistants are not subject to Texas Senate Bill 212, they are still mandatory reporters under Federal Title IX laws and are required to report a wide range of behaviors we refer to as sexual misconduct, including the types of sexual misconduct covered under Texas Senate Bill 212.The Title IX office has developed supportive ways to respond to a survivor and compiled campus resources to support survivors.

Faculty members and certain staff members are considered "Responsible Employees" or "Mandatory Reporters," which means that they are required to report violations of Title IX to the Title IX Coordinator. I am a Responsible Employee and must report any Title IX-related incidents that are disclosed in writing, discussion, or one-on-one. Before talking with me or with any faculty or staff member about a Title IX-related incident, be sure to ask whether they are a responsible employee. If you want to speak with someone for support or remedies without making an official report to the university, email advocate@austin.utexas.edu For more information about reporting options and resources, visit the Title IX Office or email titleix@austin.utexas.edu.

CAMPUS SAFETY
The following are recommendations regarding emergency evacuation from the Office of Campus Safety and Security, 512-471-5767,
- Students should sign up for Campus Emergency Text Alerts at the page linked above.
- Occupants of buildings on The University of Texas at Austin campus must evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and assembling outside.
- Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building.
- Students requiring assistance in evacuation shall inform their instructor in writing during the first week of class.
- In the event of an evacuation, follow the instruction of faculty or class instructors. Do not re-enter a building unless given instructions by the following: Austin Fire Department, The University of Texas at Austin Police Department, or Fire Prevention Services office.
- For more information, please visit emergency preparedness.