

Applied Artificial Intelligence Machine Learning Syllabus

Course Information

<i>Course Number/Section</i>	4382
<i>Course Title</i>	Applied Artificial Intelligence and Machine Learning
<i>Term</i>	Fall 2025

Professor Contact Information

<i>Professor</i>	Dr. Judd D. Bradbury
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<i>Office Location</i>	JSOM 3.220
<i>Online Office Hours</i>	Wednesday 1:00 – 2:00 PM (please make appointment)

Course Description

This course provides a comprehensive introduction to applied artificial intelligence and machine learning for business applications. Students will begin with foundational machine learning concepts including classification, regression modeling, and decision trees using industry-standard tools like Scikit-Learn, Keras, and TensorFlow. The course then transitions to modern AI applications, focusing extensively on Large Language Models (LLMs) and their practical implementation. Students will master prompt engineering techniques, explore the internal workings of LLMs through tokenization and embeddings, and learn advanced applications including Retrieval-Augmented Generation (RAG) for knowledge-based systems. The course culminates with hands-on experience in creating text embedding models and fine-tuning techniques for specialized applications. By combining traditional machine learning foundations with cutting-edge AI technologies, students will develop the skills necessary to implement AI-driven solutions that enhance business operations and drive strategic decision-making.

Student Learning Objectives

1. **Foundation Building:** Provide students with a solid understanding of fundamental machine learning concepts, algorithms, and their business applications.
2. **Technical Proficiency:** Develop competency in industry-standard machine learning and AI tools including Scikit-Learn, Keras, TensorFlow, and modern LLM frameworks.
3. **LLM Mastery:** Provide comprehensive understanding of Large Language Models, including their architecture, capabilities, and limitations in business contexts.
4. **Applied AI Skills:** Enable students to design and implement practical AI solutions including prompt engineering, RAG systems, and custom embedding models.
5. **Advanced Techniques:** Introduce students to fine-tuning methodologies and advanced AI techniques for specialized business applications.

Student Learning Outcomes

1. **Implement Core ML Solutions:** Design and deploy classification and regression models using appropriate algorithms and evaluation metrics for business problems.
2. **Master Prompt Engineering:** Create sophisticated prompts for LLMs that generate targeted, high-quality outputs for various business applications and use cases.

3. **Build Knowledge Systems:** Develop and implement Retrieval-Augmented Generation (RAG) systems that leverage external data sources to enhance decision-making processes.
4. **Understand AI Architecture:** Explain the technical foundations of LLMs, including tokenization, embeddings, and model architecture, and their impact on model performance.
5. **Create Custom AI Models:** Build text embedding models and apply fine-tuning techniques to adapt pre-trained models for specific business requirements.
6. **Analyze and Visualize Results:** Generate analytical insights and create effective visualizations to communicate AI/ML results and recommendations to stakeholders.
7. **Evaluate AI Solutions: Assess the performance, limitations, and ethical considerations of AI/ML implementations in business contexts.**

Required Textbooks and Materials

Required Texts

Online versions of each book are available from the UTD library website at no charge. Navigate to the website and paste the title into the search box. Make sure you are logged in to the library website with your student ID. <https://library.utdallas.edu/>

see eLearning

Technical Requirements

In addition to a confident level of computer and Internet literacy, certain minimum technical requirements must be met to enable a successful learning experience. Please review the important technical requirements on the [Getting Started with eLearning](#) webpage.

Course Access and Navigation

This course can be accessed using your UT Dallas NetID account on the [eLearning](#) website.

Please see the course access and navigation section of the [Getting Started with eLearning](#) webpage for more information.

To become familiar with the eLearning tool, please see the [Student eLearning Tutorials](#) webpage.

UT Dallas provides eLearning technical support 24 hours a day, 7 days a week. The [eLearning Support Center](#) includes a toll-free telephone number for immediate assistance (1-866-588-3192), email request service, and an online chat service.

Communication

This course utilizes online tools for interaction and communication. Some external communication tools such as regular email and a web conferencing tool may also be used during the semester. For more details, please visit the [Student eLearning Tutorials](#) webpage for video demonstrations on eLearning tools.

- The professor will communicate with course announcements for issues that affect all students.
- Students should send the professor an email for personal concerns that are **not** about assignments.
- Professor and teaching assistants are **off duty on weekends**.

- We provide extensive support for assignments in the following sequence. **We do not tutor students.** Asking for assistance on successive steps is tutoring.
 1. Discussion board posting including the assignment number/step number and a screen shot of your error.
 2. Attend the optional weekly lab.
 3. You may send the professor an email if you do not have a response to your discussion board posting within 24 hours.

Distance Learning Student Resources

Online students have access to resources including the McDermott Library, Academic Advising, The AccessAbility Resource Center, and many others. Please see the [eLearning Current Students](#) webpage for more information.

Server Unavailability or Other Technical Difficulties

The University is committed to providing a reliable learning management system to all users. However, in the event of any unexpected server outage or any unusual technical difficulty which prevents students from completing a time sensitive assessment activity, the instructor will provide an appropriate accommodation based on the situation. Students should immediately report any problems to the instructor and also contact the online [eLearning Help Desk](#). The instructor and the eLearning Help Desk will work with the student to resolve any issues at the earliest possible time.

Academic Calendar

WEEK/ DATES	TOPIC/LECTURE	READING	ASSESSMENT / ACTIVITY	DUE DATE
1 08/25	AI-ML Environments Lecture 1 – Machine Learning	AI-ML Environments Lecture 1 – Machine Learning	Assignment 1A – ML Environments Class Policy Test	09/05
2 09/01	Lecture 1 – Machine Learning	Lecture 1 – Machine Learning	Assignment 1B – ML Landscape	09/05
3 09/08	Lecture 2 – Framing Machine Learning Projects	Lecture 2 – Framing Machine Learning Projects	Assignment 2 – End to End Machine Learning	09/12
4 09/15	Lecture 3 – Classification	Lecture 3 – Classification	Assignment 3 – Classification	09/19

5 09/22	Lecture 4 – Regression Modeling	Lecture 4 – Regression Modeling	Assignment 4 – Regression Models	09/26
6 09/29	Lecture 5 – Decision Trees	Lecture 5 – Decision Trees	Assignment 5 – Decision Trees	10/03
7 10/06	Lecture 6 – AI Language Modeling	Lecture 6 – AI Language Modeling	Assignment 6 – Tokens and Token Embeddings	10/10
8 10/13	Midterm Exam	Midterm Exam	Midterm Exam	10/17 – 10/18
9 10/20	Lecture 7 – Large Language Models	Lecture 7 – Large Language Models	Assignment 7 – Looking Inside an LLM	10/24
10 10/27	Lecture 8 – Prompt Engineering	Lecture 8 – Prompt Engineering	Assignment 8 – Prompt Engineering	10/31
11 11/03	Lecture 9 – Retrieval Augmented Generation	Lecture 9 – Retrieval Augmented Generation	Assignment 9 – Retrieval Augmented Generation	11/07
12 11/10	Lecture 10 – Creating Text Embedding Models	Lecture 10 – Creating Text Embedding Models	Assignment 10 – Text Embedding Models	11/14
13 11/17	Lecture 11 – Fine Tuning Representation Models for Classification	Lecture 11 – Fine Tuning Representation Models for Classification	Assignment 11 – Fine Tuning	11/21
14	Fall Break		Fall Break	11/28

11/24				
15 12/01				12/05
16 12/08	Final Exam Course Evaluation	N/A	Final Exam (seat must be booked 48 hours in advance) UTD Testing Center	12/12 – 12/13

Proctored Exam Procedures

This course requires human proctored examinations. Students taking the exam at the UTD on campus testing center need to register at the [UTD Testing Center](#) webpage. Students taking their exam at a remote proctored exam center need to schedule their exam at least 14 days in advance using the [Distance Learning Proctored Exams](#) webpage. Following the practices below will help students achieve the best outcomes on their exam.

- Book your exam in the testing center at least 48 hours in advance
- Create a calendar appointment in outlook/google
- Arrive at the testing center 2 hours early
- Avoid booking the last appointment of the day (if late you will be turned away)
- Students that miss their exam for any reason will not receive the curve and in most cases will receive a zero for the exam

Class Materials

The Instructor may provide class materials that will be made available to all students registered for this class as they are intended to supplement the classroom experience. These materials may be downloaded during the course; however, these materials are for registered students' use only. Classroom materials may not be reproduced or shared with those not in class or uploaded to other online environments except to implement an approved AccessAbility Resource Center accommodation. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#).

Class Participation

Regular class participation is expected. Students who fail to participate in class regularly are inviting scholastic difficulty. A portion of the grade for this course is directly tied to your participation in this class. It also includes engaging in group or other activities during class that solicit your feedback on homework assignments, readings, or materials covered in the lectures (and/or labs). Class participation is documented by faculty. Successful participation is defined as consistently adhering to University requirements, as presented in this syllabus. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#).

Class Recordings

Students are expected to follow appropriate University policies and maintain the security of passwords used to access recorded lectures. Unless the AccessAbility Resource Center has approved the student to record the instruction, students are expressly prohibited from recording any part of this course. Recordings may not be published, reproduced, or shared with those not in the class, or uploaded to other online environments except to implement an approved AccessAbility Resource Center accommodation. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#).

Note: if the instructor records any part of the course, then the instructor will need to add the following syllabus statement:

The instructor may record meetings of this course. These recordings will be made available to all students registered for this class if the intent is to supplement the classroom experience. If the instructor or a UTD school/department/office plans any other uses for the recordings, consent of the students identifiable in the recordings is required prior to such use unless an exception is allowed by law.

Grading Policy

Weights

Assignments		50%
Midterm Exam (with backtracking)		20%
Final Exam (with backtracking)		20%
Quiz, Class Policy Test, Course Evaluation		10%
Total		100%

Grading Scale

Scaled Score	Letter Equivalent
>= 93	A+
>= 90	A
>= 88	A-
>= 85	B+
>= 82	B
>= 80	B-
>= 76	C+
>= 73	C
>= 70	C-
>= 66	D+

>= 63	D
>= 60	D-
< 60	F

Course Policies

Make-up exams

Students that do not schedule their exam in a timely manner will not participate in the exam curve. Medical issues require a note from a medical doctor or documentation of a hospital stay.

Late Work

Assignments turned in after the due date will receive a 10% discount. A 7 day late period is provided for students to turn in their assignments late. Assignments more than 7 days late will receive a 0. Requests for deadline exception require a note from a medical doctor stating that you could not work on the day of the deadline. We call your doctor.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

“As a Comet, I pledge honesty, integrity, and service in all that I do.”

Academic Integrity

The faculty, administration, and student body of UT Dallas expects a high level of responsibility and academic integrity. These expectations and specific prohibitions are published by the office of community standards here:

<https://conduct.utdallas.edu/dishonesty/>

Students in this course students suspected of academic dishonesty are subject to disciplinary proceedings by the office of Judicial Affairs. If found responsible, the following sanctions will be applied:

1. **Assignments – One letter grade reduction**
2. **Projects & Case Studies – One letter grade reduction**
3. **Quizzes – One letter grade reduction**
4. **Exams – F as the final course grade**

Academic Support Resources

The information contained in the following link lists the University’s academic support resources for all students.

Please go to [Academic Support Resources](#) webpage for these policies.

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University’s policies and procedures segment of the course syllabus. Please review the catalog sections regarding the [credit/no credit](#) or [pass/fail](#) grading option and withdrawal from class.

Please go to [UT Dallas Syllabus Policies](#) webpage for these policies.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.