1. KentVision Code and title of the module

COMP6685 Deep Learning

COMP8685 Deep Learning

## Division and School/Department or partner institution which will be responsible for management of the module

Division of Computing, Engineering, Mathematical Sciences (CEMS)

School of Computing

## The level of the module (Level 4, Level 5, Level 6 or Level 7)

*If a module is available at more than one level please indicate this here, stating the codes.*

Level 6: COMP6685, Level 7: COMP8685

## The number of credits and the ECTS value which the module represents

15 credits (7.5 ECTS)

## Which term(s) the module is to be taught in (or other teaching pattern)

Spring

## Prerequisite and co-requisite modules and/or any module restrictions

N/A

## The course(s) of study to which the module contributes

Compulsory to the following courses:

MSc Artificial Intelligence with and without Year in Industry

Optional to the following courses:

All UG and PGT courses in the School of Computing (except YinCo)

## The intended subject specific learning outcomes. On successfully completing the module students will be able to:

**On successfully completing the level 6 module students will be able to:**

8.1 Comprehend the benefits of data re-representation in deep neural networks, and their ensuing modelling capacity.

8.2 Demonstrate an understanding of the algorithms that are required to train deep neural networks.

8.3 Demonstrate an awareness of computational and practical challenges existing in deep learning.

8.4 Demonstrate a systematic understanding of the key parameters in a neural network’s architecture.

8.5 Competently use deep learning software to solve practical problems.

8.6 Understand the objectives of explainability and interpretability of neural networks.

8.7 Explain the differences between the major deep learning architectures.

**On successfully completing the level 7 module students will also be able to:**

8.8 Critically evaluate the strengths and weaknesses of the state-of-the-art deep learning models and algorithms.

## The intended generic learning outcomes. On successfully completing the module students will be able to:

## On successfully completing the level 6 module students will be able to:

9.1 Demonstrate critical thinking and problem-solving skills.

9.2 Communicate with other professionals using appropriate technical vocabulary.

9.3 Construct reasoned arguments about pros and cons of algorithms and their implementations.

**On successfully completing the level 7 module students will also be able to:**

9.4 Demonstrate originality in tackling and dealing with challenges related to the process of generalisation from data in a broader context of scientific enquiry.

## A synopsis of the curriculum

This module looks into the training of modern deep neural networks: backpropagation, regularisation, automatic differentiation, computational graphs. Introduces different types of deep neural networks, such as, LSTM, convolutional networks, and autoencoders. Presents the theoretical underpinnings of deep learning and its mechanisms. Delves into selected recent advanced topics in deep learning. Examines applications of deep learning.

## Reading list

## The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices.

## The most up to date reading list for each module can be found on the university's [reading list pages](https://kent.rl.talis.com/index.html).

Bengio, Yoshua, Ian Goodfellow, and Aaron Courville. Deep learning. MIT press, 2017.

Kelleher, John D. Deep learning. MIT press, 2019.

<https://www.deeplearningbook.org/>

Sejnowski, Terrence J. The deep learning revolution. MIT press, 2018.

## Contact Hours

Private Study: 124

Contact Hours: 26

Total: 150

## Assessment methods

Main assessment methods

## 13.1 For Level 6 - COMP6685:

50% Practical assignment 1 (individual; approximately 40 hours)

25% Demo on practical assignment 1 (individual; 1 hour with 10 hours revision)

25% Time limited assessment 2 (individual; 1 hour with 10 hours revision)

## 13.1 For Level 7 – COMP8685:

50% Practical assignment 1 (individual; approximately 40 hours), with an additional challenging task with respect to COMP6685 assessment 1

25% Demo on practical assignment 1 (individual; 1 hour with 10 hours revision)

25% Time limited assessment 2 (individual; 1 hour with 10 hours revision), with a different set of questions with respect to COMP6685, appropriate for a master level

13.2 Reassessment methods

Retrieval by 100% Coursework

## Map of module learning outcomes (sections 8 & 9) to learning and teaching methods (section 12) and methods of assessment (section 13)

**Module learning outcomes against learning and teaching methods:**

| **Module learning outcome** | 8.1 | 8.2 | 8.3 | 8.4 | 8.5 | 8.6 | 8.7 | 8.8 | 9.1 | 9.2 | 9.3 | 9.4 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Private Study** |  | **x** |  | **x** | **x** | **x** | **x** | **x** | **x** |  | **x** | **x** |
| *Lectures* | **x** | **x** |  |  |  | **x** | **x** |  |  |  |  |  |
| *Practical classes* | **x** | **x** | **x** | **x** | **x** |  |  | **x** | **x** | **x** | **x** | **x** |

**Module learning outcomes against assessment methods:**

| **Module learning outcome** | 8.1 | 8.2 | 8.3 | 8.4 | 8.5 | 8.6 | 8.7 | 8.8 | 9.1 | 9.2 | 9.3 | 9.4 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time limited assessment 2 | **x** | **x** |  | **x** |  | **x** | **x** |  | **x** |  | **x** |  |
| Demo (video) on practical assignment 1 *1* |  | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |
| Practical assignment 1 | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |

## Inclusive module design

The Division recognises and has embedded the expectations of current equality legislation, by ensuring that the module is as accessible as possible by design. Additional alternative arrangements for students with Inclusive Learning Plans (ILPs)/declared disabilities will be made on an individual basis, in consultation with the relevant policies and support services.

The inclusive practices in the guidance (see Annex B Appendix A) have been considered in order to support all students in the following areas:

a) Accessible resources and curriculum

b) Learning, teaching and assessment methods

## Campus(es) or centre(s) where module will be delivered

Canterbury

## Internationalisation

The topics addressed by this module relate to a field which is of international importance, given the global role of computers in today's technological innovation. The topics covered by this module are international in nature, being identical worldwide and independent of traditional spoken language.

**If the module is part of a course in a Partner College or Validated Institution, please complete sections 18 and 19. If the module is not part of a course in a Partner College or Validated Institution these sections can be deleted.**

## Partner College/Validated Institution

## University Division responsible for the course

**DIVISIONAL USE ONLY**

**Module record – all revisions must be recorded in the grid and full details of the change retained in the appropriate committee records.**

| Date approved | New/Major/minor revision | Start date of delivery of (revised) version | Section revised  (if applicable) | Impacts PLOs (Q6&7 cover sheet) |
| --- | --- | --- | --- | --- |
|  | New | Sept 2022 |  |  |
| 01/02/2023 | Minor | Sept 2023 | 13,14 | No |