COURSE DESCRIPTION/COURSE OVERVIEW: Foundations of Deep Learning, beginning with an overview of Intelligent Systems (AKA Artificial Intelligence), including a taxonomy of current systems. Focused introduction to basic concepts and techniques of artificial neural networks (ANNs), including their relation to biological neurons. Summary discussion of ANN's computational and learning abilities, and applications. Methodologies for improvement of performance, including fuzzy theory and other biology-based models.

COURSE RATIONALE: This course provides a taxonomy for what is currently titled “Artificial Intelligence,” or AI. Background is provided, coupled with exercises, in the historical evolution of “Deep Learning.” A detailed operation of biologically-based computing is presented, and Back-Propagation, the cornerstone of Deep Learning is presented. An opportunity to author an original simulation is provided, and students may receive a 1 SCH CREDIT for the laboratory where the simulation is coded. (This credit may be used to fulfill the 1SCH credit of Senior-Lab Experience that is a BSEE degree requirement.)

COURSE PRE-REQUISITES: EE 2372 (Software Design I), with a C or better; and EE 3353 (Discrete Time Signals & Systems), with a C or better.

CREDIT ALLOCATION: 3-0-0
NOTE: there is an associated EE 4171 course that can provide TA guidance of the course project, and credit for the “Senior-Lab” experience credit on the BSEE degree plan.

REQUIRED TEXTBOOKS: none required. Optional:
(3) Current articles on the subject. References will be provided, as needed.
LEARNING OUTCOMES: Students successfully completing EE 4365 will be able to:

1. Utilize a working knowledge of the taxonomy of Artificial Intelligence to classify new and unconventional models.
2. Identify different architectures and paradigms, their limitations and appropriate learning structures.
3. Describe the difference between Shallow, Deep Feedforward, Convolution, Recurrent, and Recursive Networks, and identify appropriate optimization techniques for Deep Models.
4. Design and implement a deep learning network simulation (with two modes of operation: learning and processing) using a high-level language.
5. Select appropriate system topology, based application characteristics and hyperparameters.

TOPICS COVERED:
1. Taxonomy of Artificial Intelligence
2. Overview of Historically Significant Models
3. Historical Foundations of Learning
4. Modern Practices in Deep Networks
5. Regularization for Deep Learning
6. Computational Challenges and Optimization for Training of Deep Models
7. Practical Methodology and Unconventional Architectures
9. Current Applications and Deep Learning Research

GRADING POLICY AND STRUCTURE

Homework ........................................20%
Project or Final Exam....................25%
Oral Presentation.........................5%
Exams (3 equally weighted)\(^1\) ......45%
Instructor assessment....................5%

In the case of emergency when you cannot submit your homework in person, please contact the Course Faculty as soon as possible in person, by phone, or via email. If you know you will be out of town or otherwise prevented from submitting assignments on the due date, make every effort to turn them in early, or have a classmate submit the assignment for you. Anytime you feel that you are falling behind in the course, it is best to contact the Course Faculty immediately to discuss your situation.

GRADING SCALE:

Grading scale:
90 - 100 = A
80 – 89 = B
75 – 79 = C
60 – 74 = D
< 60 = F

\(^1\) There will be four scheduled exams, one of which will be eliminated from the grade calculation. Typically, the lowest grade will be eliminated.
Expectations of the Class

What are the faculty expectations of the student?

- I expect you to be “in the moment” and participate in the class. Unless you are expecting a very important communication, cell phones should not be examined while you are in class.
- I will check my UTEP email at least once a day and will get back to you within 24 to 48 hours.
- I will provide graded feedback on your performance.
- I will keep you informed about your graded progress in the class and will generate a “Grade Report,” which will show where you stand, grade-wise prior to the drop date. This report will go to your UTEP email.
- I will leave myself open to suggestions about improvement of the class and class related activities.
- I will do all I can to facilitate your learning and success in this class.
- The course calendar, provided in a different document, is a document subject to change, and may be adjusted due to events occurring during the semester. If any changes in the course are implemented, I will ensure that the class is notified via email and in-class announcements in a timely manner.

What faculty expect of their students:

- At the beginning of the course, students should review the syllabus, calendar, and other items.
- Students should keep up with the assigned reading and homework assignments.
- If the student misses a lecture, it is incumbent on the student to obtain the information from a fellow classmate. NOTE: PowerPoint slides will be made available, after they are used in class.

COURSE POLICIES:

Academic Regulations: Review in UTEP Undergraduate Student Catalog (available at catalog.utep.edu).

Attendance: Students are expected to attend lectures, since we only meet twice per week. Please note that it is appreciated to be given notice if you will be absent due to a previously scheduled activity, such as an industry site visit, or other commitment.

Blackboard:
- Students are required to subscribe to and access the course Blackboard site. Students are encouraged to access this site daily. Course syllabus, calendar, topical outline of scheduled lectures, and assigned readings are posted on this site.

Communication:
- Communication is the responsibility of both students and faculty. The faculty will keep students informed of progress in theory. Students with questions or concerns should:
- Go to the faculty member’s office hours, or
- send email to the faculty member.

**Grievances:**
- Challenges to grades may be pursued only on the basis of malice, bias, arbitrary or capricious grade determination or impermissible discrimination. In no event shall a challenge be pursued only on the basis of the standards employed in setting grades, so long as those standards are employed impartially. Grievances MUST be in WRITING and filed through the course faculty member, the Director of RN-BSN Undergraduate Program, the CoEN Assistant Dean for Undergraduate Studies and the Dean of the CoEN. If the student is not satisfied with the outcome after using the chain of command, the student may consult with and/or file a challenge with the Chairperson of the University Student Welfare and Grievance Committee.

**Policy on Scholastic Dishonesty:**
- Students are expected to be above reproach in all scholastic activities. Students who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and dismissal from the Department of Electrical and Computer Engineering and/or university. Scholastic dishonesty includes but is not limited to reproducing test or quiz materials from memory, copy/paste, or Xerox, cheating, plagiarism, collusion, the submission for credit or any work or materials that are attributable in whole or in part to another person, taking an examination for another person, and any act designed to give unfair advantage to a student or the attempt to commit such acts. Regents' Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22.
- Since scholastic dishonesty harms the individual, all students, and the integrity of the College of Engineering and the university, policies on scholastic dishonesty will be strictly enforced, see detailed procedure in the Handbook of Operating Procedures (HOP) available at https://www.utep.edu/vpba/hoop/
- Use a consistent citation method for your written work. The APA Style of citation is preferred for your final paper (see Guidelines on citing according to the APA citation style on Blackboard).

**Policy relating to Disability & CASS:**
- **Disability:** In Section 504 of the Vocational Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA) of 1990, if a student needs an accommodation then the Office of Disabled Student Services located at UTEP need to be contacted. If you have a condition, which may affect your ability to perform successfully in this course, you are encouraged to discuss this in confidence with the instructor and/or the director of the Disabled Student Services. Written guidelines r/t accommodations from CASS must be submitted to the course manager PRIOR to the start of the course. If you have a disability and need classroom accommodations, please contact CASS at 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass. CASS’ Staff are the only individuals who can validate and if need be, authorize accommodations
Professional Behavior:
• Students are expected to behave professionally at all times with faculty, peers, preceptors, and clients in any setting in which the student is a representative of UTEP. Bullying, verbal abuse, insubordination, or personal attacks will not be tolerated in any form. Any behavior deemed inappropriate by faculty and/or preceptors will result in faculty conference(s), and completion of a Student Opting for Success (SOS) plan that addresses the student’s areas of needed improvement. Possible activities available to assist the student in attaining the SOS objectives include stress and/or anger management counseling sessions. Inappropriate behaviors may result in an administrative withdrawal from the course and/or dismissal from the program.

Retention: Students under-performing in the course.
• When a student is not progressing in the course as expected, or is not successful on an examination, they will be required to meet with the instructor to discuss strategies for success. The faculty, in concert with the student, will identify recommendations for improving the student’s success potential and will specify timelines for completion of these recommendations.

Being Successful

Although originally developed for online learning, these recommendations are pertinent to all college students. Learning is not a spectator sport. It is everyone's responsibility to participate as fully as they can, so everyone can get the most from the experience. Here are some simple rules to follow to ensure your participation and engagement in the learning process:

• Ask questions: If you don't know the answer, someone else will. Go to the IEEE Lounge to do homework, and get tutoring. This is an excellent place for asking questions related to content OR any problems related to the class.
• Reach out to others: Offer a fact, technique or other item that can help others learn something you can share.
• Stay focused: Stay on topic to increase the efficiency of your learning. Remember: when in class, “be in the moment.” Please do not subject other students to your distracted behavior…. If you don’t want to be in class on a particular day, either “grin and bear it,” or leave.

Effective Electronic Communication Guidelines
• Keep your messages concise and clearly written. Most ideas can be stated in a couple of sentences, although sometimes a longer message may be needed to communicate your thoughts adequately. Keep in mind that people are more apt to read and digest shorter messages than long ones. Also, please start exercising your professional etiquette for email messages. NOTE: Please do not address me as “Miss” or “Teacher” in person or via email. The appropriate title is Dr. Nava.
Netiquette

- At this point in the course, it is also important to share a word of caution, so that the student develops some professionalism with regard to interpersonal electronic communications. As you may know, when communicating electronically, many of the feelings or impressions that are transmitted via body language in face-to-face communications are lost. Consequently, interpreting emotions and innuendoes is far more difficult. The words become more antiseptic, and one-dimensional. Only what is written, or drawn, carries the message. Often excitement can easily be misinterpreted as anger or an insult. It is important that everyone keep this in mind when communicating electronically. Words in print may appear harmless; however, they can emotionally injure the person reading them. More information can be found at http://www.albion.com/netiquette.

Social Media:

- Students enrolled in the UTEP CoEN must practice and behave in a manner that protects their professional reputation by exercising reasonable judgment when using social media technologies whether in their personal life or in their professional life. Inappropriate use of Electronic/Social Media can potentially impact job offers or quality of said offers. Being undisciplined in postings may result in civil and criminal penalties including fines or possible jail time in accordance with state and federal laws. http://admin.utep.edu/Portals/1805/PDF/UTEP%20Social%20Media%20Standards.pdf