



## Syllabus

### ML530: Deep Learning Machine Learning

Online  
Thursdays; Sep 29 – Dec 8, 2022; 6-9pm Pacific time



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Office Hours: available upon request; 6-9pm Pacific time: Mon, Tue, Wed, Fri

#### COURSE PHILOSOPHY:

I'm a fan of getting a basic understanding of theory, then using applied problems to gain some practical experience.

#### COURSE DESCRIPTION:

Deep learning is the subfield of artificial intelligence that was inspired by a theoretical model of how the human brain works, a concept often referred to as neural networks. In the last decade we've seen significant development of deep learning methods that enable state-of-the-art performance for many tasks, including image classification, natural language processing, and speech recognition. In this course, you'll gain hands-on experience with feedforward, convolutional, recurrent, and transformer-based neural network architectures.

#### COURSE LEARNING OBJECTIVES:

Upon successful completion of this course, you will be able to:

- Construct deep learning models for image classification, natural language processing, and speech recognition
- Identify an appropriate loss function and evaluation metric for a given task
- Select the model architecture, including the depth of the model and the width of the layers
- Use early stopping, regularization, dropout, and normalization to improve generalization
- Tune the model to improve performance, including selection of the activation functions, optimizer, learning rate schedule, and batch size

## COURSE FORMAT:

This is an online class. Due to the ongoing pandemic, there will be no in-person class meetings. We'll be doing 3 hours of lecture via Zoom on Thursdays, from 6 to 9pm. There will be a 15-minute break, generally somewhere between 7:15 and 7:45pm. You'll need to login to <https://washington.zoom.us/j/92772841363> using your University of Washington Network Identity (UW NetId) in order to attend class. The meeting should automatically be recorded to the cloud, but you'll be expected to attend at least 6 of the 10 classes. Please ask questions and take advantage of the course discussion forums on Canvas: <https://canvas.uw.edu/courses/1582713>.

## Online classroom etiquette:

Below are points to remember about participating in your real-time online class.

- **Mute your microphone**  
To help keep background noise and echo feedback to a minimum, make sure you mute your microphone when you are not speaking.
- **Be mindful of background noise**  
When your microphone is not muted, avoid activities that could create additional noise, such as shuffling papers.
- **Position your camera properly**  
If you choose to use a web camera, be sure it is in a stable position and focused at eye level, if possible. Doing so helps create a more direct sense of engagement with your instructor and other classmates.
- **Limit distractions**  
You can make it easier to focus on the class by turning off notifications, closing or minimizing running apps, and muting your smartphone.
- **Warn roommates of your live webcam**  
Avoid potential for embarrassment by warning others in your location that your webcam is broadcasting live to a class full of people. If they must walk through the field of view, have them at least wear a robe. 😊
- **Avoid multi-tasking**  
You'll retain more information if you refrain from replying to emails or text messages during the class and wait to work on your homework assignment until after the meeting ends.
- **Prepare materials in advance**  
If you will be sharing content during the class, make sure you have the files and/or links ready to go before class begins.
- **Other helpful behaviors**  
Make eye contact with your instructor and classmates by looking into the camera, not at the screen. Show that you are listening by nodding your head once in a while.

## ORGANIZATION & STRUCTURE:

There are 3 textbooks for this course:

- Deep Learning Illustrated [DLI], by Jon Krohn, Grant Beyleveld, Algaé Bassens: This book provides a broad [not necessarily deep (all pun intended)] overview of a range of topics, including recent developments such as the Mask R-CNN (Region-based Convolutional Neural Network) model and the Transformer architecture
- Manning | Deep Learning with Python [DLP], by Francois Chollet: Like Francois Chollet's Keras library, the intent of this book is to help democratize deep learning via hands-on learning
- The Science of Deep Learning [SDL], by Iddo Drori: we will use this book as an occasional reference
- We will not cover Deep Learning ([deeplearningbook.org](https://deeplearningbook.org)) explicitly, though by the end of the course you should be able to understand the basic operation of Algorithm 6.4
- Consider using <https://guides.lib.uw.edu/oreilly> to access the first two books

Course topics include ...

- Review of machine learning basics and the extension to multi-layer perceptrons (“deep” means many layers)
- Introduction: Chapter 1 - 4 from DLP
- Fundamentals: Chapters 5 - 7 from DLP
- ConvNets: Chapters 1 and 10 from DLI
- ConvNets: Chapter 8 and 9 from DLP [transfer learning part one]
- Embeddings and Sequences: Chapters 2 and 11 from DLI
- Embeddings and Sequences: Chapter 10 and 11 from DLP
- Transformers and Sequence-to-Sequence Models [transfer learning part two]
- Generative Models: Chapters 3 and 12 from DLI; Chapter 12 from DLP
- Deep Reinforcement Learning: Chapters 4 and 13 from DLI

## Assignments

Every week you will have ...

- one question: checking comprehension, worth 1 point (can have multiple parts)
- one model to build: checking application, worth 5 points

There are a total of 54 points available for this course. You need 27 or more points to successfully complete the course. The homework will be due at the beginning of the next week’s class. If the homework is turned in late, you can still get half credit.

- do not stress out: don’t forego sleep in order to complete homework
- do not try to turn in everything during the last week

## Safe Space

Any and all questions, comments, and concerns are welcome! This is a safe space, where we are expected to communicate freely with one another. We all come from different backgrounds, but we also have an amazing amount of common ground between us. Our goal is to learn and grow together.

## STUDENT SUPPORTS & RESOURCES

### Access and Accommodations

Your experience in this class is important to us, and it is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law. The Disability Services Office (DSO) provides accommodation, referral information, and assistance for professional and continuing education students with a documented physical, mental, or sensory disability.

If you have already established accommodations with DSO, please communicate your approved accommodations to your instructor at your earliest convenience so we can discuss your needs in this course. If you have not yet established services through DSO, but have a temporary or permanent disability that requires accommodations (this can include but is not limited to: mental health, attention-related, learning, vision, hearing, physical or health impacts), you are welcome to contact DSO at 206-543-6450 or [dso@uw.edu](mailto:dso@uw.edu) or via their Contacts page.

### Religious Accommodations Policy

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy (<https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/>). Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form (<https://registrar.washington.edu/students/religious-accommodations-request/>).

### Mental Health Resources

Any member of the UW community can call SafeCampus anytime to anonymously discuss safety and well-being concerns for yourself or others. Caring, trained professionals will talk you through options and connect you with additional resources if you want them. Available 24/7 by phone at 206-685-7233, or M-F, 8am-5pm at [safecampus@uw.edu](mailto:safecampus@uw.edu).

Crisis Connections provides immediate help to individuals, families, and friends of people in emotional crisis, dealing with addiction, or struggling to meet basic needs. Anyone in Washington State can receive support and resource referrals 24/7 through their crisis line at 866-4CRISIS (866-427-4747 or TTY 206-461-3219).

### Student Conduct Code

The University of Washington's Student Conduct Code applies to all students. Students are expected to maintain the highest standards of academic responsibility. Plagiarism and other kinds of academic misconduct are considered serious offenses at the UW. Plagiarism is using someone else's words or ideas without proper citation. It can range from failure to credit a single sentence or paragraph to passing off an entire article, speech or another student's paper as one's own.

For non-credit courses, instances of academic dishonesty are handled by the University of Washington Professional & Continuing Education Committee on Academic Conduct. If evidence of academic misconduct is established, the

student will be given a failing grade for the course and any request for a refund of course or other fees will be denied.

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## UW PCE CONTACTS:

### [UW Continuum College IT \(Canvas Learning Platform, Zoom\)](#)

[ctnmhelp@uw.edu](mailto:ctnmhelp@uw.edu) , 206-221-1393

Regular hours: 8am-5pm Mon-Fri

Extended hours during first two weeks of quarter: 8am-10pm Mon-Fri, 10am-8pm, Sat

### [Registration Services \(enrollment, tuition\)](#)

[c2reg@uw.edu](mailto:c2reg@uw.edu), 206-543-2310

Regular hours: 8am-5pm Mon-Thu, 9am-5pm Fr

### [Academic Records \(grade reports for reimbursement\)](#)

[c2rcrds@uw.edu](mailto:c2rcrds@uw.edu)

206-543-2350

\*You can also get an unofficial grade report online:

<https://portal.continuum.uw.edu/records/>

### [Enrollment Services \(anything else!\)](#)

[enroll@pce.uw.edu](mailto:enroll@pce.uw.edu)

800-506-1325