

The University of Texas at El Paso
Industrial, Manufacturing, and Systems Engineering (IMSE) Department

SE 5390 Applied Machine Learning

Fall 2024 - Syllabus

COURSE INFORMATION

SE 5390: Applied Machine Learning, CRN: 17232

Delivery Method: Online

Meeting Day and Time: Wednesday, 6:00 pm – 8:50 pm. Meeting time is OPTIONAL.

Location: [Link to Blackboard Shell](#)

Meeting session: [Link to Zoom virtual session](#)

INSTRUCTOR INFORMATION

Instructor: Sergio Luna Fong, Ph.D.

Written Communication: (1) MS Teams, (2) Email

Phone Number: (915) 747-7450

Office Hours: Wednesday, 8:00 am to 9:30 am, or by appointment. In-person or MS Teams

COURSE DESCRIPTION

To extract useful information from the vast amount of data we encounter, we need a combination of methodologies, tools, techniques, algorithms, and creativity. This includes visualizing data, identifying trends, defining patterns, and recognizing clusters. Data mining, which has evolved from statistics and artificial intelligence, now incorporates machine learning techniques. This course will delve into methods from both fields that are effective for pattern recognition and prediction from an application standpoint. The ultimate goal is to provide students with a “data toolbox” for real-world scenarios. The hands-on approach uses open source Data Science tools with Graphical User Interfaces.

This course does not require programming experience.





COURSE OBJECTIVES

By the end of the course, students will be able to:

- **Analyze** problems of interest through the lens of critical thinking and contextualizing the “so-what?”
- **Identify** proper analytical strategies to extract actionable information from data
- **Formulate** solutions that considers structured and unstructured data attributes
- **Generate** data-driven insights by implementing machine learning algorithms
- **Incorporate** some of the most popular tools for data analysis, text mining, and network analysis
- **Formulate** a data analytics manuscript and project presentation that explores data life cycles

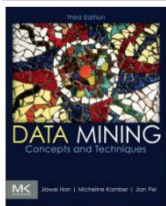
EDGE ADVANTAGES

This course is designed to equip students with essential Edge Advantages that contribute to their professional and personal development. Through the completion of course requirements and assignments, such as team projects, presentations, and essays, students will develop the following Edge Advantages:

	Problem-Solving	Assignments will challenge students to identify and address complex issues using innovative and analytical approaches.
	Communication	Class discussions and written assignments will improve students' skills in articulating ideas clearly and persuasively in both oral and written forms.
	Confidence	By actively participating and successfully completing assignments, students will build self-assurance in their abilities to tackle academic and real-world challenges.
	Critical Thinking	The course's emphasis on analysis and synthesis of information will strengthen students' abilities to think critically and make informed decisions.

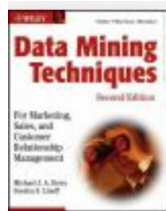
REFERENCE MATERIALS

The course relies on <https://www.utep.edu/library/>



Data Mining: Concepts and Techniques Ebook

Han, J., Kamber, M., & Mining, D. (2006). Concepts and techniques. *Morgan Kaufmann*, 340, 94104-3205.



Data mining techniques : For marketing, sales, and customer relationship management

Berry, M. J. A., Linoff, G. S., & Berry, M. J. A. (2004). *Data mining techniques : For marketing, sales, and customer relationship management*. John Wiley & Sons, Incorporated.



Discovering knowledge in data : An introduction to data mining

Larose, D. T., & Larose, C. D. (2014). *Discovering knowledge in data : An introduction to data mining*. John Wiley & Sons, Incorporated.

TENTATIVE COURSE SCHEDULE

Module	Date	Topic(s)	Reading	Assignment Due Tuesday at 11:59pm
Week 01	Aug 28 th – Sept 3 rd , 2024	Orientation & Introduction	<ul style="list-style-type: none"> • Student Introduction • A complete guide to data mining and how to use it • Data Mining: Concepts and Techniques Ebook - Chapter 1 • Machine learning, explained • Data analytics vs. Data Science vs. Machine Learning: What's the Difference? • CRISP-DM: Towards a standard process model for data mining. • KNIME Getting Started Guide 	Student Introduction HW: Concepts of data mining, data science, and machine learning Quiz
Week 02	Sept 4 th – Sept 10 th	Refresh of statistical analysis	<ul style="list-style-type: none"> • Data Mining Techniques: For Marketing, Sales, and Customer Relationship Management - Chapter 5 	HW Data Structures Quiz
Week 03	Sep 11 th – 17 th	Data Manipulation	<ul style="list-style-type: none"> • Data Mining Techniques: For Marketing, Sales, and Customer Relationship Management - Chapter 5 	HW: Data Preparation
Week 04	Sep 18 th – 24 th	Learning from Data	<ul style="list-style-type: none"> • Supervised, Unsupervised, and Reinforcement • Supervised vs Unsupervised Learning: What's the Difference? Source: IBM • Reinforcement Learning 101 	HW: Learning from Data
Week 05	Sep 25 th – Oct 1 st , 2024	Regression Analysis	<ul style="list-style-type: none"> • Data Mining Techniques: For Marketing, Sales, and Customer Relationship Management - Chapter 5 Page 139 • Discovering Knowledge in Data - Chapter 6 • Different Types of Regression Models 	Quiz
Week 06	Oct 2 nd – Oct 8 th	Classification Analysis	<ul style="list-style-type: none"> • A comprehensive survey of clustering algorithms • Discovering Knowledge in Data - Chapter 5 	HW: Regression and Classification
Week 07	Oct 9 th – Oct 15 th	Clustering Analysis	<ul style="list-style-type: none"> • Review Midterm Project Instructions • Discovering Knowledge in Data - Chapter 8 Page 153-161 • Data Mining Techniques: For Marketing, Sales, and Customer 	HW: Clustering Analysis

			<p>Relationship Management - Chapter 8 Page 383-387</p> <ul style="list-style-type: none"> • The 5 Clustering Algorithms Data Scientists Need to know 	
Week 08	Oct 16 th – 22 nd	Association Analysis	<ul style="list-style-type: none"> • Discovering Knowledge in Data - Chapter 10 Page [180 - 197] • Data Mining Techniques: For Marketing, Sales, and Customer Relationship Management - Chapter 9 • The Apriori Algorithm 	- Midterm Project
Week 09	Oct 23rd – Nov 5th, 2024	Dimensionality Reduction Analysis	<ul style="list-style-type: none"> • A beginner's guide to dimensionality reduction in Machine Learning • Seven Techniques for Dimensionality Reduction • Dimensionality Reduction Techniques in Machine Learning • A review of dimensionality reduction techniques for efficient computation 	<p>Mid Term due: 10/25</p> <p>Quiz</p>
Week 10	Nov 6 th – Nov 12 th , 2024	Reinforcement Learning	<ul style="list-style-type: none"> • An Introduction to Reinforcement Learning • Reinforcement Learning vs Genetic Algorithm - AI for Simulations board for Your Agile Project 	Quiz
Week 11	Nov 13 th – Nov 19 th , 2024	Neural Networks	<ul style="list-style-type: none"> • Review Final Project Instructions • Discovering Knowledge in Data - Chapter 7 • Data Mining Techniques: For Marketing, Sales, and Customer Relationship Management - Chapter 7 • Classification Using Neural Networks 	HW: Neural Networks
Week 12	Nov 20 th – 26 th	Network Analysis	<ul style="list-style-type: none"> • Review Final Project Instructions • Network Metrics Explained • How to Get Started with Social Network Analysis 	HW: Network Analysis
Week 13	Nov 18 th – 20 th	Text Mining	<ul style="list-style-type: none"> • Review Final Project Instructions • Text analytics 101: The C-Suite guide to mining the voice of the customer Source: Forbes • Natural Language Processing (NLP) • A Guide to Knowledge Graphs 	Quiz
Week 14	Nov 27 th – Dec 3 rd	Large Language Models (LLMs)	<ul style="list-style-type: none"> • What are large language models (LLMs)? • Types of Open Source & Closed Source LLMs(Large Language Models) 	HW: LLMs

			• How ChatGPT Works: A Non-Technical Primer	
Week 15	Dec 2nd – Dec 4th, 2024			Final Project Report (12/9th)

ASSIGNMENTS AND GRADING

Assignments for this course are assessed according to rubrics.

Grade Distribution:

100-90 = A 89.9-80 = B 79.9-70 = C 69.9-60 = D 59.9 and Below = F

Class assignments are described by the following breakdown:

- (15%) – Quizzes
- (30%) - Assignments
- (25%) – Mid-term project – Lectures 2 to 8
- (25%) – Final Project
- (5%) – Final Presentation

TECHNOLOGY REQUIREMENTS

Tools to use in this course:

- KNIME Analytics [Download KNIME Analytics Platform](#)
- Account to ChatGPT – Free version [Link to OpenAI ChatGPT](#)

Some course content is delivered via the Internet through the Blackboard learning management system. Ensure your UTEP e-mail account is working and that you have access to the Web and a stable web browser. Google Chrome and Mozilla Firefox are the best browsers for Blackboard; other browsers may cause complications. When having technical difficulties, update your browser, clear your cache, or try switching to another browser.

You will need to have access to a computer/laptop. You will need to download or update the following software: Microsoft Office, Adobe Acrobat Reader, Windows Media Player. Check that your computer hardware and software are up-to-date and able to access all parts of the course.

If you do not have word-processing software, you can download Word and other Microsoft Office programs (including Excel, PowerPoint, Outlook and more) for free via UTEP's Microsoft Office Portal. Click the following link for more information about [Microsoft Office 365](#) and follow the instructions.

IMPORTANT: If you encounter technical difficulties beyond your scope of troubleshooting, please contact the UTEP [Technology Support](#) as they are trained specifically in assisting with technological needs of students. Please do not contact me for this type of assistance. The Help Desk is much better equipped than I am to assist you!

COURSE COMMUNICATION: How we will stay in contact with each other

Here are the ways we can keep the communication channels open:

- Office Hours: I will have office hours for your questions and comments about the course. My office hours are via MS Teams. If you cannot meet me at the scheduled time, feel free to message to schedule an appointment.
- MS Teams: Teams is the best way to contact me. I will make every attempt to respond to your question within 24 hours of receipt. When messaging me, be sure to message me from your UTEP student e-mail account and please include the course number in the conversation.
- Announcements: Check Blackboard, Email, and MS Teams announcements frequently for any updates, deadlines, or other important messages.

ATTENDANCE AND PARTICIPATION

Our class meetings are online via Zoom, every Wednesday at 6:00 pm, beginning August 28 through December 4. Attendance in the course is determined by participation in the learning activities of the course. Your participation in the course is important not only for your learning and success but also to create a community of learners.

Attendance is Optional, there is no penalization for not joining live sessions

EXCUSED ABSENCES AND/OR COURSE DROP POLICY

According to UTEP Catalog, “At the discretion of the instructor, a student can be dropped from a course because of excessive absences or lack of effort. A grade of “W” will be assigned before the course drop deadline and a grade of “F” after the course drop deadline.” See Policies and Regulations in the UTEP Undergraduate Catalog for a list of excuse absences. Therefore, if I find that, due to non-performance in the course, you are at risk of failing, I will drop you from the course. I will provide 24 hours advance notice via email.

OR

I will not drop you from the course. However, if you feel that you are unable to complete the course successfully, please let me know and then contact the [Registration and Records Office](#) to initiate the drop process. If you do not, you are at risk of receiving an “F” for the course.

DEADLINES, LATE WORK, AND ABSENCE POLICY

Assignments

Writing assignments will be due on **Tuesday at midnight (11:59 PM)** via Blackboard. No late work will be accepted if the reason is not considered excusable.

MAKE-UP WORK

Make-up work will be given *only* in the case of a *documented* emergency. Note that make-up work may be in a different format than the original work, may require more intensive preparation, and may be graded with penalty points. If you miss an assignment and the reason is not considered excusable, you will receive a zero. It is therefore important to reach out to me—in advance if at all possible—and explain with proper documentation why you missed a given course requirement. Once a deadline has been established for make-up work, no further extensions or exceptions will be granted.

ALTERNATIVE MEANS OF SUBMITTING WORK IN CASE OF TECHNICAL ISSUES

I strongly suggest that you submit your work with plenty of time to spare in the event that you have a technical issue with the course website, network, and/or your computer. I also suggest you save all your work (answers to discussion points, quizzes, exams, and essays) in a separate Word document as a backup. This way, you will have evidence that you completed the work and will not lose credit. If you are experiencing difficulties submitting your work through Blackboard, please contact the UTEP Help Desk. You can email me your backup document as a last resort.

INCOMPLETE GRADE POLICY

Incomplete grades may be requested only in exceptional circumstances after you have completed at least half of the course requirements. Talk to me immediately if you believe an incomplete is warranted. If granted, we will establish a contract of work to be completed with deadlines.

ACCOMMODATIONS POLICY

The University is committed to providing reasonable accommodations to students with documented disabilities. Students who become pregnant may also request reasonable accommodations, in accordance with state and federal laws and regulations and University policy. Accommodations that constitute undue hardship are not reasonable. To make a request, please register with the UTEP Center for Accommodations and Support Services (CASS). Contact CASS at 915-747-5148, email them at cass@utep.edu, or apply for accommodations online via the CASS portal.

SCHOLASTIC INTEGRITY

Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, **cheating, plagiarism, and collusion**. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as ones' own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the [Office of Community Standards](#) for possible disciplinary action. To learn more, please visit [HOOP: Student Conduct and Discipline](#)

CLASS RECORDINGS

The use of recordings will enable you to have access to class lectures, group discussions, and so on in the event you miss a synchronous or in-person class meeting due to illness or other extenuating circumstance. Our use of such technology is governed by the Federal Educational Rights and Privacy Act (FERPA) and UTEP's acceptable-use policy. A recording of class sessions will be kept and stored by UTEP, in accordance with FERPA and UTEP policies. Your instructor will not share the recordings of your class activities outside of course participants, which include your fellow students, teaching assistants, or graduate assistants, and any guest faculty or community-based learning partners with whom we may engage during a class session. **You may not share recordings outside of this course.** Doing so may result in disciplinary action.

PLAGIARISM DETECTING SOFTWARE

Some of your course work and assessments may be submitted to SafeAssign, a plagiarism detecting software. SafeAssign is used to review assignment submissions for originality and will help you learn how to properly attribute sources rather than paraphrase.

COPYRIGHT STATEMENT FOR COURSE MATERIALS

All materials used in this course are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. They may not be further disseminated.