

IS 6733 901

# Deep Learning on Cloud Platforms

Course Syllabus - Fall 2024



## Course Information

**Course Description:** This course presents students with basic understanding of modern neural networks and their applications in computer vision and natural language processing (NLP). The course starts with a recap of linear models and discussion of stochastic optimization methods that are crucial for training deep neural networks. Students will examine all of the popular neural network building blocks including fully connected layers, convolution, and recurrent layers. In this course, students will gain a thorough introduction to cutting-edge topics such as attention and transformer in Deep Learning for NLP using public cloud platforms. Students will also gain practical hands-on experience in the optimization, deployment, and scaling ML models of various types. The prerequisites for this course are: 1) Basic knowledge of Python. 2) Basic linear algebra and probability.

**Credit Hours:** 3

**Course Modality:** Mix of in-person and online

## Meeting Times

---

**Duration:** 08/26/2024-12/13/2024

**Campus:** Downtown Campus

**Location:** [SP1 200A](#)

**Time(s):** R 6:00 PM - 7:15 PM

## Learning Goals

At the end of the course, you will be able to:

- Learn how to use deep learning frameworks to build deep learning-based solutions.
- Train your models on cloud platforms such as Google colab and UTSA Arc.
- Analyze your deep learning solutions based on ML metrics.

- Demonstrate the ability to fit solutions to your dataset of interest.
- Demonstrate an understanding of deep learning models in computer vision, natural language, encode-decode, explainability and emerging technologies such as large language models (LLMs).
- Carry out a novel project in one of the emerging AI technologies, such as LLMs.

## Communicate with Me

**Instructor Name:** Nishant Vishwamitra

**Department**

Information Systems and Cyber Security

**Student Hours**

Zoom/Office Hours by Appointment

**Email Address:** [nishant.vishwamitra@utsa.edu](mailto:nishant.vishwamitra@utsa.edu)

**Preferred Method of Communication**

Canvas Messages

**Instructor Name:** Ramiro Rodriguez

**Department**

Computer Science

**Student Hours**

By Appointment

**Email Address:** [ramiro.rodriguez5@utsa.edu](mailto:ramiro.rodriguez5@utsa.edu)

**Preferred Method of Communication**

Canvas Messages

## About Me & My Teaching Philosophy

**About Me:**

I am an Assistant Professor of Information Systems and Cybersecurity at the University of Texas at San Antonio (UTSA). My research interests include online abuse defense, online hate and harassment defense, Artificial Intelligence (AI) in cyber security, and crowdsourcing. My work has been published in major cyber security conferences such as IEEE S&P, NDSS, and USENIX Security, AI conferences such as AAAI, and leading Information Systems (IS) journals, such as Management Information Systems Quarterly (MIS Quarterly). I can be contacted at [nishant.vishwamitra@utsa.edu](mailto:nishant.vishwamitra@utsa.edu).

**Teaching Philosophy:**

This course is designed to be hands-on. We want to learn how to do things, not simply “know about” things. Starting early on projects is important. Continuous, incremental learning is a good strategy for this course. If you have any issues, it is important to contact me early.

## Course Materials

**Class Slides**

**Google Account with Access to Colab**

**UTSA ARC Account (Preferable)**

## Assessments and Assignments

**Labs:** There are 4 individual hands-on labs in this course. They have been made available online, and are compatible with Google Colab or UTSA Arc so that you can work on them from your home. I suggest doing a first couple on Colab, then transitioning to Arc, since you will likely need Arc for your final project. Arc account requests can be made with me as the advisor.

**Groups Project Artifact:** The final project will be a group activity. Groups of 3 -5 are best suited. For the final group project, a model, system, or framework counts as an artifact. In special cases where your project may not have an artifact, let me know beforehand.

**Midterm Exam:** The exam will be theoretical and practical (with a few numerical). Before the exam, I will provide the concepts from which questions will be asked.

**Group Project Report:** Final report, to be submitted as a team.

There will be no final exam. There will be a final group presentation.

## Activities and Grading

| Activity                   | Quantity | %           |
|----------------------------|----------|-------------|
| Labs (4)                   | 400 pts  | 40%         |
| Group Project Artifact (1) | 200 pts  | 20%         |
| Midterm Exam (1)           | 200 pts  | 20%         |
| Group Project Report (1)   | 200 pts  | 20%         |
| <b>Total</b>               |          | <b>100%</b> |

Distribution of Course Assignments, Their Quantity, and Contribution to Final Grade.

## Grade Distribution and Letter Grade

| Letter Grade | Grade Range |
|--------------|-------------|
| A+           | 98.0 – 100  |
| A            | 92.0 – 97.9 |
| A-           | 90.0 – 91.9 |
| B+           | 88.0 – 89.9 |
| B            | 82.0 – 87.9 |
| B-           | 80.0 – 81.9 |
| C+           | 78.0 – 79.9 |
| C            | 72.0 – 77.9 |
| C-           | 70.0 – 71.9 |
| D+           | 68.0 – 69.9 |
| D            | 62.0 – 67.9 |
| D-           | 60.0 – 61.9 |
| F            | < 60.0      |

Grade Distribution and Letter Grade

## Course Expectations & Policies

### Video and Audio Recording

---

As the instructor of this course, I may record meetings and lessons. You are expected to follow appropriate University policies and maintain the security of passwords used to access recorded lectures. Recordings may not be published, reproduced, or shared with those not in the class. If the instructor or a UTSA office plans any other uses for the recordings, consent of the students identifiable in the recordings is required before such use unless an exception is allowed by law. For more information on your privacy and class recordings, review [Student Privacy \(FERPA\) in Virtual Classrooms and Other Educational Recordings](#) and the [Guide to Secure Video Conferencing Tools](#).

### Academic Freedom

---

Academic freedom<sup>1</sup> is a cornerstone of the University. Academic freedom in its teaching aspect is fundamental for the protection of the rights of the teacher in teaching and of the student to freedom in learning.<sup>2</sup> Each faculty member is entitled to full freedom in the classroom discussing the subject that the faculty member teaches.<sup>3</sup> The University of Texas at San Antonio will not penalize or discipline members of the faculty because of their exercise of academic freedom.

Along with this freedom comes responsibility. It is the responsibility of faculty members to ensure that topics taught are related to the classroom subject. Students should be free to take reasoned exception to the data or views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.<sup>4</sup> It is not the proper role of the university or any outside agency to attempt to shield individuals from ideas and opinions they find unwelcome, disagreeable, or even deeply offensive.<sup>5</sup> Engaging with new ideas and perspectives helps students grow intellectually and is beneficial to the educational process.

1. Statement adapted from Texas A&M University's [Syllabus Statement Regarding Academic Freedom](#)
2. 1940 Statement of Principles on Academic Freedom and Tenure
3. Board of Regents Rule 31004; HOP Policy 4.02
4. American Association of University Professors Joint Statement on Rights and Freedoms of Students
5. The Chicago Statement

## Our Commitment to Inclusivity

---

The University of Texas at San Antonio, a Hispanic Serving Institution situated in a global city that has been a crossroads of peoples and cultures for centuries, values diversity and inclusion in all aspects of university life. As an institution expressly founded to advance the education of Mexican Americans and other underserved communities, our university is committed to promoting access for all. UTSA, a premier public research university, fosters academic excellence through a community of dialogue, discovery and innovation that embraces the uniqueness of each voice.

## Syllabus Changes

---

The syllabus is subject to change at the instructor's discretion. Any changes/corrections to the course materials, assignment dates, or other updates will be communicated to the students ahead of time. You are responsible for checking Canvas for corrections or updates to the syllabus.

## Course Schedule

For a list of important university-wide dates, review [One Stop's academic calendar](#).

| Due Date | Activities/Assignments                  | Points |
|----------|---|--------|
|          | <a href="#">Your AI-based Invention</a> | 0      |
| 9/15     | <a href="#">Lab 1</a>                   | 100    |
| 10/10    | <a href="#">Midterm</a>                 | 100    |
| 9/29     | <a href="#">Lab 2</a>                   | 100    |

| Due Date | Activities/Assignments                 | Points |
|----------|--|--------|
| 11/3     | <a href="#">Lab 3</a>                  | 100    |
| 11/17    | <a href="#">Lab 4</a>                  | 100    |
| 12/8     | <a href="#">Final Project Artifact</a> | 200    |
| 12/10    | <a href="#">Group Project Report</a>   | 200    |

All deliverables are due **11:59 PM Central Daylight Time (CDT)** according to the schedule below. Refer to the [Academic Calendar](#) for university-wide deadlines and be in touch *early* and *often* with any issues. *Schedule is subject to change.*

### Week 1 (Thur, Aug 29) | Neural Networks 1 (Due Date: Sun, Sep 1)

1. Welcome: **Submit discussion** (0 grade)
2. Neural Networks Lecture
3. Lab 1: Neural Networks Intro

### Week 2 (Thur, Sep 05 | Neural Networks 2 (Due Date: Sun, Sep 08)

1. DNN Lecture (*Will be available online*)

*Census Date: Wednesday, Sep 11, 5 P.M. – Last Day to Drop/Withdraw without Penalty*

### Week 3 (Thur, Sep 12) | Lab 1 and CNN 1 (Due Date: Sun, Sep 15)

1. CNN Lecture
2. Lab 1 due: **100 points**
3. Lab 2: CNN Intro

### Week 4 (Thur, Sep 19) | CNN 2 (Due Date: Sun, Sep 22)

1. CNN Lecture

### Week 5 (Thur, Sep 26) | Midterm Exam (Due Date: Sun, Sep 29)

1. Transfer Learning
2. Lab 2 due: **100 points**

### Week 6 (Thur, Oct 3) | Lab 2, Transfer Learning and Encode-Decode 1 (Due Date: Sun, Oct 6)

1. Encode-decode

## 2. Midterm Exam Review

### Week 7 (Thur, Oct 10) | Transfer Learning and Encode-Decode 2 (Due Date: Sun, Oct 13)

1. Midterm Exam: Neural Networks and CNN: **100 points**

*Midterm Grades Due: Monday, October 14, 2 P.M. – Grades cover 20%.*

### Week 8 (Thur, Oct 17) | Attention and BERT (Due Date: Sun, Oct 20)

1. Attention
2. Lab 3: Transfer learning and Encode-decode intro
3. Form group project team and choose team leader

### Week 9 (Thur, Oct 24) | Attention and BERT (Due Date: Sun, Oct 27)

1. BERT
2. Lab 4: NLP intro
3. **Group project teams due** and paper assignment

*Drop Deadline: Monday, Oct 28 – Last Day to Drop Individual Courses for a “W”*

### Week 10 (Thur, Oct 31) | Lab 3, Diffusion and XAI 1 (Due Date: Sun, Nov 3)

1. Diffusion
2. XAI
3. Lab 3 due: **100 points**

### Week 11 (Thur, Nov 07) | Group Project (Due Date: Sun, Nov 10)

1. Group project paper presentation (15 minutes)
2. Idea pitch (5 minutes)

### Week 12 (Thur, Nov 14) | Group Project (Due Date: Sun, Nov 17)

1. Guest Lecture (TBA)
2. Lab 4 due: **100 points**

### Week 13 (Thur, Nov 21) | Group Project (Due Date: Sun, Nov 24)

1. Group project update with intermediate results (15 minutes)

*Happy Thanksgiving!*

Week 14 (Thur, Nov 28) | Final Project Presentation (Due Date: Sun, Dec 1)

Thanksgiving break

*Study Day: Friday, Dec 06*

Week 15 (Thur, Dec 05) | Artifact Demo and Final Project Presentation (Due Date: Thur, Dec 5)

1. Group project presentation (15 minutes + 2 minutes Q&A)
2. Artifact demo with metrics and baseline comparison (3 mins)

Week 16 (-) | Final Report (Due Date: Tue, Dec 10)

1. Submit the *Group Project Report*: **100 points**

## Essential Student Information

- **Important:** Bookmark and visit the [Common Syllabus Information webpage](#) to find important and valuable resources about counseling services, transitory/minor medical issues, supplemental instruction, tutoring services, academic success coaching, sexual harassment and sexual misconduct, campus safety and emergency preparedness, and the Roadrunner Creed.
- For technical requirements, support, and resources, visit [Academic Innovation's Student Technical Support](#) page.
- UTSA provides reasonable accommodations to students via [Student Disability Services](#). For more details on eligibility, policies, and requirements, please visit [www.utsa.edu/disability](http://www.utsa.edu/disability) or call (210) 458-4157.
- Students at UTSA are responsible for ensuring their work is consistent with UTSA's standards for academic integrity. Students should review [Section 203 of the UTSA Student Code of Conduct](#) for appropriate standards of academic integrity.
- UTSA provides numerous services for students from counseling to tutoring to a food pantry. Visit [Student Affairs Programs and Services](#) and [Student Success](#) for more information.
- Visit the [UTSA Libraries and Museums](#) site for access to journals, research tutorials, and tech gear you can borrow and to find your department's librarian.
- Enroll in the [Roadrunner Success Playbook](#), an open enrollment, self-paced, online hub in Canvas tailored to ensure you have the resources you need to excel at UTSA.
- Follow [Digital Learning Netiquette](#) standards for your online communication activities.