

Course Syllabus for DS 776: Deep Learning

NOTE: This syllabus document contains the basic information of this course. The most current syllabus is available in the full course.

Course Description

Introduction to the theory and applications of deep learning. The course begins with studying neural networks and how to train them. Various deep learning architectures are introduced, including convolutional neural networks and transformers. Applications may include image classification, object detection, and natural language processing. Algorithms will be implemented in Python using a high-level framework such as PyTorch or TensorFlow.

Course Objectives

By the end of this course, you will be able to:

- Understand Core Neural Network Architectures: Describe and differentiate key neural network architectures, including convolutional neural networks (CNNs) and transformers, and their applications in computer vision and NLP.
- Develop and Train Models in PyTorch: Use PyTorch to build, train, and fine-tune neural network models for computer vision and NLP tasks.
- Apply Deep Learning to Computer Vision: Implement CNNs and advanced architectures for computer vision applications, such as object detection, image classification, and segmentation.
- Implement Transformer-Based Models for NLP: Utilize transformer models to perform NLP tasks such as text classification, named entity recognition, text generation, and summarization.
- Leverage the Hugging Face Ecosystem for NLP: Use Hugging Face's models and tools to explore, fine-tune, and experiment with transformer-based NLP models.
- Evaluate and Optimize Model Performance: Assess model performance for computer vision and NLP applications, using appropriate metrics to interpret results and improve accuracy.

Course Components

CoCalc Homework

Project: Your assignment is to produce a tutorial that briefly introduces a topic and demonstrates a working example using PyTorch and/or Hugging Face.

- The tutorial should be suitable for someone who has not yet encountered the topic but is familiar with the material covered in this course up to this point.

- If you choose a topic we've already covered, you need to do something to make it different from how it was covered in class. At the very least, you should use other data and a different model.
- You can also choose a topic from one of our textbooks that was covered in class.
- You can also choose other topics, but keep your idea relatively straightforward because you only have two weeks.

Grading

Your mastery of course content is assessed using a variety of methods:

Activity	Points
CoCalc Homework (12)	600 total points
Project (1)	100 points
TOTAL	700 total points

If you complete the homework set (Jupyter notebook) on your computer, you must upload it to CoCalc to the relevant homework folder before the due date. All code in your submitted notebook must be executed with the output showing to get credit for the homework.

Final grades are assigned using the following scale:

90–100%	A
80–89%	B
60–79%	C
0–59%	F