CSC 374

Deep Learning

TTh 9:40-10:55 | Wall B05

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Welcome!

Deep learning is a subfield of machine learning based on neural networks. Deep learning methods have been central to recent advances in natural language processing, image analysis, speech recognition, autonomous driving, and many other areas. We will explore the mathematics and computational foundations of neural networks and apply state-of-the-art deep learning libraries to a range of machine learning tasks. The ethical implications of deep learning systems will be assessed along with discussions around topics such as emerging AI policy and FAIR data principles.

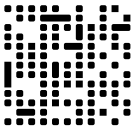
Prerequisites CSC 221 and (MAT140 or MAT150 or MAT160). Implementing deep learning techniques require significant experience with computer programming, as well as familiarity with concepts from linear algebra and multivariable calculus.

It is important to acknowledge that each of us has a responsibility to create an environment where we can all learn from and teach each other. We are more successful when everyone participates since we all benefit from the unique insights and experiences that each person brings to the class.

Note

There is much uncertainty in the world. Please prioritize your health [physical and mental] and keep notice that your classmates [and professor] are doing the same. Empathy and compassion are essential to establish "lives of leadership and service". We will adapt to the tide of the semester as we progress, so contents of this syllabus may change in response to our experiences.

grade breakdown



Applications
Projects which include data exploration, experiment design, development with version control, results, reported in a paper.

50%

Fundamentals
Code and written evaluations of the mathematical foundations of deep learning.

30%

Final Project
You will investigate an application not covered during the semester.

20%

course materials

book: none required
Dive into Deep Learning is a free online textbook for practical deep learning.
Deep learning by Goodfellow, et. al is a good reference book for deep learning foundations.
resources: Github, Moodle, JupyterHub

selected course topics

Learning tasks:

- *regression*
- *classification*
- *generative models*

Learning types:

- *supervised learning*
- *self-supervised learning*
- *unsupervised learning*

accommodations

religion

If you anticipate assignments or other course deadlines conflicting with a major religious holiday of your tradition, please let me know. We will work together to make the necessary accommodations.

access

The college welcomes requests for accommodations related to disability and will grant those that are determined to be reasonable and maintain the integrity of a program or curriculum. To make such a request or to begin a conversation about a possible request, please contact the Office of Academic Access and Disability Resources by emailing **AADR@davidson.edu**. It is best to submit accommodation requests within the drop/add period; however, requests can be made at any time in the semester. Please keep in mind that accommodations are not retroactive.

learning objectives

By the end of this course you will:

1. engage with the theory, models, and algorithms that are employed in creating systems that extract insight from large datasets to improve their performance in some specific task;
2. apply deep learning techniques to real-world datasets. This often requires careful and rigorous experimentation in order to determine effective representations, tune parameters, and compare different approaches;
3. be able to identify societal effects from deploying models.

learning outcomes

By the end of this course you will:

1. identify the learning problem, and identify deep learning approaches to solve the problem;
2. build and understand simple deep learning models from scratch
3. build and train modern advanced deep learning models using common deep learning packages
4. address training and tuning issues such as over- and under-fitting.
5. process and explore data used to build a deep learning model
6. disseminate your work via technical reports and papers.