The University of Texas at El Paso
Department of Electrical and Computer Engineering

Fall 2019--CRN 16950

FACULTY INFORMATION
Dr. P. Nava Office: A-319
Phone extension: 747-5994 Email: pnava@utep.edu
Office Hours: 3:30 - 4:30 Monday
11:00 - 12:00 Tuesday
12:30 - 1:30 Wednesday
11:00 - 12:00 Friday
Other times by appointment

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
8. Current Applications and Deep Learning Research

GRADING POLICY AND STRUCTURE

Homework ........................................20%
Project or Final Exam ....................25%
Oral Presentation ...........................5%
Exams (3 equally weighted) ..............................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:

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<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>90 - 100</td>
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<td>B</td>
<td>80 - 89</td>
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<td>D</td>
<td>60 - 74</td>
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<td>&lt; 60</td>
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1 There will be four scheduled exams, one of which will be eliminated from the grade calculation. Typically, the lowest grade will be eliminated.
Important Date: Final Exam Date – Friday, December 14\textsuperscript{th}, 10:00 a.m.– 12:45 p.m.

Other requirements:

Graduate students taking this course as part of their degree plan are responsible for completing all work required of undergraduates. In addition expectations include:

- written review of an article from a current journal;
- completion of a final project;
- successful completion of a final exam, prepared for graduate students; and
- 80\% average (minimum) on homework, design work and exams.

Expectations of the Class