1. **Title of the module**

COMP8360 (CO836) - Cognitive Neural Networks

1. **School or partner institution which will be responsible for management of the module**

School of Computing

1. **The level of the module (Level 4, Level 5, Level 6 or Level 7)**

Level 7

1. **The number of credits and the ECTS value which the module represents**

15 credits (7.5 ECTS)

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

Autumn or Spring

1. **Prerequisite and co-requisite modules**

None

1. **The programmes of study to which the module contributes**

Portfolio of Taught Postgraduate Programmes in Computing

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

8.1 Describe what is meant by neural networks, list a number of types of network and give a brief description of each together with some examples of their (actual or potential) applications.

8.2 Select the appropriate neural network paradigm for a particular problem and be able to justify this choice based on knowledge of the properties and potential of this paradigm. To be able to compare the general capabilities of a number of such paradigms and give an overview of their comparative strengths and weaknesses.

8.3 Explain the mathematical equations that underlie neural networks, both the equations that define activation transfer and those that define learning.

8.4 Analyse cognitive and neurobiological phenomena from the point of view of their being computational systems. To be able to take these phenomena and identify the features which are important for computational problem solving.

8.5 Simulate and understand neural networks using state of the art simulation technology and apply these networks to the solution of problems. In particular, to select from the canon of learning algorithms which is appropriate for a particular problem domain.

8.6 Discuss examples of computation applied to neurobiology and cognitive psychology, both in the instrumental sense of the application of computers in modelling and in the sense of using computational concepts as a way of understanding how biological and cognitive systems function.

8.7 To have a detailed knowledge of an advanced specialised topic in cognitive neural networks. Furthermore, the student should be able to explain the key details of one or more of these specialised topics.

8.8 To have the capacity to engage with the research literature in Computational Neuroscience.

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

9.1 Group work.

9.2 Time management and organisation.

9.3 Communication skills.

9.4 Problem solving.

9.5 Analytical skills.

9.6 Independent study and appropriate use of resources, e.g. the library, online resources and internet sites.

1. **A synopsis of the curriculum**

Neural networks will be placed into a historical perspective related to neuro-biology and in the context of the artificial intelligence hypothesis. Students will familiarise themselves with the Leabra/Emergent environment.

1. **Reading list (Indicative list, current at time of publication. Reading lists will be published annually)**

O'Reilly, R.C. and Munakata, Y. (2000) Computational Explorations in Cognitive Neuroscience, Understanding the Mind by Simulating the Brain. A Bradford Book, MIT Press.

Rumelhart, D.E., McClelland J.L. and the PDP Research Group (1986) Parallel Distributed Processing, Volume 1: Foundations. MIT Press.

Rumelhart, D.E., McClelland J.L., and the PDP Research Group (1986) Parallel Distributed Processing, Volume 2: Psychological and Biological Models. MIT Press.

Bechtel, W. and Abrahamson, A. (2002) Connectionism and the Mind, Parallel Processing Dynamics and Evolution of Networks. Blackwell Publishers.

Haykin, S. (1999) Neural Networks, A Comprehensive Foundation. Prentice Hall International Edition.

Bishop, C.M. (1995) Neural Networks for Pattern Recognition. Oxford University Press.

Ellis, R. and Humphreys, G. (1999) Connectionist Psychology, A Text with Readings. Psychology Press Publishers.

1. **Learning and teaching methods**

Total contact hours: 46

Private study hours: 104

Total study hours: 150

1. **Assessment methods**
   1. Main assessment methods

Two simulation assessments (15% total)

Talk in workshop (15%)

Examination (70%)

13.2 Reassessment methods

Like for like

1. **Map of module learning outcomes (sections 8 & 9) to learning and teaching methods (section12) and methods of assessment (section 13)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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 | 9.5 | 9.6 |
| **Learning/ teaching method** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Private study | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Lectures and seminars | x | x |  | x |  | x | x | x |  | x | x |  |  | x |
| Practical |  | x | x |  | x |  |  | x | x | x |  | x | x | x |
| **Assessment method** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Simulations assessments |  | x | x |  | x |  |  | x | x | x |  | x | x | x |
| Talk in workshop | x | x |  | x |  | x | x | x |  | x | x |  |  | x |
| Examination | x | x | x |  | x |  |  | x |  | x |  | x | x | x |

1. **Inclusive module design**

The School 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

1. **Campus(es) or centre(s) where module will be delivered**

Canterbury and Medway

1. **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.

**DIVISIONAL USE ONLY**

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date approved | Major/minor revision | Start date of delivery of revised version | Section revised | Impacts PLOs (Q6&7 cover sheet) |
| 01/12/2020 | Minor | September 2021 | 5 | No |
|  |  |  |  |  |