INFO 7375 - Building AI Applications: Foundations to Deployment

FALL 2025

Course Information
Course Title: Prompt Engineering for Generative AI
Course Number: INFO 7375
Term and Year: FALL 2025
Credit Hour: 4
CRN: TBD
Course Format: Online

Instructor Information
Full Name: Shirali Patel
Email Address: shi.patel@northeastern.edu
Office Hours: Virtual Upon Request; TA will host assistance hours

Instructor Biography
Shirali Patel is an adjunct faculty member at Northeastern University, based at the Arlington Campus. With over 20 years of experience as a systems engineer, program and product manager, Shirali brings a wealth of knowledge and practical expertise to her students. She holds a Doctorate in Engineering Management from George Washington University and currently serves as a Director of AI Sales Management at Microsoft. In this role, she leads a team responsible for launching M365 Copilot Products for Government customers. In addition to her professional accomplishments, Shirali is a proud US Airforce veteran, bringing a unique perspective and discipline to her work and teaching.

Teaching Assistant Information
Full Name: TBD
Email Address: TBD
Office Hours: TBD

Course Prerequisites
None, but a basic understanding of Python coding is required.

Course Description
This course empowers students to build intelligent AI applications by mastering the art and science of prompt engineering. Designed for aspiring developers, entrepreneurs, and technologists, the course explores how carefully crafted prompts can unlock the full potential of Large Language Models (LLMs)

such as GPT-4, Google Bard, and Copilot—without requiring deep coding expertise. Students will learn to design, test, and deploy AI-powered agents and assistants using cutting-edge tools and frameworks.

Through hands-on projects and real-world use cases, students will explore foundational AI concepts (AI, ML, DL, GenAI), advanced NLP techniques, and the inner workings of LLMs. The course also covers prompt automation, chaining, evaluation, and security, as well as ethical and societal implications of AI. By the end, students will be equipped to create transformative AI solutions that are secure, scalable, and socially responsible.

Course Learning Outcomes

Upon successful completion of this course, students will be able to:

1. **Explain the fundamentals** of AI, ML, DL, and Generative AI, and their relevance to modern application development.
2. **Understand the architecture and behavior** of LLMs, including tokenization, attention mechanisms, and API parameter tuning.
3. **Master prompt engineering techniques**, including zero-shot, few-shot, chain-of-thought, knowledge generation, and Tree of Thought prompting.
4. **Design and build AI applications** and intelligent agents using LLM APIs, prompt chaining tools, and retrieval-augmented generation (RAG).
5. **Develop and manage prompt libraries** to streamline workflows and support collaborative development.
6. **Apply transfer learning and fine-tuning** to adapt pre-trained models for domain-specific tasks.
7. **Identify and mitigate common LLM issues**, such as hallucinations, bias, and prompt injection attacks.
8. **Evaluate prompt performance** using metrics like perplexity and implement prompt testing frameworks.
9. **Explore the ethical, legal, and societal implications** of AI systems, including fairness, transparency, and responsible deployment.
10. **Conduct AI-assisted coding and data analysis**, leveraging LLMs to enhance productivity and creativity across disciplines.
11. **Engage in AI R&D**, exploring emerging trends and contributing to the advancement of intelligent systems.

Required Tools and Course Textbooks.

•TEXTBOOK: El Amri, Aymen. LLM Prompt Engineering for Developers. Packt Publishing, 2024.

•Students will review academic papers, AI research reports, and articles focused on prompt engineering and fine-tuning techniques within the field of Generative AI.

Course Schedule/Topics Covered.

Week	In Class Topic	In-Class	Assignment (Due before next class)
1	• Class Syllabus & Expectations • Course Introduction • Introduction to AI/ML/DL • Generative Al Concepts	Survey on Coding Skills & AI Knowledge	
2	• Understanding NLP • Understanding LLMs • Generative AI Models and Types • Traditional vs. Generative Models		HW1: Exploration of Language Models (short paper)
3	• Understanding GPT • Tokenization • GPT Learning & Training • API Parameters • Building AI Apps	Tech Stack Setup	HW2: Project Proposal (Milestone 1)
4	• Understanding Prompting • General Guidelines & Best Practices • Prompt Anatomy • System Prompts	ChatGPT Prompt Exercises	
5	• Zero & Few-Shot Learning • Chain of Thought (CoT) • Step-Back Prompting • Analogical Prompting • Auto Chain of Thought (AutoCoT)	Few-Shot Exercise COT Exercise	HW3: Basic Project Model Using Prompting Techniques (Milestone 2)
6	• Generated Knowledge • Decomposition • Ensembling & Self-Consistency • Self-Criticism • Applying Prompting Techniques	GK Prompting Exercise	
7	• Managing Prompt Sensitivity • Transfer Learning & Fine-Tuning • Retrieval Augmented Generation (RAG)	- Transfer Learning Exercise - RAG Exercise	HW4: Fine-Tuning for Specificity (Milestone 3)
8	• Meta Prompting • Prompt Generators • Prompt Automation Tools		
9	• Flow-Engineering • Azure Prompt Flow	Azure Prompt Flow Exercise	HW5: Designing Complex Prompts using Azure Prompt Flow (Milestone 4)

10	• ReAct = Reason + Act • Prompt Frameworks • LangChain	- LangChain Exercise - ReAct with LangChain Exercise	HW6: LangChain Implementation (Milestone 4)
11	• Perplexity • Success Criteria & Test Cases • Evaluating a Prompt • Integrating Promptfoo with LangChain	- Perplexity Better Prompt Exercise - Promptfoo Scenarios	HW7: Test and Refine the Project Model (Milestone 5)
12	• Prompt Hacking, Defense, & Security	Prompt Hacking & Defense Exercise	HW8: Prompt Security (Milestone 6)
13	• Ethics and Societal Implications • R&D on Prompt Engineering		
14		Project Presentation & Live Demo (Milestone 7)	Functional Project Submission & Final Report (Milestone 8)
	Final Exam, virtual, due by Friday		

Assignment Grading

- In-class Participation – 14%
- Homework Assignments – 40%
- Project Presentation & Live Demo – 20%
- Final Exam – 25%
- Class Evaluation – 1%

Grading Scale

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

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_cTlAbH7ZRaaw0Ki

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.*