



## **INFO 7375 ST: Theory/Prac Apps of AI Gen** **[Summer Full 2025]**

### **Course Information**

Course Title: ST: Theory/Prac Apps of AI Gen  
Course Number: INFO 7375  
Term and Year: Full Summer  
Credit Hour: 4 SH  
CRN: 53595  
Course Format: Traditional On-Ground  
Timing: Thursday's 3:15 – 6:35 pm PST.  
Lecture location: 1526 (Vancouver Campus)  
Timing: Monday's 1:00 – 4:30 pm PST

### **Instructor Information**

Full Name: Rushdi Alsaleh, PhD  
Email Address: r.alsaleh@northeastern.edu  
Office Hours: On-campus:  
Monday 11:30-1:00 pm (Classroom: 1513)  
Friday 12:30-1:00 pm (Classroom: 1513)  
Or  
Online through the link:  
<https://calendly.com/ralsaleh/15-min-gn>  
Monday 7:00-8:00 pm  
Thursday 3:00-4:30 pm; 7:00-8:00 pm  
Or  
Anytime by appointment

### **Instructor Biography**

Associate Professor of Data Science, and Artificial Intelligence, with more than 12 years of experience in industry and has led multiple high-impact data-driven projects with local and global companies.

### **Teaching Assistant Information**

Full Name: TBA  
Email Address: TBA  
Office Hours : TBA

## Course Prerequisites

Graduate level INFO 6205 Minimum Grade of B

## Course Description

This advanced course in generative AI theory and practice equips students with the foundational knowledge and applied skills necessary for roles in building, deploying, and maintaining generative AI systems across industry domains. The course explores generative modeling as a framework for capturing probabilistic distributions over high-dimensional data, enabling the synthesis of new data, imputation of missing information, and the modeling of complex relationships.

Students will study a broad spectrum of generative models, including transformer-based large language models (e.g., ChatGPT, Gemini), generative image models (e.g., GANs, diffusion models, variational autoencoders), and structured-data models (e.g., probabilistic graphical models and Bayesian networks). The course spans key data modalities—text, images, and structured relational data—highlighting their unique challenges and applications.

Through practical assignments and projects, students will implement these models using Python and leading machine learning libraries such as TensorFlow/Keras and PyTorch. The curriculum emphasizes neural network architectures, model training and fine-tuning.

The course also addresses ethical considerations, responsible deployment of generative AI, and techniques for reproducibility and maintainability in real-world environments. Students will engage in technical paper reviews and learn how to communicate their project work effectively in interviews and professional settings.

## Course Learning Outcomes

- Demonstrate a rigorous understanding of generative modeling theory, including probabilistic frameworks and mathematical foundations underpinning generative models across text, image, and structured data modalities.
- Critically analyze, design, and implement advanced generative AI models, such as large language models (LLMs), GANs, variational autoencoders, diffusion models, and Bayesian networks, using Python and frameworks like PyTorch and TensorFlow/Keras.
- Evaluate and compare the performance and suitability of different generative modeling techniques for complex, real-world tasks involving multi-modal data.
- Address practical challenges in scaling, adapting, and maintaining generative models in production environments, including model drift, data shifts, and lifecycle management.
- Apply ethical reasoning and critical thinking to assess the societal and professional implications of deploying generative AI, including fairness, bias, accountability, and transparency.
- Engage with current academic and industry research, synthesizing insights to inform the design and improvement of generative AI systems.
- Demonstrate industry readiness through a capstone project, showcasing the ability to build, deploy, and evaluate a complex generative AI system aligned with real-world use cases.

## Required Tools and Course Textbooks.

- Zhang, A., Lipton, Z. C., Li, M., Smola, A. J. (2023). Dive Into Deep Learning. United Kingdom: Cambridge University Press.

- Goodfellow, I., Bengio, Y., Courville, A. (2016). Deep Learning. United Kingdom: MIT Press.
- Géron, A. (2019). Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems. United States: O'Reilly Media.
- Sanseviero, O., Cuenca, P., Passos, A., Whitaker, J. (2024). Hands-On Generative AI with Transformers and Diffusion Models. (n.p.): O'Reilly Media.
- Kulkarni, A., Shivananda, A., Kulkarni, A., Gudivada, D. (2023). Applied Generative AI for Beginners: Practical Knowledge on Diffusion Models, ChatGPT, and Other LLMs. United States: Apress.

Tools include:

Python and machine and deep learning libraries in Scikit, Keras/TensorFlow, OpenAI, Hugging Face, and Pytorch, NLTK, Spacy, Gensim.

### Course Schedule/Topics Covered.

Week	Date	In Class Topic	Assignment Due
1	5/5	Introduction to AI and Course Overview	
2	12/5	Basics of Neural Networks	
3	19/5	CNN, RNN & LSTM	Assignment 1
4	26/5	Large Language Models and Transformer	
5	2/6	Large Language Models and Transformer	Assignment 2
6	9/6	Midterm Exam	
7	16/6	Vision Transformer	
8	23/6	Training Deep Learning Models	
9	30/6	Introduction to Generative AI	Assignment 3
10	7/7	Foundation Models and Natural Language Understanding	
11	14/7	Natural Language Generation	Assignment 4
12	21/7	Image & Video Generation and Diffusion Models, Multi-Modal Models	
13	28/7	Multi-Modal Models	Final Project Presentations
14	4/8	Final Exam	Final Exam
18/8		Faculty grade deadline at 2:00 p.m. ET for full summer classes	

### Assignment Grading

- Class Participation and Attendance– 10%
- Assignments – 20%
- Midterm Exam – 25%

- Final Exam – 25%
- Final Term Project – 20%

## Grading Scale

Percentage Range	Letter Grade	Grade Point Equivalent
95.0–100.0%	A	4.000
90.0–94.9%	A-	3.667
87.0–89.9%	B+	3.333
84.0–86.9%	B	3.000
80.0–83.9%	B-	2.667
77.0–79.9%	C+	2.333
74.0–76.9%	C	2.000
70.0–73.9%	C-	1.667
69.9% and Below	F	0.000

## Incomplete Grades

An incomplete grade may be reported by the instructor when a student has failed to complete a major component of a required course, such as homework, a quiz or final examination, a term paper, or a laboratory project. Students may make up an incomplete grade by satisfying the requirements of the instructor. Be aware that instructors' policies on the granting of incomplete grades may vary and that the final decision on an incomplete grade is up to the instructor. **Instructors may deny requests for an incomplete grade.** If the missing assignment(s) have not been submitted to the instructor within 30 days from the end of the term in which the course was offered, or the agreed upon due date, the grade entered will reflect the student's grade in the course for the work completed and the missing assignments receiving no credit toward the final grade.

## Attendance/Late Work Policy

### Attendance Policy

In each term, students enrolled in on-ground sections are expected to be on campus and attending class beginning with the first day of classes. Students in online sections are expected to log in and participate in class beginning with the first day of classes.

Students who join a class after the first day of class during the university add period, or who are approved for late registration by the instructor and the Graduate School of Engineering, are responsible for all coursework missed prior to enrolling. In the interest of students' success, the college does not

support the arrival of students to class after the university add deadline. **Enrolled students who do not attend class during the first week of a semester risk being dropped from the course.**

In cases where an enrolled student cannot arrive to campus by the first day of class due to circumstances beyond their control, it is the student's responsibility to contact the instructor for approval and notify the Graduate School of Engineering.

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 'F' for that course. Course instructors are not expected to make accommodations and students are expected to inform their instructors of any absences in advance of the class. 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 and accommodations in accordance with the University's academic and global entry expectations. Students may be asked to share communications about class absences with their Academic Advisor. 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-gradadvising@northeastern.edu](mailto:coe-gradadvising@northeastern.edu)) to learn more about the Medical Leave of Absence. 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.

#### Course Evaluations

Student feedback on their learning experience is valuable and helps improve future courses. We encourage all students to complete the course evaluation surveys when they become available.

Surveys are distributed at both the midterm mark and the end of the term via email and are completely anonymous and confidential. Any questions about the surveys can be directed to [mgen-programs@coe.northeastern.edu](mailto:mgen-programs@coe.northeastern.edu)

#### 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](https://neu.co1.qualtrics.com/jfe/form/SV_cTIAbH7ZRaaW0Ki)

#### 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.

The following is a broad overview, but not an all-encompassing definition, of what constitutes a violation of academic integrity:

***Cheating:*** The University defines cheating as using or attempting to use unauthorized materials, information, or study aids in any academic exercise. When completing any academic assignment, a student shall rely on their own mastery of the subject.

***Fabrication:*** The University defines fabrication as falsification, misrepresentation, or invention of any information, data, or citation in an academic exercise.

***Plagiarism:*** The University defines plagiarism as using as one's own the words, ideas, data, code, or other original academic material of another without providing proper citation or attribution. Plagiarism can apply to any assignment, either final or drafted copies, and it can occur either accidentally or deliberately. Claiming that one has "forgotten" to document ideas or material taken from another source does not exempt one from plagiarizing.

***Unauthorized Collaboration:*** The University defines unauthorized collaboration as instances when students submit individual academic works that are substantially similar to one another. While several students may have the same source material, any analysis, interpretation, or reporting of data required by an assignment must be each individual's independent work unless the instructor has explicitly granted permission for group work.

***Participation in Academically Dishonest Activities:*** The University defines participation in academically dishonest activities as any action taken by a student with the intention of gaining an unfair advantage over other students.

***Facilitating Academic Dishonesty:*** The University defines facilitating academic dishonesty as intentionally or knowingly helping or contributing to the violation of any provision of this policy.

Please visit <https://osccr.sites.northeastern.edu/academic-integrity-policy/> to access the full academic integrity policy.

### **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/uahcs>.

### **Student Accommodations/Disability Access Services (DAS)**

Northeastern University and Disability Access Services (DAS) 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 DAS, students must provide documentation of a disability that demonstrates a current substantial limitation. Accommodations are approved based on a review of the information that is submitted and reviews are done on a case-by-case basis.

If the course is conducted in an on-ground (in-person) format, students are expected to attend class physically as scheduled. Professors are **not required to provide virtual attendance links** unless a student has documented accommodation approved by the **Disability Access Services (DAS) office** and their **Academic Advisor**. If a student requires accommodation for remote participation, they must submit a formal request through the **Disability Office** and coordinate with their **Academic Advisor** prior to the course start date.

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

### **Office of Global Services**

As an F-1, J-1, or Study Permit student, you must meet certain obligations in order to maintain lawful nonimmigrant status. Maintaining status is necessary in order to retain eligibility for the benefits of F-1 or J-1 status, such as employment authorization and program extension, and can be crucial to a successful application for a change or adjustment of nonimmigrant status in the future. Failure to maintain your nonimmigrant status can result in serious problems with immigration and *could lead to deportation from the U.S. or Canada*.

Students must maintain on-ground presence throughout the academic term. At Northeastern, there are four different defined instructional methods: Traditional, Hybrid, Live Cast, and Online. Traditional, Hybrid, and Live Cast courses meet the Visas' on-ground presence requirements. **Online courses do not meet the Visas' on-ground presence requirements.**

Students enrolled in Summer courses should adhere to OGS guidelines on maintaining status during the Summer term.

For more information please visit, <https://international.northeastern.edu/ogs/current-students/understanding-visa-requirements/guidelines-on-maintaining-status/>

### **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](mailto: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](mailto:help@northeastern.edu)

ITS Customer Service Desk: 617-373-4357

## **Outreach, Engagement, Belonging**

Northeastern University is committed to fostering a community of belonging, which is essential to the advancement of Northeastern University's mission of teaching and research. Our university is stronger as a result of the varied backgrounds, experiences, and perspectives that all members of our global community bring to the pursuit of knowledge. Embracing this pluralism is not the work of one office, department, or academic unit. It is a shared responsibility that spans disciplines and boundaries. By harnessing the power of our differences, we will continue to light the path to bold new ideas and life-changing discoveries.

It is my intention that students from all backgrounds and perspectives will be well served by this course, and that the diverse experiences that students bring to this class will be viewed as an asset. I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, socioeconomic background, family education level, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and belonging environment for every other member of the class. Your suggestions are encouraged and appreciated.

Please visit [Belonging at Northeastern – Northeastern Provost](#) for complete information.

## **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.

The Office for University Equity and Compliance (OUEC) leads Northeastern University's efforts in maintaining compliance with all federal, state, and provincial civil rights laws and prohibits discrimination within any of its programs, activities, and services. Please visit <https://ouec.northeastern.edu/> for more information and for the link to file a report.