

Course Outline

1. Document Information

Degree Program	Computer Science
Course Number	CS 537
Course Title	Advanced Topics in Expert Systems
Semester Hours	3
Course Coordinator	Henry Hexmoor
Revision Term	Fall 2020
Latest Revision	Spring 2024

2. Catalog Description

Foundation models are a recent class of AI models that are large-scale in terms of number of parameters and are trained on broad data. This course will outline the fundamental concepts of foundation models including the capabilities of pre-trained models for AI-powered applications. Topics covered include Transformers, Large Language Models such as GPT4, Diffusion models, generative modeling, and multi-modal foundation models. There is no required textbook, and we will be mostly reading publicly available research papers. The papers will be mostly from major conferences.

3. Textbooks

4. References

- Will be provided

5. Course Learning Outcomes

- Understanding the science of foundation models

6. Assessment of the Contribution to Student Outcomes

Outcome	1	2	3	4	5	6	7
Assessed	X		X	X	X		X

7. Prerequisites by Topic

CS 330 or consent of instructor.

8. Major Topics Covered in the Course

1. Introduction and Transformers
2. Optimization, Backpropagation, and Training
3. Word Embeddings
4. Transformers
5. Transfer Learning
6. Scaling laws and GPT-3
7. Prompting
8. Class Project

8. Major Lab Assignments and Projects

8. Assessment Plan for the Course

Tool 1. Assignments:

PO 1,2, 5

Tool 2. Midsem:

PO 1, 4

Tool 3. Project:

PO 5, 7