



جمهورية مصر العربية

وزارة التعليم العالي والبحث العلمي

Ministry of Higher Education and Scientific Research



المعهد العالى للحاسبات وتكنولوجيا المعلومات
مدينة الشروق - القاهرة
شعبة علوم الحاسب

Course specification

Course Code: CS 361

Course Title: Neural Network

Academic Year: /

Course specification
(CS 361 - Neural Network)

Course Outline

Faculty:	<i>HICIT- (Higher Institute for Computers & Information Technology-El Shorouk Academy)</i>		
Programme(s) on which the course is given:	Undergraduate program in Computer Science		
Major or minor element of programme:	Compulsory		
Department offering the program	Department of Computer Science		
Department offering the course:	Department of Computer Science		
Level	Third Level		
Date of specification approval	DD/MM/YYYY		

Basic Information

Code:	CS 361	Title:	Neural Network	
Prerequisites:	CS 307 Logic Programming			
Weekly Hours:				
Lecture: 2	Exercise: -	Practical : 2	Total: 3 credit hours	

Professional Information

Course Aims:

This course will cover basic neural network architectures and learning algorithms, for applications in *pattern recognition, image processing, and computer vision*. Three forms of learning will be introduced (i.e., *supervised, unsupervised and reinforcement learning*) and applications of these will be discussed. The students will have a chance to try out several of these models on practical problems. So this course, attendees will:

- Understand the context of neural networks and deep learning
- Know how to use a neural network
- Understand the data needs of deep learning
- Have a working knowledge of neural networks and deep learning

Explore the parameters for neural networks.

Program ILOs Covered by Course

Knowledge and understanding	Intellectual Skills	Professional and practical skills	General and Transferable skills
A1, A6, A7	B1, B6, B11, B15, B17	C7, C16	D8, D9

Intended learning outcomes of course (ILOs)

A. Knowledge and Under-Standing:

- a1- Understand the major technology trends in advanced machine learning. [A6, A7]
- a2- A good understanding of artificial neural networks and their practical applications. [A6, A7]
- a3- An understanding of the fundamentals of neural networks. [A6, A7]
- a4- Build, train and apply fully connected deep neural networks. [A1, A6, A7]
- a5- Know how to implement efficient, vectorized neural networks in python and understand the underlying backends. [A1, A6, A7]
- a6- Apply deep learning methods to new applications. [A1, A6, A7]

B. Intellectual Skills:

- b1- How to think in simulating the human brain with an artificial neural network. [B1, B6, B11, B15]
- b2- How to think about building a supervised and unsupervised neural network in simple applications. [B1, B6, B11, B15, B17]

C. Professional and practical skills

- c1- Build a simple neural network with Mat-Lab tool and try to perform simple training to his network with a small dataset. [C7, C16]
- c2- Interact with the activation function the weight matrix for a given neural network. [C7, C16]
- c3- The ability to use the neural networks in some applications like pattern recognitions and classification. [C7, C16]
- c4- The ability to adapt the weight matrix of a given neural network during the training process in a small dataset. [C7, C16]

D. General and transferable skills

- d1- Work as a part of a team to produce reports. [D8, D9]
- d2- Apply specific tasks in certain periods of time. [D8, D9]

Contents

Topic	Contact Hours	
	lecture	Lab
Introduction to machine learning	3	3
Single perceptron N.N and delta rule	3	3
Multi-layer N.N and generalized delta rule	4	4
FFNN pre-processing and FFNN applications	3	3
Advanced training algorithms	3	6
Bidirectional associative memories	3	4
Hopfield memories	3	6
Applications of memories NN	3	3
Counter propagation neural networks	3	3
Convolution NN (CNN)	4	5

Teaching and learning methods

Teaching and learning methods	Used
Lectures	√
Tutorial Exercises	√
Practical Lab	√
Discussions.	√
Self – Learning (Reading material, Websites search,)	-
Self-studies	-
Group work	-
Presentation	-
Problem solving/problem solving learning based	-
Case study	-
Synchronous E-Learning	-
Video lectures	-
Asynchronous E-Learning	-

Student assessment methods & Schedule

Methods	Used	Week#
Midterm Exam	√	8
Final Exam	√	16
Course Work & Quizzes	√	2-14
Practical Exam	√	15

Assessment Weight

Assessment	Weight %
Mid Term Exam	10
Practical Exam	10
Final Exam	70
Course Work & Quizzes	10
Total	100

Course Work & Quizzes

Short Exams, Assignments, Research, Reports, Presentations
Class/Project discussion

List of references

Essential books (textbooks)	<p>Principe, Euliano, and Lefebvre, "Neural and Adaptive Systems: Fundamentals through Simulations", John Wiley and Sons, ISBN: 0471351679.</p> <p>Laurene Fausett, "Fundamentals of Neural Networks Haykin, Neural Networks: A Comprehensive Foundation</p>
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Course notes	E-Learning Portal
Recommended books	
Periodicals, website	
Videos link	

Required Facilities

Tools & SW (Technology facilities):	- Paython, TensorFlow	
Teaching facilities:	Whiteboard	√
	Computer Lab	√
	Data show	√
	E-Learning	√
	Videos	√
	Website	√

Learning Method /ILOs Matrix

Learning Methods	Knowledge and understanding						Intellectual skills		Professional and practical skills				General	
	a1	a2	a3	a4	a5	a6	b1	b2	c1	c2	c3	c4	d1	d2
Lectures	√	√	√	√	√	√					√	√		√
Tutorial Exercises							√	√	√	√	√	√	√	√
Practical Lab							√	√	√	√	√	√	√	√
Discussions.							√	√	√	√	√	√	√	√

Course Content/ILO Matrix

Course Contents	Knowledge & understanding						Intellectual skills		Professional and practical skills				General	
	a1	a2	a3	a4	a5	a6	b1	b2	c1	c2	c3	c4	d1	d2
Introduction to machine learning	√					√				√	√			
Single perceptron N.N and delta rule		√				√	√		√	√			√	√
Multi layer N.N and generalized delta rule			√			√	√		√	√	√		√	√
FFNN pre-processing and FFNN applications				√		√		√	√		√	√	√	√
Advanced training algorithms					√		√	√		√		√	√	√

Bidirectional associative memories			√	√	√			√	√	√	√	√	√	√
Hopfield memories			√		√		√	√		√	√	√		
Applications of memories NN			√	√	√		√	√	√	√	√	√	√	√
Counter propagation neural networks					√		√	√	√	√	√	√	√	
Convolution NN (CNN)			√	√		√		√	√	√	√		√	√

Assessment Methods /ILOs Matrix

Assessment Methods	Knowledge and understanding						Intellectual skills		Professional and practical skills				General	
	a1	a2	a3	a4	a5	a6	b1	b2	c1	c2	c3	c4	d1	d2
Mid Term Exam	x	x	x	x			x	x	x	x	x	x		
Final Exam	x	x	x	x	x	x	x	x	x	x	x	x		
Course Work & Quizzes	x	x	x	x	x	x	x	x	x	x			x	x
Practical Exam	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Course ILOs Vs Program ILOs

Course ILOs \ Prog ILOs		Knowledge and understanding			Intellectual skills					Professional and practical skills		General	
		A1	A6	A7	A1	B6	B11	B15	B17	C7	C16	D8	D9
Knowledge and Understanding	a1		x	x									
	a2	x	x	x									
	a3	x	x	x									
	a4	x	x	x									
	a5	x	x	x									
	a6	x	x	x									
Intellectual skills	b1				x	x	x	x					
	b2				x	x	x	x	x				
Professional and practical skills	c1									x	x		
	c2									x	x		
	c3									x	x		
	c4									x	x		
General skills	d1											x	x
	d2											x	x

Course Coordinator : ()

Head of Department : Dr. Ahmed El-Abbassy ()

Date: --/--/2023