



Syllabus
MLearn 530: Deep Learning
Certificate in Machine Learning

Online

Apr 6 – Jun 8, 2021: Tuesdays, 6-9pm Pacific time



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Office Hours: by request

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 both feedforward and recurrent 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 Tuesdays, from 6 to 9pm. There will be a 10-minute break, generally somewhere between 7:15 and 7:45pm. You'll need to login to <https://washington.zoom.us/j/96116966326> 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/1432990/>.

To install Zoom on your device follow these steps:

1. Go to: <http://washington.zoom.us>
2. Click on "Sign in to Standard UW Zoom"
3. Enter your UW NetID
4. Download the Zoom app for your operating system
5. Locate your class Zoom link and click "Join Meeting"

NOTE: if you have any fluctuation in your internet connection strength, we strongly recommend that you call in using your phone audio.

To use phone audio:

1. Click the arrow next to **Mute/Unmute**
2. Click **Leave Computer Audio**
3. Click **Phone Call** and follow the prompt to dial in



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.
 - **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.
 - **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.
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ORGANIZATION & STRUCTURE:

There are two textbooks for this course:

- [Deep Learning Illustrated](#) [DLI], by Jon Krohn, Grant Beyleveld, Algaé Bassens: This book provides a broad [not necessarily deep] 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

Consider using <https://guides.lib.uw.edu/oreilly> to access these books.

We will not cover [Deep Learning \(deeplearningbook.org\)](https://www.deeplearningbook.org) explicitly, though by the end of the course you should be able to understand the basic operation of Algorithm 6.4.

Course topics include ...

- Review of machine learning basics and the extension to multi-layer perceptrons (“deep” means many layers)
- Introduction: Chapter 1 and 2 from DLP
- Fundamentals: Chapters 3 and 4 from DLP
- ConvNets: Chapters 1 and 10 from DLI
- ConvNets: Chapter 5 from DLP [transfer learning part one]
- Embeddings and Sequences: Chapters 2 and 11 from DLI
- Embeddings and Sequences: Chapter 6 from DLP
- Transformers and Sequence-to-Sequence Models [transfer learning part two]
- Generative Models: Chapters 3 and 12 from DLI; Chapter 8 from DLP
- Deep Reinforcement Learning: Chapters 4 and 13 from DLI

Assignments

Each week, you'll be given a hands-on Kaggle task worth 5 points; and you'll also get a question worth 1 point. You'll need 27 out of the 54 points to pass the course. Assigned homework is due by 6pm the following Tuesday. To discourage you from getting behind, late homework will receive half credit.

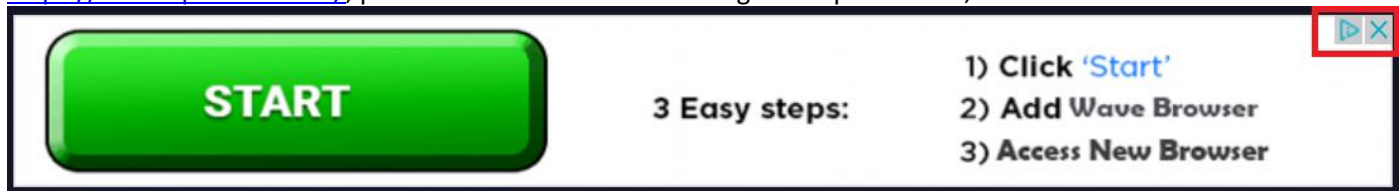
COURSE TECHNOLOGY:

We'll be using Azure Virtual Machines to do homework. We'll be using Tensorflow to construct and evaluate Deep Learning models. You'll need to log into <https://portal.azure.com> using your UW NetId to set up your Virtual Machine (VM); then you'll need to use an ssh client (e.g. [Download PuTTY - a free SSH and telnet client for Windows](#)) to access your VM. Predictions for hands-on assignments will be uploaded to [Kaggle InClass](#), while answers to homework questions will be uploaded to Canvas: <https://canvas.uw.edu/courses/1432990>. We'll also use the following libraries:

- Python Imaging Library (PIL): Pillow fork
- syntactic parsing using Cython (spaCy)
- libROSA: library for the Recognition and Organization of Speech and Audio

Test Your Tech

You can use this link to test your web-browser and internet speeds to determine if they are sufficient for use with Canvas and Zoom: <https://uwodashboard.pce.uw.edu/techTest.asp>. Note: If you navigate to <https://www.speedtest.net/>, please take care to avoid clicking on suspicious ads, like this one ...



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 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.

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.

UW PCE CONTACTS:

UW Continuum College IT (Canvas Learning Platform, Zoom)

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, 206-543-2310

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

Academic Records (grade reports for reimbursement)

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

800-506-1325
