COMP9444
Neural Networks and Deep Learning

1a. Overview

Course Web Page

- https://www.cse.unsw.edu.au/~cs9444/20T3/
- https://webcms3.cse.unsw.edu.au/COMP9444/20T3/

Lecturer-in-Charge

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Lecture / Lab Schedule

- Online Lectures (Zoom)
  - Monday 2pm-4pm (Weeks 1-3, 5-10)
  - Thursday 6pm-8pm (Weeks 1-10)
- Labs (Optional, tentative)
  - We are planning to have a number of online lab sessions via Zoom each week, starting in Week 2 (times and details TBA)

Lectures

- Students are required to watch pre-recorded lecture videos before each session. The scheduled class time will take the form of an interactive video chat session, and will be used to briefly summarise the content, deliver additional material, and to answer any questions that you may have about each topic.
- As well as watching the lecture videos, consider doing these things:
  - review the lecture material before and after the scheduled class
  - discuss the material with fellow students if possible
  - read up on the topics covered in each lecture
  - complete relevant assignments and exercises, if any
  - explore the topic by writing and running your own programs
  - ask questions in an online consultation session

Textbook

The textbook for this course is:

Deep Learning

By Ian Goodfellow, Yoshua Bengio and Aaron Courville

MIT Press

`http://www.deeplearningbook.org`

`https://mitpress.mit.edu/books/deep-learning`

Assumed Knowledge

The course will assume knowledge of the following mathematical topics:

- Linear Algebra (2.1-2.8)
- Probability (3.1-3.14)
- Calculus and Chain Rule (6.5.2)

Students should study the relevant sections of the textbook (shown in brackets) and, if necessary, try to revise these topics on their own during the first few weeks of the course.

Planned Schedule (Weeks 1-5)

Week 1, Mon:	Neuroanatomy, Perceptrons	(1.2, 9.10)
Week 1, Thu:	Backpropagation	(4.3, 5.1-5)
Week 2, Mon:	Probability, Backprop Variations	(3.1-14, 6.1-5)
Week 2, Thu:	PyTorch	
Week 3, Mon:	Hidden Unit Dynamics	(7.11-12, 8.2-3)
Week 3, Thu:	Convolutional Networks	(7.9, 9.1-5)
Week 4, Mon:	(Labor Day Holiday)	
Week 4, Thu:	Image Processing	(7.4, 8.4, 8.7.1)
Week 5, Mon:	Recurrent Networks, LSTM and GRU	(10.2, 10.7, 10.10)
Week 5, Thu:	Word Vectors	(10.4, 12.4)

Planned Schedule (Weeks 7-10)

Week 6:	(Flexibility Week)	
Week 7, Mon:	Language Processing	
Week 7, Thu:	Reinforcement Learning	(12.5.1.1)
Week 8, Mon:	Deep Reinforcement Learning	(18.1, 20.9)
Week 8, Thu:	Hopfield Network, Boltzmann Machine	(16.7, 17.4, 18.2, 20.1-4)
Week 9, Mon:	Autoencoders	(14.1-5, 20.10.3)
Week 9, Thu:	Generative Adversarial Networks	(20.10.4)
Week 10, Mon:	Extension Topics	
Week 10, Thu:	Review	

Assessment

Assessment will consist of:

Assignment 1	30%
Assignment 2	30%
Final Exam	40%

The assignments may involve, for example:

- using code written in pytorch
- writing your own code
- running experiments and analysing the results

Further details will be provided on the course Web site.

Pytorch

Please try to install Pytorch on your own laptop, and try to match the environment on the CSE Lab machines as closely as possible:

python3	3.7.3
torch	1.2.0
numpy	1.16.2
sklearn	0.20.2

Plagiarism

- Plagiarism is taken seriously by UNSW/CSE and treated as Academic Misconduct. ALL work submitted for assessment must be your own work.
- For an individual assignment, collaborative work in the form of "think tanking" is encouraged, but students are not allowed to derive code together as a group during such discussions. In the case of a group assignment, code must not be obtained from outside the group.
- Plagiarism detection software may be used on submitted work.
- Academic Integrity and Plagiarism:
  `https://student.unsw.edu.au/plagiarism`

Related Courses

- COMP3411/9414 Artificial Intelligence
- COMP9417 Machine Learning and Data Mining
- COMP9418 Advanced Topics in Statistical Machine Learning
- COMP4418 Knowledge Representation and Reasoning
- COMP3431 Robotic Software Architecture
- COMP9517 Machine Vision
- 4th Year Thesis topics