The University of Texas at Austin
McCombs School of Business

MIS 285N, Privacy-Preserving Analytics

UNIQUE NUMBER: 04984, 04983

Semester: Fall 2023

CLASS MEETS:

Unique	Day	Hour	Room
GSB 3.106	Tue, Thu	5:00 p.m.-7:00 p.m.	TBD

Instructor: David Hendrawirawan
To schedule virtual appointment: https://calendly.com/dhendrawirawan-1/ut-austin-ms-program
Email: dhendrawirawan@dataintegrityfirst.com

TA: Rutuparn Pawar
Office hours: By appointment
Email: rutuparn.pawar@utexas.edu

Course Description

UNIVERSITY CATALOG COURSE DESCRIPTION:

This class teaches the theoretical foundations and hands-on skills in privacy-preserving analytics. Students will be exposed to data protection rules, security and privacy risks associated with data analytics, proper policy and technical controls to address them. Future analytics professionals will gain best practices and competencies to design and implement analytics solutions that provide robust protection of individual data privacy. Where applicable, the same architectural principles and governance framework will also address commercial data confidentiality and intellectual property. Key topics include sensitive data discovery, data access management, encryption, de-identification, synthetic data generation, differential privacy, multi-party computation, homomorphic encryption, and data protection in AI models and blockchain systems.

WHAT WILL I LEARN?

- Introduction to global data protection and privacy rules, such as the European Union General Data Protection Regulation (EU GDPR), California Consumer Privacy Act (CCPA), the Health Insurance

Portability and Accountability Act (HIPAA), and Personal Data Protection Commission of Singapore (PDPC).

- Overview of modern data analytics trends (e.g., Generative AI, Blockchain, IoT sensors) and their implication towards increased data privacy and confidentiality risks.
- Privacy risk scenarios such as record linkage, database reconstruction, attribute disclosure, inference attacks, and machine learning model inversion / reverse engineering.
- Reidentification science and fundamental de-identification techniques to datasets. This includes encryption, tokenization, masking and obfuscation, and statistical based de-identification (e.g., k-anonymity, l-diversity, t-closeness).
- Advanced tools and privacy preserving techniques including differential privacy, homomorphic encryption, secure-multiparty computation, synthetic data generation, and trusted execution environment.

LEARNING OUTCOMES

1. Students can describe the types and assess the level of data privacy risks under different analytical use cases and scenarios.
2. Students can articulate the current industry trends, ethical implications, and regulatory standards pertaining to advanced capabilities such as AI and Hyper-Automation.
3. Students can perform hands-on techniques to anonymize data sets, measure the degree of privacy loss, apply trust and safety principles in designing their analytics approach / solution.
4. Students are conversant and in advanced privacy enhancing technologies in the market and under which situation would they be most beneficial.

HOW TO SUCCEED IN THIS COURSE:

The foundation for success in this course is appreciating the importance of data security and privacy for the good of society. Secondly, recognize that these skills are rarely taught in colleges, and will differentiate you from other IT and analytics professionals in the job market. With these in mind, I hope you will be enthusiastic in continuously learning about the subject within and even beyond this class.

How will I learn?

The mode of instruction will be in person, though it could be shifted online as needs warrant. This course will use a combination of classroom lectures, hands-on exercises (in-class and take home), online discussions, and group project. Students should familiarize themselves with the readings before each class. During class, students should actively participate in discussions and provide constructive suggestions to their peers.

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Course Requirements

REQUIRED MATERIALS:

- No textbook is required. All required reading will be assigned through Canvas.
- Exercises will require Python 3.9 or later. Please install Anaconda and Jupyter Notebook (https://youtu.be/-sNX_ZMVpQM)

GRADING FOR THIS COURSE

Course Component	Percent of Total Grade
Discussion Board	20%
Exercise	20%
Research Project & Presentation	50%
Attendance & participation	10%
TOTAL	100%

1. **Discussion Board:** During designated weeks, reflective questions will be posted on the discussion board to prompt every student to share their takeaways, ideas, and/or thought-provoking questions referencing the textbooks, class lectures or discussions.
    - All students are expected to ***individually post a response*** to prompt questions on Canvas discussion board.
    - You are encouraged to compare and correlate the contents from the assigned reading or class lectures with outside sources and current events.
    - Grading will be determined by relevance, writing mechanics, and thoughtful analysis using class materials or related outside sources.
    - Out of the total of five (5) graded discussions, the one with the lowest grade will be dropped.
2. **Exercise**: There will be lab exercises to test your comprehension of the assigned materials and/or your ability to practice the skills you learned.
    - Each student must ***individually complete assigned lab exercises*** in the classroom.
    - You must preview case study materials and perform preparation tasks before the lab days.
    - During lab days, we will work on the exercise in the class. Preparation tasks must be completed or attempted to the best of your ability to avoid non-completion during class.
    - Exercises will require Python 3.9 or later. Please install Anaconda and Jupyter Notebook (https://youtu.be/-sNX_ZMVpQM)
    - Out of the total of five (5) graded exercises, the one with the lowest grade will be dropped.

3. **Research Project & Presentation**: Group will research and present about privacy preserving analytics techniques to raise public awareness.
    - Research ***must be completed as a group effort.*** Each group consists of 3 to 5 members.
    - Research topics include (but not limited to): differential privacy, homomorphic encryption, secure-multiparty computation, synthetic data generation, and trusted execution environment.
    - The presentation should include the problems, how your privacy solution addresses them, and examples of real-world application. Include sources cited, survey method / people interviewed, and tools / framework evaluated in the appendix.
    - You will present your research to a lay audience without deep expertise in technology. To explain a complex subject to seasoned business executives is similar to explaining it to younger children (e.g. 3rd graders or 10 years of age or older).
    - The grading of the presentation will be based on how clear and compelling the materials are, the thoroughness of the research, and the level of engagement with the audience.
4. **Attendance and Participation**: Every class meeting, all students are expected to take an active role in class discussions and other aspects of the class.
    - Every student should come on time, leave after class is dismissed, and contribute thoughtful comments during class.
    - There will be no make-up session. If you miss a class, you are responsible for obtaining the class notes or assignments from peer students.
    - Students who miss three class sessions (or scheduled instructor meetings) without excused absence will receive a grade of "F" for this course.

COURSE OUTLINE

All instructions, assignments, readings, rubrics and essential information will be on the Canvas website at utexas.instructure.com. Check this site regularly and use it to ask questions about the course schedule.

Changes to the schedule may be made at my discretion and if circumstances require. It is your responsibility to note these changes when announced (although I will do my best to ensure that you receive the changes with as much advanced notice as possible).

#	Date	Weekday	Topic	Lab
1	10/10/2023	Tue	Class Intro; Defining Data Privacy	
2	10/12/2023	Thu	Privacy Laws, Purpose, and Data Discovery	
3	10/17/2023	Tue	Data Subject Rights & Consent	
4	10/19/2023	Thu	Reidentification and Linkage Attacks	

5	10/24/2023	Tue	Obfuscation & Classical De-Identification	Lab 1 - Anonypy
6	10/26/2023	Thu	Synthetic Data Generation	
7	10/31/2023	Tue	Statistical Disclosure & Data Reconstruction	Lab 2 - SDV
8	11/2/2023	Thu	Differential Privacy	
9	11/7/2023	Tue	Homomorphic Encryption	Lab 3 - Diffprivlib
10	11/9/2023	Thu	Machine Unlearning: Training Data Erasure	
11	11/14/2023	Tue	Secure Multiparty Computation	Lab 4 - Mpyc & Paillier
12	11/16/2023	Thu	Data Minimization, Archival and Destruction	
	11/21/2023	Tue	THANKSGIVING - No Class	
	11/23/2023	Thu	THANKSGIVING - No Class	
13	11/28/2023	Tue	Blockchain Security & Privacy	Lab 5 - Unlearning
14	11/30/2023	Thu	Policy Driven Data Protection	
15	12/2/2023	Sat	Student Presentation	
16	12/9/2023	Sat	Student Presentation	

Policies

CLASSROOM EXPECTATIONS

McCombs Classroom Professionalism Policy.

The highest professional standards are expected of all members of the McCombs community. The collective class reputation and the value of the Texas MS experience hinges on this. You should treat the Texas MS classroom as you would a corporate boardroom. Faculty are expected to be professional and prepared to deliver value for each and every class session. Students are expected to be professional in all respects. The Texas MS classroom experience is enhanced when:

- Students arrive on time. On time arrival ensures that classes are able to start and finish at the scheduled time. On time arrival shows respect for both fellow students and faculty and it enhances learning by reducing avoidable distractions.
- Students display their name cards. This permits fellow students and faculty to learn names, enhancing opportunities for community building and evaluation of in-class contributions.
- Students are fully prepared for each class. Much of the learning in the Texas MS programs take place during classroom discussions. When students are not prepared, they cannot contribute to the overall learning process. This affects not only the individual, but their peers who count on them, as well.
- Students respect the views and opinions of their colleagues. Disagreement and debate are encouraged. Intolerance for the views of others is unacceptable.
- Students do not confuse the classroom for the cafeteria. The classroom (boardroom) is not the place to eat your breakfast tacos, wraps, sweet potato fries, or otherwise set up for a picnic. Please plan accordingly. Recognizing that back-to-back classes sometimes take place over the lunch hour, energy bars and similar snacks are permitted. Please be respectful of your fellow students and faculty in your choices.
- Students minimize unscheduled personal breaks. The learning environment improves when disruptions are limited.
- Students attend the class section to which they are registered. Learning is enhanced when class sizes are optimized. Limits are set to ensure a quality experience and safety.
- Technology is used to enhance the class experience. When students are surfing the web, responding to e-mail, instant messaging each other, and otherwise not devoting their full attention to the topic at hand they are doing themselves and their peers a major disservice. Those around them face additional distraction. Fellow students cannot benefit from the insights of the students who are not engaged. Faculty office hours are spent going over class material with students who chose not to pay attention, rather than truly adding value by helping students who want a better understanding of the material or want to explore the issues in more depth. Students with real needs may not be able to obtain adequate help if faculty time

is spent repeating what was said in class. There are often cases where learning is enhanced by the use of technology in class. Faculty will let you know when it is appropriate.

- Phones and wireless devices are turned off. Not only is it not professional, it cuts off the flow of discussion when the search for the offender begins. When a true need to communicate with someone outside of class exists (e.g., for some medical need) please inform the professor prior to class.

Zoom Professionalism and Etiquette. Following are some best practices for making sure we are working together to create an efficient, effective, respectful, and ultimately enjoyable classroom when accessing remotely:

- Keep your video on at all times.
- Be mindful of your surroundings when on camera to minimize distractions.
- Avoid display of inappropriate materials or expressions, either visual, textual, or otherwise. Such displays may be subject to disciplinary action.
- Turn your camera off when leaving the meeting temporarily and use the away feedback icon.
- Include a professional photo of yourself for your Zoom profile picture. This photo will be visible during class sessions, if you keep your video off.
- Mute yourself unless you are speaking. This will reduce background or feedback noise and limit distractions.
- Pose questions or comments by using the "raise" your hand feature or typing in the chat window. Try to keep questions and comments brief, especially in large classes.
- Turn off your video if the video or audio is choppy. After the class or meeting, try these Internet Connection Tips.
- Use the most reliable WIFI you can access. If you are experiencing problems with your internet connection, here are some Internet Connection Tips.

For more information, please see Zoom Etiquette

CLASSROOM POLICIES

STATEMENT ON LEARNING SUCCESS

Your success in this class is important to me. We will all need accommodations because we all learn differently. 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'll 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. Many are listed on this syllabus, but I am happy to connect you with a person or Center if you would like.

GRADING POLICIES

Grade	Cutoff
A	94%
A-	90%
B+	87%
B	84%
B-	80%
C+	77%
C	74%
C-	70%
D	65%
F	<65%

LATE WORK AND ABSENCES

If you are unable to attend class, prior written notice must be provided to the instructor. Excused absences typically include, but are not limited to, death in the immediate family, serious personal or immediate family illness, religious holiday, and jury duty. Documented proof substantiating the reason for absence may be required. The instructor reserves the right to determine excused absence.

Assignments missed due to an excused absence must be made up within one week for full credit, or no credit will be given. Assignments missed due to an unexcused absence may not be made up.

RELIGIOUS HOLY DAYS

By UT Austin policy, you must notify me of your pending absence at least fourteen days prior to 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.

CLASSROOM SAFETY

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

- Vaccinations (and boosters) are widely available, free and not billed to health insurance. The vaccine helps protect against viral transmission to others and reduces serious symptoms in those who are vaccinated.
- What if you're sick?

- For *any* illness, students should stay home if they are sick or contagious, not only to stop the spread but also to promote their personal wellness. Also, please use the exposure action chart below to help you know what to do in the event you are sick:
  - https://www.healthyhorns.utexas.edu/coronavirus_exposure_action_chart.html
  - UHS maintains up-to-date resources on COVID, which can be found at: https://www.healthyhorns.utexas.edu/coronavirus.html

SHARING OF COURSE MATERIALS IS PROHIBITED

Sharing of Course Materials is Prohibited: No materials used in this class, including, but not limited to, lecture hand-outs, videos, assessments (quizzes, exams, papers, projects, homework assignments), in-class materials, review sheets, and additional problem sets, may be shared online or with anyone outside of the class unless you have my explicit, written permission. Unauthorized sharing of materials promotes cheating. It is a violation of the University's Student Honor Code and an act of academic dishonesty. I am well aware of the sites used for sharing materials, and any materials found online that are associated with you, or any suspected unauthorized sharing of materials, will be reported to Student Conduct and Academic Integrity in the Office of the Dean of Students. These reports can result in sanctions, including failure in the course.

FERPA AND CLASS RECORDINGS

Class recordings are reserved only for students in this class for educational purposes and are protected under FERPA. The recordings should not be shared outside the class in any form. Violation of this restriction by a student could lead to Student Misconduct proceedings.

STUDENT RIGHTS & RESPONSIBILITIES

- You have a right to a learning environment that supports mental and physical wellness.
- You have a right to respect.
- You have a right to be assessed and graded fairly.
- You have a right to freedom of opinion and expression.
- You have a right to privacy and confidentiality.
- You have a right to meaningful and equal participation, to self-organize groups to improve your learning environment.
- You have a right to learn in an environment that is welcoming to all people. No student shall be isolated, excluded or diminished in any way.

With these rights come responsibilities:

- You are responsible for taking care of yourself, managing your time, and communicating with the teaching team and with others if things start to feel out of control or overwhelming.
- You are responsible for acting in a way that is worthy of respect and always respectful of others. • Your experience with this course is directly related to the quality of the energy that you bring to it, and your energy shapes the quality of your peers' experiences.
- You are responsible for creating an inclusive environment and for speaking up when someone is excluded.
- You are responsible for holding yourself accountable to these standards, holding each other to these standards, and holding the teaching team accountable as well.

DIVERSITY AND INCLUSION

It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed and that the diversity that students bring to this class can be comfortably expressed and be viewed as a resource, strength and benefit to all students. Please come to me at any time with any concerns.

PERSONAL PRONOUN PREFERENCE

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. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by a name different than what appears on the roster, and by the gender pronouns you use. Please advise me of this preference early in the semester so that I may make appropriate changes to my records.

UNIVERSITY POLICIES

ACADEMIC INTEGRITY

Each student in the course is expected to abide by the University of Texas Honor Code: "As a student of The University of Texas at Austin, I shall abide by the core values of the University and uphold academic integrity." **Plagiarism is taken very seriously at UT**. Therefore, if you use words or ideas that are not your own (or that you have used in previous class), you must cite your sources. Otherwise you will be guilty of plagiarism and subject to academic disciplinary action, including failure of the course. You are responsible for understanding UT's Academic Honesty and the University Honor Code which can be found at the following web address: deanofstudents.utexas.edu/conduct

UNIVERSITY RESOURCES FOR STUDENTS

Your success in this class is important to me. We will all need accommodations because we all learn differently. 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'll develop strategies to meet both your needs and the requirements of the course. There are also a range of resources on campus:

SERVICES FOR STUDENTS WITH DISABILITIES

This class respects and welcomes students of all backgrounds, identities, and abilities. If there are circumstances that make our learning environment and activities difficult, if you have medical information that you need to share with me, or if you need specific arrangements in case the building needs to be evacuated, please let me know. I am committed to creating an effective learning environment for all students, but I can only do so if you discuss your needs with me as early as possible. I promise to maintain the confidentiality of these discussions. If appropriate, also contact Services for Students with Disabilities, 512-471-6259 (voice) or 1-866-329- 3986 (video phone). diversity.utexas.edu/disability/about

COUNSELING AND MENTAL HEALTH CENTER

Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress.

All of us benefit from support during times of struggle. You are not alone. There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful.

If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. cmhc.utexas.edu/individualcounseling.html

STUDENT EMERGENCY SERVICES:

If at any time you experience an emergency that necessitates your absence from a class requirement (e.g., attendance, assignment submission, or exam), please report your circumstances and absence via the Student Emergency Services website: deanofstudents.utexas.edu/emergency

IMPORTANT SAFETY INFORMATION

If you have concerns about the safety or behavior of fellow students, TAs or Professors, call BCAL (the Behavior Concerns Advice Line): 512-232-5050. Your call can be anonymous. If something doesn't feel right – it probably isn't. Trust your instincts and share your concerns.

TITLE IX REPORTING

Title IX is a federal law that protects against sex and gender-based discrimination, sexual harassment, sexual assault, sexual misconduct, dating/domestic violence and stalking at federally funded educational institutions. UT Austin is committed to fostering a learning and working environment free from discrimination in all its forms. When sexual misconduct occurs in our community, the university can:

1. Intervene to prevent harmful behavior from continuing or escalating.
2. Provide support and remedies to students and employees who have experienced harm or have become involved in a Title IX investigation.
3. Investigate and discipline violations of the university's relevant policies.

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 titleix.utexas.edu or contact the Title IX Office at titleix@austin.utexas.edu.

The following recommendations regarding emergency evacuation from the Office of Campus Safety and Security, 512-471-5767, operations.utexas.edu/units/csas
Occupants of buildings on The University of Texas at Austin campus are required to 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.
- Link to information regarding emergency evacuation routes and emergency procedures can be found at: emergency.utexas.edu

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LAND ACKNOWLEDGEMENT

We would like to acknowledge that we are meeting on Indigenous land. Moreover, We would like to acknowledge and pay our respects to the Carrizo & Comecrudo, Coahuiltecan, Caddo, Tonkawa, Comanche, Lipan Apache, Alabama-Coushatta, Kickapoo, Tigua 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, here on Turtle Island.
https://liberalarts.utexas.edu/nais/land-acknowledgement/what-is-la.php