

# TERM PROJECT

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Points: \_\_\_\_\_ / 100

## Note about Group Work:

You may work in groups of up to 4 students in total. If a group has both undergraduate and graduate students in it, the requirements will be based on graduate level expectations/rubric.

## Overview

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The term project gives you the opportunity to apply deep learning methods to a real-world dataset or research problem. You may choose from applied projects (building and evaluating a model), survey projects (literature review of recent methods), or hybrid projects (small-scale implementation + research synthesis).

## Requirements

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### Undergraduates (CIS 483)

- Implement a deep learning model (CNN, RNN/LSTM, Transformer, or GAN) applied to a chosen dataset.
- Provide a written report (**6–8 pages**, IEEE format) describing the dataset, preprocessing, architecture, training results, and discussion.
- Include experiments with at least **one baseline model** and one variant/improvement.
- Make a presentation at least 10 minutes long (no more than 20 minutes)

### Graduates (CIS 583)

- All of the above in the Undergraduate section, **plus at least one of the following:**
  1. Implement two distinct architectures and compare results.
  2. Conduct a deeper literature review (minimum 10 peer-reviewed sources) tying your work to state-of-the-art methods.
  3. Explore a more advanced technique (e.g., transfer learning, attention mechanisms, diffusion models, or reinforcement learning with neural networks).
- Report length: **8–12 pages** (IEEE format).
- Make a presentation that is at least 12 minutes long (no more than 25 minutes)

## Deliverables

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- Submit the report, including a link to a GitHub repository with your code, on your chosen topic.
- Create a discussion board post
  - Including a screenshare/recording of your brief presentation
  - Including the report and any slides on your topic, as well
- You must **respond** to at least **two** of your peers for full points
  - The response should be meaningful
  - E.g., NO insignificant responses that don't demonstrate that you watched the presentation and/or read their report
    - NOT things like "Good work brah." Or completely off topic unrelated responses, such as, "Girllll, where do you get your nails done???"
    - I certainly can give these responses if I'd like, but you cannot

## Evaluation Criteria

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- **Topic depth and difficulty (20 pts)** - topic is substantive and appropriate for this level.
- **Clarity and organization (20 pts)** - writing is structured, logical, and well-explained.
- **Technical accuracy (20 pts)** - correct use of AI, ML, and DL terminology and principles. Correct implementation.
- **Research effort(20 pts)** - appropriate and sufficient references.
- **Presentation and discussion engagement (20 pts)** - clear, interesting presentation and peer interaction.

## Possible Project Topics

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This is not an exhaustive list. Each bullet point is a single idea that could be explored. If you think of something outside of this list, then that's great! Run it past me if you are concerned if it achieves the requirements.

Clearly, if you choose a topic that we covered in class, your coverage of it, implementation, and other aspects must be more extensive and/or sufficiently different than what we covered in class.

### Computer Vision

- Image classification (CIFAR-10, MNIST, or a dataset of your choice).
- Object detection (YOLO/SSD/Faster R-CNN).
- Medical image analysis (e.g., chest X-rays).

### Natural Language Processing

- Sentiment analysis using RNN/LSTM vs Transformer.
- Text summarization or translation with pre-trained LLMs.
- Fake news or spam detection.

## Generative Models

- GAN for image synthesis.
- Variational Autoencoder (VAE) for anomaly detection.
- Style transfer (images or text).

## Time Series & Sequential Data

- Stock price or weather prediction with LSTMs.
- Speech recognition or music generation.
- IoT/sensor anomaly detection.

## Survey/Research-Oriented

- Compare architectures across a domain (e.g., CNN vs Vision Transformer for vision tasks).
- Literature review on diffusion models or reinforcement learning + deep networks.
- Ethical/interpretability analysis of deep learning in healthcare, security, or education.