Master Course Syllabus

Prerequisite(s): Acceptance into the Master of Computer Science program or Graduate Certificate in Artificial Intelligence program

Semester: Spring
Year: 2025
Course Prefix: CS
Course and Section #: 6480-001
Course Title: Deep Learning
Credits: 3

Course Description

Presents advanced models, algorithms, approaches and applications in neural networks and machine learning. Broadens and deepens the horizons of study of the philosophy and utility of machine learning models beyond what is covered in Machine Learning. Includes advanced gradient descent models, bayesian methods, boltzmann machines, recurrent neural nets, hidden markov models, randomized optimization, hopfield nets, computer vision, modern toolkits, learning from gigantic data.

Course Attributes

This course has the following attributes:

☐ General Education Requirements
☐ Global/Intercultural Graduation Requirements
☐ Writing Enriched Graduation Requirements
☐ Discipline Core Requirements in Program
☐ Elective Core Requirements in Program
☐ Open Elective

Other: N/A

Instructor Information

Instructor Name: Larry Zeng

Student Learning Outcomes

Upon successful completion, students should be able to . . .

1 Explain what deep learning is.
2 Decide whether a deep learning approach is appropriate for a given problem domain.
3 Create programs that implement and incorporate deep learning to solve real-world problems.
4 Use modern toolkits to implement deep learning models.

Course Materials and Texts

Text: Deep Learning with Python, Second Edition, by Francois Chollet
E-Book link: https://www.manning.com/books/deep-learning-with-python#toc
https://www.manning.com/books/deep-learning-with-python-second-edition?gclid=EAIaIQobChMI1KGm8J_98wIVMwnnCh1aZQA5EAAYAyAAEgJjkvD_BwE
Jupyter notebooks for the code samples of the book "Deep Learning with Python"
https://github.com/fchollet/deep-learning-with-python-notebooks

Course Requirements

Course Assignments, Assessments, and Grading Policy

Grading

Attendance	25%
Homework	30%
Project	30%
Presentation	10%
SRI	5%

Grading scale

94% or higher	A	73–75.9%	C
90–93.9%	A-	70–72.9%	C-
86–89.9%	B+	66–69.9%	D+
83–85.9%	B	63–65.9%	D
80–82.9%	B-	60–62.9%	D-
76–79.9%	C+	0–59.9%	E

Required or Recommended Reading Assignments

Other Readings

Boltzmann 1: Intro to Restricted Boltzmann Machines (Links to an external site.)
Boltzmann 2: Implementing Restricted Boltzmann Machine with Python and TensorFlow (Links to an external site.)
HMM 1: Hidden Markov Model, Wikipedia (Links to an external site.)
HMM 2: Intro to Hidden Markov Models, Amit (Links to an external site.)
Hop 1: The Hopfield Model, Rojas

General Description of the Subject Matter of Each Lecture or Discussion

Week	Monday	Wednesday
Week 1: Jan 6	1. What is deep learning?	2. Mathematical Building Blocks of Neural Networks
Week 2: Jan 13	3. Build from scratch	4. Tomography
Week 3: Jan 20	Holiday	5. Chollet 2: Tensorflow, Keras
Week 4: Jan 27	6. Chollet 8: regression Convolutional Neural Network I	7. Chollet 8: CNN II
Week 5: Feb 3	8. More on deep networks	9. Chollet 7: Working with Keras: A Deep Dive
Week 6: Feb 10	10. Ch. 8 Data Augmentation, Using a Pre-Trained Model	11. Chollet 9: Deep Learning for Computer Vision I
Week 7: Feb 17	Holiday	12. Chollet 9: Deep Learning for Computer Vision II
Week 8: Feb 24	13. Chollet 10: Deep Learning for Timeseries	14. Chollet 11: Deep Learning for Text II
Week 9: Mar 3	15. Chollet 11: Deep Learning for Text II	16. Chollet 12: Generative Deep Learning I
Week 10: Mar 10	Spring Break	Spring Break

Week	Monday	Wednesday
Week 11: Mar 17	17.Chollet 12: Generative Deep Learning II	18. Diffusion Model
Week 12: Mar 24	19. Hopfield Networks	20. Hebbian Learning Rule
Week 13: March 31	21. Eight-Rook Problem w/ Ising Model	22. Travelling Salesmen Problem w/ Isling Model
Week 14: Apr 7	Student Presentations	Student Presentations
Week 15: Apr 14	Student Presentations	Student Presentations
Week 16: Apr 21	Student Presentations	Student Presentations
Week 17: Apr 28	None	None

Required Course Syllabus Statements

Generative AI
Encouraged to use

Using Remote Testing Software
☒ This course does not use remote testing software.

☐ This course uses remote testing software. Remote test-takers may choose their remote testing locations. Please note, however, that the testing software used for this may conduct a brief scan of remote test-takers' immediate surroundings, may require use of a webcam while taking an exam, may require the microphone be on while taking an exam, or may require other practices to confirm academic honesty. Test-takers therefore shall have no expectation of privacy in their test-taking location during, or immediately preceding, remote testing. If a student strongly objects to using test-taking software, the student should contact the instructor at the beginning of the semester to determine whether alternative testing arrangements are feasible. Alternatives are not guaranteed.

Required University Syllabus Statements

Accommodations/Students with Disabilities
Students needing accommodations due to a permanent or temporary disability, pregnancy or pregnancy-related conditions may contact UVU Accessibility Services at accessibilityservices@uvu.edu or 801-863-8747.

Accessibility Services is located on the Orem Campus in BA 110.

Deaf/Hard of Hearing students requesting ASL interpreters or transcribers can contact Accessibility Services to set up accommodations. Deaf/Hard of Hearing services can be contacted at DHHservices@uvu.edu

DHH is located on the Orem Campus in BA 112.

Academic Integrity
At Utah Valley University, faculty and students operate in an atmosphere of mutual trust. Maintaining an atmosphere of academic integrity allows for free exchange of ideas and enables all members of the community to achieve their highest potential. Our goal is to foster an intellectual atmosphere that

produces scholars of integrity and imaginative thought. In all academic work, the ideas and contributions of others must be appropriately acknowledged and UVU students are expected to produce their own original academic work.

Faculty and students share the responsibility of ensuring the honesty and fairness of the intellectual environment at UVU. Students have a responsibility to promote academic integrity at the university by not participating in or facilitating others' participation in any act of academic dishonesty. As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, assessments, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Likewise, instructors are responsible to clearly state expectations and model best practices.

Further information on what constitutes academic dishonesty is detailed in UVU Policy 541: *Student Code of Conduct*.

Equity and Title IX

Utah Valley University does not discriminate on the basis of race, color, religion, national origin, sex, sexual orientation, gender identity, gender expression, age (40 and over), disability, veteran status, pregnancy, childbirth, or pregnancy-related conditions, citizenship, genetic information, or other basis protected by applicable law, including Title IX and 34 C.F.R. Part 106, in employment, treatment, admission, access to educational programs and activities, or other University benefits or services. Inquiries about nondiscrimination at UVU may be directed to the U.S. Department of Education's Office for Civil Rights or UVU's Title IX Coordinator at 801-863-7999 – TitleIX@uvu.edu – 800 W University Pkwy, Orem, 84058, Suite BA 203.

Religious Accommodation

UVU values and acknowledges the array of worldviews, faiths, and religions represented in our student body, and as such provides supportive accommodations for students. Religious belief or conscience broadly includes religious, non-religious, theistic, or non-theistic moral or ethical beliefs as well as participation in religious holidays, observances, or activities. Accommodations may include scheduling or due-date modifications or make-up assignments for missed class work.

To seek a religious accommodation, a student must provide written notice to the instructor and the Director of Accessibility Services at accessibilityservices@uvu.edu. If the accommodation relates to a scheduling conflict, the notice should include the date, time, and brief description of the difficulty posed by the conflict. Such requests should be made as soon as the student is aware of the prospective scheduling conflict.

While religious expression is welcome throughout campus, UVU also has a specially dedicated space for meditation, prayer, reflection, or other forms of religious expression.