The University of Texas at Tyler
Department of Electrical and Computer Engineering
ENG 5319/EENG 4350- Neural networks

Syllabus

Catalog Description :

Artificial Neural Networks (ANNs) are a cornerstone of modern artificial intelligence. In this course, you will learn how to design, train, and apply neural networks to tackle real-world problems using AI techniques. Explore cutting-edge advancements that enhance the accuracy and effectiveness of neural networks across diverse applications.

Credits:	(	3	hours of lecture,	0	hours of laboratory per week)

Text(s):

1. *Neural Networks and Learning Machines* , 3rd Edition , S. Haykin , Prentice-Hall , 2008 , ISBN No. 0131471392

   We will use parts of:

   1. Deep Learning with Python, 2nd Edition, by François Chollet, Manning Publishing, 2021
   2. Hands-on Machine Learning with Scikit-Learn & TensorFlow, 3rd edition, by Aurelie Geron, O'Reilly, 2022
   3. Machine Learning with Pytorch and Scikit-Learn by Sebastian Raschka, Yuxi (Hayden) Liu, and Vahid Mirjalili, Packt Publishing Ltd, 2022
   4. Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville, MIT Press, 2017. DS

Additional Material: TBD

Course Coordinator/Instructor: Dr. Vijayalakshmi Saravanan, Assistant Professor, Computer Engineering

Topics Covered: (paragraph of topics separated by semicolons)

1. Introduction to Artificial Neural Networks 2. Feedforward and Multistage Networks 3. Supervised Learning of Feedforward Networks 4. Recurrent Networks 5. Unsupervised Learning Networks 6. Applications.

Evaluation Methods: (only items in dark print apply):

1. Quizzes
2. Assignments/Programming
3. Final presentation
4. Homework
5. Report
6. Project
7. Presentation
8. Course Participation
9. Peer Review

Course Learning Outcomes[1] By the end of this course, students will be able to:

1. Describe the structure of artificial neural networks
2. Construct a multi-layer NN using leading frameworks

3. Build and train NN to solve real-world problems
4. Compare and apply various types of neural networks such as Convolutional and Recurrent NN

Contribution to Meeting Professional Component: (in semester hours)

Mathematics and Basic Sciences:		hours
Engineering Sciences and Design:	3	hours
General Education Component:		hours

Prepared By:		Date:	
Updated By:	Vijayalakshmi Saravanan	Date:	6/9/2025

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COURSE OUTLINE

Course coordinator: Vijayalakshmi Saravanan
Office: 2009B, Department of Electrical and Computer Engineering
Phone: 585-298-9650
Email: vsaravanan@uttyler.edu

Class hours

T/THU: 9.00-10.35 AM (Online)
Zoom Link:
https://uttyler.zoom.us/j/82421987093?pwd=oFngaIKswN72SbrVbvqzwBvOPuhlfY.1

Office Hours (M/W): 1-2 PM

NB. Students are welcome to discuss with me outside of office hours. You may also send an email for an in-person appointment.

Course Schedule (TENTATIVE):

WEEK	TOPICS COVERED
1	Introduction to Artificial Neural Networks - Overview and Fundamental Concepts, Historical Development, Basic Models and Learning Rules of ANNS, Distributed Representations, Linear Threshold Elements and the Perceptron
2	Feedforward and Multistage Networks - One-Stage and Multistage Feedforward Networks, Introduction to Sigmoidal, Radial Basis, and Other Activation Functions
3	Supervised Learning of Feedforward Networks - Discriminant Functions, The Perceptron Learning Algorithm, The Least Mean Square (LMS) Algorithm and the Adaline, The Backpropagation Learning Algorithm, Convergence Analysis, Optimal Choices of Learning Parameters, Generalization Properties
4	Recurrent Networks
5	Unsupervised Learning Networks
6	Applications

Grading scale

90% - 100%: A
80% - 89%: B
70% - 79%: C
60% - 69%: D
< 60%: F (Fail)

When assigning final grades, the instructor reserves the right to alter these division points as he or she deems necessary based on the overall evaluation of individual or class performance and effort.
While grading students, what issues are considered?
1. Quizzes (25%)
2. Assignments and Programming (50%)
3. Final Presentation (25%)

Late submissions:
Late submission will receive a penalty of 10 percent of the total grade per day up to 3 days. Any submission after 3 days will not be accepted for credit. Extensions can be granted in rare cases based on individual circumstances, if requested before the original due date.

Academic Integrity
Plagiarism, cheating, and other forms of academic dishonesty are inimical to the objectives of higher education. The College supports the imposition of penalties on students who engage in academic dishonesty, as defined in the "Conduct" section.
No credit can be given for a dishonest assignment. A student found to have engaged in any form of academic dishonesty may, at the discretion of the instructor, be:
a. Given a zero for that assignment.
b. Allowed to rewrite and resubmit the assignment for credit.
c. Assigned a reduced grade for the course.
d. Dropped from the course.
e. Failed in the course.

Attendance Policy:
Students are expected to attend all scheduled lectures and meetings. By signing up for the class it is understood that the student has checked for ANY significant recurring conflicts with lecture and laboratory meeting times (including work, family, or any other commitments). No exceptions can be made to attendance requirements as this will be unfair to the other students. The progressive nature of the class means that perfect attendance is recommended if a good grade is desired. No more than three excused absences for valid reasons are allowed and documentation should be submitted for each absence. Class participation is graded based on attendance, faculty and graduate assistant observation and involvement in class activities.

Students Rights and Responsibilities:
To know and understand the policies that affect your rights and responsibilities as a student at UT Tyler, please follow this link: http://www.uttyler.edu/wellness/rightsresponsibilities.php

Grade Replacement/Forgiveness and Census Date Policies:
Students repeating a course for grade forgiveness (grade replacement) must file a Grade Replacement Contract with the Enrollment Services Center (ADM 230) on or before the Census Date of the semester in which the course will be repeated. Grade Replacement Contracts are available in the Enrollment Services Center or at http://www.uttyler.edu/registrar. Each semester's Census Date can be found on the Contract itself, on the Academic Calendar, or in the information pamphlets published each semester by the Office of the Registrar.
Failure to file a Grade Replacement Contract will result in both the original and repeated grade being used to calculate your overall grade point average. Undergraduates are eligible to exercise grade replacement for only three course repeats during their career at UT Tyler; graduates are eligible for two grade replacements. Full policy details are printed on each Grade Replacement Contract.

The Census Date is the deadline for many forms and enrollment actions that students need to be aware of. These include:

• Submitting Grade Replacement Contracts, Transient Forms, requests to withhold directory information, approvals for taking courses such as Audit, Pass/Fail or Credit/No Credit.

• Receiving 100% refunds for partial withdrawals. (There is no refund for these after the Census Date)

• Schedule adjustments (section changes, adding a new class, dropping without a "W" grade)

• Being reinstated or re-enrolled in classes after being dropped for non-payment

• Completing the process for tuition exemptions or waivers through Financial Aid

State-Mandated Course Drop Policy:

Texas law prohibits a student who began college for the first time in Fall 2007 or thereafter from dropping more than six courses during their entire undergraduate career. This includes courses dropped at another 2-year or 4-year Texas public college or university. For purposes of this rule, a dropped course is any course that is dropped after the census date (See Academic Calendar for the specific date). Exceptions to the 6-drop rule may be found in the catalog. Petitions for exemptions must be submitted to the Enrollment Services Center and must be accompanied by documentation of the extenuating circumstance. Please contact the Enrollment Services Center if you have any questions.

Disability Services:

In accordance with federal law, a student requesting accommodation must provide documentation of his/her disability to the Disability Services counselor. If you have a disability, including a learning disability, for which you request accommodation, please contact the Disability Services office in UC 3150, or call (903) 566-7079.

Student Absence due to Religious Observance:

Students who anticipate being absent from class due to a religious observance are requested to inform the instructor of such absences by second class meeting of the semester.

Student Absence for University-Sponsored Events and Activities:

If you intend to be absent for a university-sponsored event or activity, you (or the event sponsor) must notify the instructor at least two weeks prior to the date of the planned absence. At that time the instructor will set a date and time when make-up assignments will be completed.

Social Security and FERPA Statement:

It is the policy of The University of Texas at Tyler to protect the confidential nature of social security numbers. The University has changed its computer programming so that all students have an identification number. The electronic transmission of grades (e.g., via e-mail) risks violation of the Family Educational Rights and Privacy Act; grades will not be transmitted electronically.

Emergency Exits and Evacuation:

Everyone is required to exit the building when a fire alarm goes off. Follow your instructor's directions regarding the appropriate exit. If you require assistance during an evacuation, inform your instructor in the first week of class. Do not re-enter the building unless given permission by the University Police, Fire department, or Fire Prevention Services.

AI is not permitted in this course at all:

a. Example 1: I expect all work students submit for this course to be their own. I have carefully designed all assignments and class activities to support your learning. Doing your

own work, without human or artificial intelligence assistance, is best for your efforts in mastering course learning objectives. For this course, I expressly forbid using ChatGPT or any other artificial intelligence (AI) tools for any stages of the work process, including brainstorming. Deviations from these guidelines will be considered a violation of UT Tyler's Honor Code and academic honesty values.

b. Example 2: To best support your learning, you must complete all graded assignments by yourself to assist in your learning. This exclusion of other resources to help complete assignments includes artificial intelligence (AI). Refrain from using AI tools to generate any course context (e.g., text, video, audio, images, code, etc.) for an assignment or classroom assignment.

c. Example 3: The work submitted by students in this course will be generated by themselves. This includes all process work, drafts, brainstorming artifacts, editing, and final products. This extends to group assignments where students must collaboratively create the project. Any instance of the following constitutes a violation of UT Tyler's Honor Code: a student has another person/entity do any portion of a graded assignment, which includes purchasing work from a company, hiring a person or company to complete an assignment or exam, using a previously submitted assignment and/or using AI tools (such as ChatGPT).