SYLLABUS: DEEP LEARNING (COSC 40523 - 074)

COURSE & INSTRUCTOR INFORMATION

Course

Course Info: Deep Learning, COSC 40523 – 074 (Class Number:

71579) Semester and Year: Fall 20XX

Number of Credits: 3

Course Component Type: LEC

Course Webpage: TCU Online (https://tcuonline.tcu.edu)

Instructor

Response Time: Emails will be responded to within 24 hours.

Final Evaluative Exercise & Important Dates

Final Exam: December 10, 5PM-7:30PM
Midterm Exam(s): October 8, 4PM-6PM
Last Day to Drop: November 3
Last Day to Select P/NC: December 1
See TCU Calendar for detailed information: https://registrar.tcu.edu/fall-academic-dates.php

Note for students: The syllabus is your first course reading. It provides an orientation to, overview of the flow, and expectations of the course. You should turn to the syllabus for details on assignments and course policies.

Student Resources & Policy Information

Click or scan QR code for resources to support you as a TCU student. Please note section on Student Access and Accommodation, Academic Conduct & Course Materials Policies, and Emergency Response & TCU Alert.

Course Description

Catalog Description

This course introduces fundamental knowledge of deep learning algorithms, practical skills to build, train and tune a deep artificial neural network with applications such as computer vision, natural language processing, and business analytics. Topics include but not limited to fully connected neural networks, convolutional networks, recurrent networks, generative adversarial networks.

Prerequisites & Concurrent Enrollment

COSC/MATH 30103, MATH 30224, either MATH 10043 or 30853 or concurrent. All prerequisites need to be C- or better.

Course Materials

Required Materials

- Dive into Deep Learning, by Aston Zhang, Zack Lipton, Mu Li, and Alex Smola, https://d2l.ai/
- Mathematics for Machine Learning, by Marc Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong https://mml-book.github.io/book/mml-book.pdf
- The Python Tutorial, https://docs.python.org/3/tutorial/
- NumPy QuickStart, https://numpy.org/doc/stable/user/quickstart.html
- PyTorch, https://pytorch.org/
- Wandb: https://wandb.ai/site/

Supplementary Resources

Lecture notes/slides will be made available on TCU Online.

Learning Outcomes

Course Learning Outcomes

This course provides a hands-on introduction to fundamental knowledge of deep learning algorithms. Upon successful completion, the students will be able to:

1) build, train and apply fully connected deep neural networks
2) use the common neural network "tricks," including initialization, L2 and dropout regularization, gradient checking
3) implement and apply a variety of optimization algorithms, such as mini-batch gradient descent, momentum, and check for their convergence
4) identify the key parameters in a neural network's architecture
5) apply convolutional networks to visual detection and recognition tasks
6) apply sequence models to natural language problems, including text synthesis
7) build training pipelines and real-time inference run-times

COURSE REQUIREMENTS

Assignments

Homework

Homework will be based on lecture material and is designed to help you deepen your understanding of the course content. There will be a total of three homework assignments, accounting for 30% of the final grade. Students must have access to a laptop or desktop computer to complete all course assignments. Handwritten assignments will not be accepted.

Quizzes and Class Participation

Students are strongly encouraged and expected to attend all lectures. All quizzes will be taken in class without exception. There will be a total of six graded quizzes, which will be pre-announced. Quizzes will constitute 20% of the final grade.

Exams

There will be two exams: A Mid-term exam (20% of the final grade) and a Final exam (30% of the final grade). Both exams will be held in class, without exception.

Grading Philosophy & Policy

Late Work

Late homework assignments will be accepted up to 48 hours past the due date mentioned in TCU online. Late assignments will be penalized at 10% deduction per 12 hours. After 48 hours, you will get zero. Exceptions will only be given in extreme cases solely at instructor's discretion.

Participation, Engagement & Attendance

All students are strongly encouraged and expected to attend all lectures. While attendance may not be recorded daily, this course includes frequent in-class quizzes, and all exams will be conducted in class without exception.

Make-up Examination Policy

Make-up exams will not be provided by default, except in extreme circumstances. Exceptions may be made in cases of serious personal tragedy, severe illness, or similar situations, but such leniency is at the instructor's discretion. If unforeseen circumstances prevent you from attending class, please notify me so we can work together to ensure your success in learning the material.

Please note that I cannot accept medical documentation to justify absences, as accessing student medical records is considered an infringement on privacy. If you have a legitimate reason for your absence and want to provide verification, please access the Absence Documentation Form here.

Course Assignments & Final Grade

Each grading item listed below will have opportunity for extra-credit of up to 5-10%.

Grade Item	Percentage
Homework	30%+
Quizzes	20%+
Midterm Exam	20%+
Final Exam	30%+
Total	**100%+**

Grading Scale(s)

In the grading scale below, **" ["** means that the number is included in the range, and **") "** means that the number is excluded.

Note: Each grading item will include bonus exercises as shown above indicated by **"+"**, which allow students to earn extra credit. Apart from that, no additional extra credit or work will be offered under any circumstances. The final course grades will **NOT** be curved, with no exceptions.

Grade	Score
A	[94,100]
A-	[90, 94)
B+	[87, 90)
B	[84, 87)
B-	[80, 84)
C+	[77, 80)
C	[74, 77)
C-	[70, 74)
D+	[67, 70)
D	[64, 67)
D-	[60, 64)
F	[0, 60)

Course Policies

Academic Honesty

I take academic honesty very seriously. Academic honesty is a core value of the university and all members of the university community are responsible for abiding by the tenets of the policy. You can find TCU's student's code of conduct (see section 3.4) in student handbook for

academic misconduct. Lack of knowledge of this policy is not an acceptable defense to any charge of academic misconduct. Examples of academic misconduct and course policy violation include but are not limited to plagiarism, cheating on examinations, unauthorized collaboration, falsification, multiple submissions and unauthorized public posting and distribution of instructor-prepared course material. If the occurrence of academic misconduct or course policy violation is proven, the student or students will receive an immediate and final grade of F. Disciplinary penalties will also be sought in addition to academic penalties. Names of the persons involved will be reported to the Dean of Students. This includes all parties involved, who will be treated equally, and I will not attempt to determine who actually developed the solution and who copied. For further clarification of university policies regarding academic honesty, please read Academic Conduct & Course Materials Policies.

Technology Policy

Artificial Intelligence (AI) Ethical Considerations and Consequences for Misuse

Using AI-generated content inappropriately or without authorization may be considered academic misconduct and/or a breach of professional ethics specific to the discipline. Misuse of AI or similar assignment-help tools will be addressed in accordance with TCU's Academic Conduct Policy or other relevant policies, and could lead to penalties such as failing the course, dismissal from the program, suspension, or expulsion.

COURSE SCHEDULE

This calendar represents current course plans. Plans may need to change to enhance the learning opportunities and will be communicated via in-class announcements or TCU Online.

Week	Dates	Topics	Notes
Week 1	Aug 18, 20	Introduction to Deep Learning	Read Syllabus
Week 2	Aug 25, 27	Mathematical Foundations	
Week 3	Sep 03	Linear and Logistic Regression	Sep 01 (Labor Day)
Week 4	Sep 08, 10	Basics of Neural Networks	Quiz 1, HW1
Week 5	Sep 15, 17	Deep Neural Networks	
Week 6	Sep 22, 24	Deep Learning Training Essentials	Quiz 2
Week 7	Sep 29, Oct 01	Optimization Algorithms	Quiz 3, HW 2
Week 8	Oct 06, 08	Review and **Midterm Exam**	
Week 9	Oct 13, 15	Practical Aspects of Deep Learning	
Week 10	Oct 20, 22	Convolutional Neural Networks (CNN)	Quiz 4
Week 11	Oct 27, 29	CNN II	HW 3
Week 12	Nov 03, 05	CNN, Model Evaluation	Quiz 5
Week 13	Nov 10, 12	Sequence Models	HW 4
Week 14	Nov 17, 19	Sequence Models, Generative AI	Quiz 6
Week 15	Nov 24, 26	Thanksgiving Break	
Week 16	Dec 01, 03	Generative AI, Review	
Week 17	Dec 08, 10	**Final Exam**	