



## **CSYE 7374 - Intro AI Agent Infrastructure**

### **Summer 2025**

#### **Course Information**

Course Title: Intro AI Agent Infrastructure

Course Number: CSYE 7374

Term and Year: Summer 2025

Credit Hour: 4

CRN: 53300

Course Format: Traditional Instructional Method

#### **Instructor Information**

Full Name: YUSUF OZBEK

Email Address: y.ozbek@northeastern.edu

Office Hours: 3:00pm – 4:00pm on Tue and Thur

#### **Instructor Biography**

Yusuf Ozbek is a Teaching Professor in the Information Systems Program at Northeastern University, where he has been teaching since 2007. Dr. Ozbek joined Northeastern University with prior experience in both industry and academic institutions. Throughout his years of industry experience, he served as Web Programmer, and CAD Engineer; as faculty, he taught Computer Science courses in several academic institutions. Dr. Ozbek received his Ph.D. in Interdisciplinary Engineering from Northeastern University, Boston, USA in 2012. Additionally, he holds MS Degrees in Engineering Management, and Computer Systems Engineering, both of which are also from Northeastern University. Dr. Ozbek teaches a wide range of computing and IT courses including Web Programming, Program Structure and Algorithms, Database Design, and Big Data. His research interests include Machine learning; Information storage, security, and retrieval on the Web; Distributed Applications; Web Technologies and Applications; Deep Learning; Neural Networks; Big Data Systems.

#### **Teaching Assistant Information**

Full Name: Malik Huzaifa

Email Address: huzaifa.ma@northeastern.edu

Office Hours: TBA

#### **Course Prerequisites**

Must be enrolled in MGEN

#### **Course Description**

Unlike traditional software that follows a fixed set of instructions, the challenge for AI Agents is their ability to adapt to new information on the fly, making them indispensable for real-world applications. This course

will use the Akka Agent Actor infrastructure as a hands-on model for designing, deploying, and operating scalable, resilient AI Agent systems. Pairing these lessons with insights from areas like machine learning and Large Language Models (LLMs) will further expand your capacity to AI Agent platforms at scale. Throughout the course, we'll bridge theory and practice so you can develop a well-rounded approach to building advanced AI platforms. The materials discussed in this class are LLM, Embeddings, Tokenization, Retrieval-Augmented Generation, and the integration with the Akka Actor model to create a Distributed AI infrastructure.

### Course Learning Outcomes

- Apply Embedding algorithms to convert text to vector representation
- Have a solid understanding of how an LLM, like the ones used in ChatGPT, works on a fundamental level.
- Create your own GPT-like large language models (LLMs) from the ground up
- Build message-oriented systems with Akka
- Integrate LLM and Akka Actor system

### Required Tools and Course Textbooks.

Ebooks and resources are available on the Snell Library

### Course Schedule/Topics Covered.

Understanding large language models  
Working with text data  
Embeddings  
Tokenization  
Attention mechanisms  
Pretraining on unlabeled data  
Fine-tuning for classification  
Introduction to Vector Databases for RAG  
Introduction to Graph Databases for RAG  
Introduction to Actor Model with Akka  
Fault Tolerance with Akka  
Akka Clusters  
Spring AI  
Integrating LLM and Akka Actor Model

### Assignment Grading

- Assignments – 10%
- Midterm Exam – 30%
- Final Exam – 30%
- Final Project – 30%

### Grading Scale

Grades will be curved.

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/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](mailto: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](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/uhrs>.

### **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](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

### **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.