1. **Title of the module**

COMP6360 (CO636) - 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 6

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**

Pre-requisite: COMP3220: Foundations of Computing I

or A-level Maths or Equivalent

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

Computer Science, Mathematics and Computer Science, Computer Science with

Management Science, Computer Science with Artificial Intelligence, Business Computing, BSc Computing and

Business Administration, BEng Computer Systems Engineering, BA/BSc Joint Honours Programmes in Applied

Computing, BA/BSc Programmes ‘with Computing’, include Year-in-Industry versions.

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 Build 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. To be able to analyse related systems not directly studied in the course in a similar fashion.

8.7 Discuss examples of neural networks as applied to neurobiology.

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

9.1 Utilize the library, exploit online resources and internet sites to support investigations into these areas.

9.2 Improve their analytical skills in respect of subsymbolic systems.

9.3 Enhance their experience of working with others through group work.

1. **A synopsis of the curriculum**

In this module you learn what is meant by neural networks and how to explain the mathematical equations that underlie them. You also build neural networks using state of the art simulation technology and apply these networks to the solution of problems. In addition, the module discusses examples of computation applied to neurobiology and cognitive psychology.

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

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

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

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

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

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

C.M. Bishop "Neural Networks for Pattern Recognition" Oxford University Press 1995

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

1. **Learning and teaching methods**

Total contact hours: 38

Private study hours: 112

Total study hours: 150

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

Two Simulations assessments, 12 hours total (20%)

Examination, 2 hours (80%)

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* | *9.1* | *9.2* | *9.3* |  |  |  |
| **Learning/ teaching method** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Private Study | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |  |  |  |
| Lectures | **x** | **x** |  | **x** |  | **x** | **x** | **x** | **x** |  |  |  |  |
| Practicals |  | **x** | **x** |  | **x** |  |  |  | **x** | **x** |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Assessment method** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Simulation assessments |  | **x** | **x** |  | **x** | **x** | **x** |  | **x** |  |  |  |  |
| Examination | **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

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.

**FACULTIES SUPPORT OFFICE 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 the delivery of revised version | Section revised | Impacts PLOs (Q6&7 cover sheet) |
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Revised FSO Jan 2018