



DAMG 7370: Designing Advanced Data Architectures for Business Intelligence

Course Information

Course Title: Designing Advanced Data Architectures for Business Intelligence

Course Number: DAMG 7370

Term and Year: Fall 2024

Credit Hour: 4

CRN: 18617

Course Format: Livecast Streaming

Instructor Information

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Instructor Biography

Dr. Zheng is an Assistant Teaching Professor in the College of Engineering at the Toronto Campus. Before joining Northeastern University, he served as the Technical Vice President and the Head of Artificial Intelligence (AI) Institute at a NASDAQ-listed company. Dr. Zheng earned his Ph.D. in Computer Science from McMaster University and his Master of Engineering degree from the University of Chinese Academy of Sciences. His research interests broadly encompass data management and AI, focusing on data quality, data analytics, text mining, and machine learning. He has published numerous papers in top-tier conferences and journals in his field.

Course Prerequisites

Students should have basic knowledge of database management systems and basic programming skills (especially in Python). It is assumed that the students know Python and SQL sufficiently to understand all codes used in the slides and textbook.

Course Description

The mission of this course is to give students an understanding of the lifecycle of data engineering and pipeline of designing data architectures for business intelligence. From justifying the project, gathering requirements, getting to know the data, developing the architectural framework, designing the proper approach for BI data models, integrating the data, generating advanced analytics, dealing with “shadow systems”, and managing the full project life cycle.

Course Learning Outcomes

- 1) **Advanced Data Architecture Design:** Students will be able to design advanced data architectures that support both structured and semi-structured data sources, leveraging cloud platforms as well as on-premise solutions to create efficient and scalable data models.
- 2) **Proficiency in Data Preparation and Integration:** Students will gain proficiency in using data preparation and integration tools to gather, integrate, and load curated data, developing comprehensive data workflows for business intelligence applications.
- 3) **BI Data Visualization and Reporting Skills:** Students will obtain skills to create effective BI data visualizations and reports for data analysis, utilizing technologies such as databases, hybrid data integrations, cloud integration, data preparation, and data virtualization.

Required Tools and Course Textbooks.

Textbook:

Business Intelligence Guidebook: From Data Integration to Analytics, by Rick Sherman. Published by Morgan Kaufmann, 2014.

Data Mining Concepts and Techniques, 3rd Edition by Jiawei Han, Micheline Kamber and Jian Pei. Published by Morgan Kaufmann, 2011.

Topics Covered

Lecture	Topic	Content
1	Data Architecture for BI	<ol style="list-style-type: none"> 1. BI introduction 2. Data engineering ecosystem 3. Data architecture high-level overview
2	Getting to Know the Data	<ol style="list-style-type: none"> 1. Introduction to data 2. Data repositories 3. ETL, ELT and data pipelines 4. Data integration 5. Big data
3	Data Engineering Lifecycle	<ol style="list-style-type: none"> 1. Define requirements 2. Data architecture layers 3. Data stores and security 4. Data collection and wrangling 5. Data querying and performance tuning 6. Data governance and compliance
4	Data Modeling and Dimensional Modeling	<ol style="list-style-type: none"> 1. Data modeling and data model 2. Entity-relationship modeling 3. Dimensional modeling 4. Advanced dimensions and facts
5	Python for Data Engineering	<ol style="list-style-type: none"> 1. Python fundamentals overview 2. Python for data science 3. ETL with Python
6	Data Integration	<ol style="list-style-type: none"> 1. Data Pipelines 2. Data integration 3. Data cleaning 4. Data reduction

		5. Data transformation and data discretization
7	Data Warehousing	<ol style="list-style-type: none"> 1. Data warehouse modeling 2. Data warehouse design and usage 3. Data warehouse implementation 4. Data generalization by attribute-oriented induction
8	BI Application, Design and Development	<ol style="list-style-type: none"> 1. BI design layout 2. Data design for self-service BI 3. Matching analysis to visualizations 4. BI development
9	Advanced Analytics	<ol style="list-style-type: none"> 1. Data mining 2. Predictive analytics with machine learning techniques

Assignment Grading

Evaluation: There will be one assignment (15%), one midterm (25%) and one BI project (60%).

Detailed grading scheme: Grade = 0.15*assignment + 0.25*midterm + 0.6*project.

Grading Scale

	87-89.9% B+	77-79.9% C+	
95-100% A	84-86.9% B	74-76.9% C	
90-94.9% A-	80-83.9%B-	70-73.9% C-	69.9% or below F

Attendance/Late Work Policy

Attendance Policy

Students registered in MGEN courses (INFO, CSYE, and DAMG) are allowed **a maximum of 2 absences per course, with 3 or more absences resulting in an automatic 'F' for that course.** Students are expected to inform their instructors of any absences in advance of the class; if a student is sick long-term or experiences a medical issue that prevents class attendance, it is strongly encouraged that they speak with their Academic Advisor (coe-mgen-gradadvising@northeastern.edu) to learn more about the Medical Leave of Absence. Should a student anticipate being unable to attend 3 or more classes, they should discuss their situation with their Academic Advisor to explore other types of leave in accordance with the University's academic and global entry expectations. International students should review the Office of Global Services webpage to understand their visa compliance requirements.

Teaching Assistants (TAs) or Instructional Assistants (IAs) will be present at each class to collect student attendance.

Late Work Policy

Students must submit assignments by the deadline in the time zone noted in the syllabus. Students must communicate with the faculty prior to the deadline if they anticipate work will be submitted late. Work submitted late without prior communication with faculty will not be graded.

End-of-Course Evaluation Surveys

Your feedback regarding your educational experience in this class is particularly important to the College of Engineering. Your comments will make a difference in the future planning and presentation of our curriculum.

At the end of this course, please take the time to complete the evaluation survey at

<https://neu.evaluationkit.com>. Your survey responses are **completely anonymous and confidential**.

For courses 6 weeks in length or shorter, surveys will be open one week prior to the end of the courses; for courses greater than 6 weeks in length, surveys will be open for two weeks. An email will be sent to your Northeastern University Mail account notifying you when surveys are available.

Academic Integrity

A commitment to the principles of academic integrity is essential to the mission of Northeastern University. The promotion of independent and original scholarship ensures that students derive the most from their educational experience and their pursuit of knowledge. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University.

As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, examinations of whatever kind, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Students are responsible for learning the conventions of documentation and acknowledgment of sources in their fields. Northeastern University expects students to complete all examinations, tests, papers, creative projects, and assignments of any kind according to the highest ethical standards, as set forth either explicitly or implicitly in this Code or by the direction of instructors.

Go to <http://www.northeastern.edu/osccr/academic-integrity-policy/> to access the full academic integrity policy.

MGEN Student Feedback

Students who would like to provide the MGEN unit with anonymous feedback on this particular course, Teaching Assistants, Instructional Assistants, professors, or to provide general feedback regarding their program, may do so using this survey: https://neu.co1.qualtrics.com/jfe/form/SV_cTIAbH7ZRaaW0Ki

University Health and Counseling Services

As a student enrolled in this course, you are fully responsible for assignments, work, and course materials as outlined in this syllabus and in the classroom. Over the course of the semester if you experience any health issues, please contact UHCS.

For more information, visit <https://www.northeastern.edu/uhcs>.

Student Accommodations

Northeastern University and the Disability Resource Center (DRC) are committed to providing disability services that enable students who qualify under Section 504 of the Rehabilitation Act and the Americans

with Disabilities Act Amendments Act (ADAAA) to participate fully in the activities of the university. To receive accommodations through the DRC, students must provide appropriate documentation that demonstrates a current substantially limiting disability.

For more information, visit <https://drc.sites.northeastern.edu>.

Library Services

The Northeastern University Library is at the hub of campus intellectual life. Resources include over 900,000 print volumes, 206,500 e-books, and 70,225 electronic journals.

For more information and for education specific resources, visit <https://library.northeastern.edu>
Network Campus Library Services: [Northeastern University Library Global Campus Portals](#)

24/7 Canvas Technical Help

For immediate technical support for Canvas, call 617-373-4357 or email help@northeastern.edu

Canvas Student Resources: <https://canvas.northeastern.edu/student-resources/>

For assistance with my Northeastern e-mail, and basic technical support:

Visit ITS at <https://its.northeastern.edu>

Email: help@northeastern.edu

ITS Customer Service Desk: 617-373-4357

Diversity and Inclusion

Northeastern University is committed to equal opportunity, affirmative action, diversity, and social justice while building a climate of inclusion on and beyond campus. In the classroom, members of the University community work to cultivate an inclusive environment that denounces discrimination through innovation, collaboration, and an awareness of global perspectives on social justice.

Please visit <http://www.northeastern.edu/oidi/> for complete information on Diversity and Inclusion

Title IX

Title IX of the Education Amendments of 1972 protects individuals from sex or gender-based discrimination, including discrimination based on gender-identity, in educational programs and activities that receive federal financial assistance.

Northeastern's Title IX Policy prohibits Prohibited Offenses, which are defined as sexual harassment, sexual assault, relationship or domestic violence, and stalking. The Title IX Policy applies to the entire community, including male, female, transgender students, faculty, and staff.

In case of an emergency, please call 911.

Please visit <https://www.northeastern.edu/ouec> for a complete list of reporting options and resources both on- and off-campus.