ZEIT4154 Deep Learning - 2024

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General Course Information

Course Code : ZEIT4154
Year : 2024
Term : Semester 2
Teaching Period : Z2
Is a multi-term course? : No
Faculty : UNSW Canberra
Academic Unit : School of Systems and Computing
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : UNSW Canberra at ADFA
Campus : UNSW Canberra
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

ZEIT4154 (Deep Learning) is a 6 Units of Credit (UoC) course. Deep learning is an area of artificial intelligence that focuses on a particular family of machine learning models that are able to learn to perform complex tasks from many application areas including computer vision, natural language, genomic modelling, financial modelling and many more. In the past decade

deep learning models have improved on state-of-the-art results in many complex tasks in these areas.

This course introduces the students to various aspects of neural networks and deep learning, including optimisation and algorithms for training and regularisation, deep feedforward neural networks, convolution neural networks, recurrent neural networks, deep reinforcement learning, autoencoders and deep generative models.

Students will learn to apply these techniques to a wide variety of real-world applications.

It is recommended that students have completed ZEIT4151 Machine Learning. If you would like to do this course and you have not completed ZEIT4151 Machine Learning please reach out to the course convenor. Depending on other courses you have done you may be able to catch up quickly either before the semester starts (ideal) or in the first weeks of the semester.

Course Aims

The aim of this course is to expose students to different types of deep learning models, the principles for designing effective architectures, and the design decisions associated with each data source type, artificial intelligence skills and output required, and the topology of the deep learning model.

Relationship to Other Courses

It is recommended to study ZEIT4151 Machine Learning concurrently or prior to this course. If you would like to do this course and you have not completed or intend to enrol in ZEIT4151 Machine Learning please reach out to the course convenor. You may be able to catch up quickly either before the semester starts (ideal) or in the first weeks of the semester.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Design and implement neural network architectures and learning algorithms.
CLO2 : Investigate, evaluate, and design a deep neural network architecture to solve a given task, using appropriate tools.
CLO3 : Investigate and appraise new deep learning techniques from recent relevant research papers and other sources of information.
CLO4 : Communicate and demonstrate complex neural network concepts to people with and without a background in the field.

Course Learning Outcomes	Assessment Item
CLO1 : Design and implement neural network architectures and learning algorithms.	• Topic Quizzes • Assignment 1 • Final Exam
CLO2 : Investigate, evaluate, and design a deep neural network architecture to solve a given task, using appropriate tools.	• Assignment 2 • Topic Quizzes • Final Exam
CLO3 : Investigate and appraise new deep learning techniques from recent relevant research papers and other sources of information.	• Assignment 2 • Topic Quizzes • Final Exam
CLO4 : Communicate and demonstrate complex neural network concepts to people with and without a background in the field.	• Assignment 1 • Assignment 2 • Topic Quizzes • Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Topic Quizzes Assessment Format: Individual Short Extension: Yes (3 days)	20%	Start Date: Quizzes will be released a minimum of 1 week before they are due Due Date: Fortnightly due dates starting on 02/08/2024
Assignment 1 Assessment Format: Individual Short Extension: Yes (3 days)	20%	Start Date: 02/08/2024 11:55 PM Due Date: 23/08/2024 11:55 PM
Assignment 2 Assessment Format: Individual Short Extension: Yes (3 days)	30%	Start Date: 27/09/2024 11:55 PM Due Date: 21/10/2024 11:55 PM
Final Exam Assessment Format: Individual	30%	Start Date: In exam week Due Date: Not Applicable

Assessment Details
Topic Quizzes

Assessment Overview

There will be small quizzes every second week starting from week 2. They will be open for a week and you can get help in your labs with the general concepts (just not the answers). These

quizzes will be worth 4% each. The first quiz mark will be returned in week 4.

Course Learning Outcomes

- CLO1 : Design and implement neural network architectures and learning algorithms.
- CLO2 : Investigate, evaluate, and design a deep neural network architecture to solve a given task, using appropriate tools.
- CLO3 : Investigate and appraise new deep learning techniques from recent relevant research papers and other sources of information.
- CLO4 : Communicate and demonstrate complex neural network concepts to people with and without a background in the field.

Assignment 1

Assessment Overview

Assignment 1 will be designing, and implementing a basic neural network, and running experiments on a given dataset and task.

Course Learning Outcomes

- CLO1 : Design and implement neural network architectures and learning algorithms.
- CLO4 : Communicate and demonstrate complex neural network concepts to people with and without a background in the field.

Assignment 2

Assessment Overview

You will design and implement a deep learning model of your choice, as well as designing an appropriate task and running experiments. You will either be given a dataset or, if you can convince the course convenor it is a) suited to your experiment and task design and b) the implementation cannot be found online, you can choose your own dataset.

Course Learning Outcomes

- CLO2 : Investigate, evaluate, and design a deep neural network architecture to solve a given task, using appropriate tools.
- CLO3 : Investigate and appraise new deep learning techniques from recent relevant research papers and other sources of information.
- CLO4 : Communicate and demonstrate complex neural network concepts to people with and without a background in the field.

Final Exam

Assessment Overview

The final exam is in exam week and will be focused on concepts learned in the course with little to no programming and maths

Course Learning Outcomes

- CLO1 : Design and implement neural network architectures and learning algorithms.
- CLO2 : Investigate, evaluate, and design a deep neural network architecture to solve a given task, using appropriate tools.
- CLO3 : Investigate and appraise new deep learning techniques from recent relevant research papers and other sources of information.
- CLO4 : Communicate and demonstrate complex neural network concepts to people with and without a background in the field.

General Assessment Information

Use of Generative AI in Assessments

Unless otherwise indicated in the individual assessment description the following policy applies to the use of generative AI in assessments in this course. Please carefully read the instructions for individual assessment topics as they supersede these instructions:

PLANNING ASSISTANCE

As this assessment task involves some planning or creative processes, you are permitted to use software to generate initial ideas. However, you must develop or edit those ideas to such a significant extent that what is submitted is your own work, i.e. only occasional AI generated words or phrases may form part of your final submission. It is a good idea to keep copies of the initial prompts to show your lecturer if there is any uncertainty about the originality of your work.

If the outputs of generative AI such as ChatGPT form a part of your submission, it will be regarded as serious academic misconduct and subject to the standard penalties, which may include 00FL, suspension and exclusion.

Grading Basis

Standard

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 15 July - 19 July	Activity	Lecture1: intro to machine learning Lab: Intro to the lab environment Lecture2: intro to neural networks No tutorial
Week 2 : 22 July - 26 July	Activity	Lecture1: Neural networks basics Lab: neural network basics Lecture2: Neural networks basics Tutorial: intro to neural networks
Week 3 : 29 July - 2 August	Activity	Lecture 1: Intro to deep learning Lab: Backpropagation Lecture 2: Deep learning an alternative perspective Tutorial: neural networks basics Quiz 1 due Friday
Week 4 : 5 August - 9 August	Activity	Lecture1: Convolutional neural networks Lab: Deep learning basics Lecture2: Deep learning regularisation Tutorial: neural networks training
Week 5 : 12 August - 16 August	Activity	Compensation day Tuesday Lab: Convolutional neural networks Lecture2: Other computer vision algorithms Tutorial: Deep learning and CNNs Quiz 2 due Friday
Week 6 : 19 August - 23 August	Activity	Lecture 1: Deep learning for sequences Lab: Object detection and segmentation Lecture 2: natural language Tutorial: Computer vision training Assignment 1 due Friday
Week 7 : 9 September - 13 September	Activity	Lecture 1: Generative models Lab: Sequences Lecture 2: Generative models part 2 Tutorial: Sequences Quiz 3 due Friday
Week 8 : 16 September - 20 September	Activity	Lecture 1; Representation learning Lab: natural language Lecture 2: self-supervised learning Tutorial: Generative models
Week 9 : 23 September - 27 September	Activity	Lecture 1: Deep Reinforcement learning Lab: Generative models Lecture 2: Deep Reinforcement learning part 2 Tutorial: Representation learning Quiz 4 due Friday
Week 10 : 30 September - 4 October	Activity	Lecture 1: Graph neural networks Lab: Representation learning Lecture 2: Graph CNNs Tutorial: Deep reinforcement learning
Week 11 : 7 October - 11 October	Activity	Lecture 1: Putting it all together Lab: Reinforcement learning Lab: Reinforcement learning Military training days Thursday and Friday Quiz 5 due Friday
Week 12 : 14 October - 18 October	Activity	Lecture 1: Real world application issues Lab: Graph neural networks Lecture 2: Ethics, biases and implications Tutorial: Graph neural networks
Week 13 : 21 October - 25 October	Activity	Assignment 2 due Monday Lecture 1: exam discussion Tutorial: putting it all together/complex exam questions practice

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Resources

Recommended Resources

Recommended Readings:

Basics:

https://d2l.ai/d2l-en.pdf

Advanced:

https://www.deeplearningbook.org/

Course Evaluation and Development

This is the second time this course has run and we strongly encourage student feedback to help us improve it. Last year we received feedback that the labs were too difficult for some students and too easy for others so, for many labs we now have a standard option focusing on a thorough understanding of beginner concepts and an extension option that covers the beginner concepts more briefly and incorporates some more advanced concepts.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Jo Plested		room 110, building 15		generally available during working hours, please email to arrange a time.	Yes	Yes

Other Useful Information

School-specific Information

The Leaning Management System

Moodle is the Learning Management System used at UNSW Canberra. All courses have a Moodle site which will become available to students at least one week before the start of semester. Please find all help and documentation (including Blackboard Collaborate) at the Moodle Support page.

UNSW Moodle supports the following web browsers:

• Google Chrome 50+

• Safari 10+

Internet Explorer is not recommended. Addons and Toolbars can affect any browser's performance.

Operating systems recommended are:

• Windows 10,

• Mac OSX Sierra,

• iPad IOS10

Further details:

[Moodle System Requirements](#)

[Moodle Log In](#)

If you need further assistance with Moodle:

For enrolment and login issues please contact:

IT Service Centre

Email: itservicecentre@unsw.edu.au

Phone: (02) 9385-1333

International: +61 2 9385 1333

For all other Moodle issues please contact:

External TELT Support

Email: externalteltsupport@unsw.edu.au

Phone: (02) 9385-3331

International: +61 2 938 53331

Opening hours:

Monday – Friday 7:30am – 9:30 pm

Saturday & Sunday 8:30 am – 4:30pm

[Study at UNSW Canberra](#)

Study at UNSW Canberra has lots of useful information regarding:

• Where to get help

• Administrative matters

• Getting your passwords set up

• How to log on to Moodle

• Accessing the Library and other areas.

[UNSW Canberra Student Hub](#)

For News and Notices, Student Services and Support, Campus Comminity, Quick Links, Important Dates and Upcoming Events

School Contact Information

Deputy Head of School (Education): Dr Erandi Hene Kankanamge

E: e.henekankanamge@adfa.edu.au

T: 02 5114 5157

Syscom Admin Support: syscom@unsw.edu.au

T: 02 5114 5284

Syscom Admin Office: Building 15, Level 1, Room 101 (open 10am to 4pm, Mon to Fri)