## Tamkang University Academic Year 113, 2nd Semester Course Syllabus

Course Title	DEEP LEARNING	Instructor	CHEN, DUEN-KAI
Course Class	TEIBM1A  MASTER'S PROGRAM, DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION ENGINEERING (ENGLISH-TAUGHT PROGRAM),	Details	<ul><li>General Course</li><li>Required</li><li>One Semester</li><li>3 Credits</li></ul>
Relevance to SDGs	1A SDG4 Quality education		

#### Departmental Aim of Education

- I . Cultivate the ability to conduct independent research and problem solving.
- $\ensuremath{\mathbb{I}}$ . Strengthen creativity and research capacity.
- III. Build profound professional knowledge in computer science and information engineering.
- IV. Engage in self-directed lifelong learning.

### Subject Departmental core competences

- A. Independent problem solving ability.(ratio:20.00)
- B. Independent innovative thinking ability.(ratio:20.00)
- C. Research paper writing and presentation ability.(ratio:10.00)
- D. Research & development (R&D) ability in information engineering.(ratio:20.00)
- E. Project execution and control ability.(ratio:20.00)
- F. Lifelong self-directed learning ability.(ratio:10.00)

#### Subject Schoolwide essential virtues

- 1. A global perspective. (ratio:10.00)
- 2. Information literacy. (ratio:20.00)
- 3. A vision for the future. (ratio:10.00)
- 4. Moral integrity. (ratio:10.00)
- 5. Independent thinking. (ratio:10.00)
- 6. A cheerful attitude and healthy lifestyle. (ratio:10.00)
- 7. A spirit of teamwork and dedication. (ratio:20.00)
- 8. A sense of aesthetic appreciation. (ratio:10.00)

# Course Introduction

Deep learning is a subset of machine learning that focuses on utilizing deep neural networks (networks with multiple hidden layers) to perform tasks such as classification, regression, and representation learning. This course will start with traditional Machine Learning approaches and then move to modern Deep Learning architectures like Convolutional Neural Networks. Upon completion of the course, students will learn to apply Deep Learning techniques to solve various problems.

# The correspondences between the course's instructional objectives and the cognitive, affective, and psychomotor objectives.

Differentiate the various objective methods among the cognitive, affective and psychomotor domains of the course's instructional objectives.

- I. Cognitive: Emphasis upon the study of various kinds of knowledge in the cognition of the course's veracity, conception, procedures, outcomes, etc.
- II. Affective: Emphasis upon the study of various kinds of knowledge in the course's appeal, morals, attitude, conviction, values, etc.
- III.Psychomotor: Emphasis upon the study of the course's physical activity and technical manipulation.

No.	Teaching Objectives	objective methods
1	This course provides an introduction to Deep Learning. Students will learn to select or design neural network architectures for new data problems based on their requirements, and problem characteristics, and then analyze their performance. This course will also describe some of the latest research being conducted in the field and open problems that are yet to be solved.	Cognitive

The correspondences of teaching objectives: core competences, essential virtues, teaching methods, and assessment

No.	Core Competences	Essential Virtues	Teaching Methods	Assessment
1	ABCDEF	12345678	Lecture, Discussion, Practicum	Study Assignments, Discussion(including classroom and online), Practicum, Report(including oral and written), Activity Participation
				Participation

#### Course Schedule

Week	Date	Course Contents	Note
1	114/02/17 ~ 114/02/23	Course introduction	

2   144/37/37   Introduction to Artificial Neural Networks	14403/02   14403/02   14403/03   Full-cycle of a Deep Learning Project			
14/03/05   Full-Cycle of a Deep Learning Project	14-03-09   Full-Cycle of a Deep Learning Project	2		Introduction to Artificial Neural Networks
4 14/09/15 Deep Learning Strategy / Optimization of Deep Neural Networks  5 14/09/21 Deep Learning Strategy / Optimization of Deep Neural Networks  6 14/09/21 Deep Learning Strategy / Optimization of Deep Neural Networks  7 14/09/21 Structured Neural Representations  8 14/09/05 Applications of Deep Learning - Translation  9 14/09/21 Applications of Deep Learning - Speech Recognition  10 14/09/21 14/09/22 Generative Models  11 14/09/22 Generative Models  12 14/09/22 Generative Models  13 14/09/23 Advance Topics in Deep Learning  14 14/09/23 Advance Topics in Deep Learning  15 14/09/25 Advance Topics in Deep Learning  16 14/09/26 Advance Topics in Deep Learning  17 14/09/26 Advance Topics in Deep Learning  18 14/09/26 Advance Topics in Deep Learning  19 14/09/26 Advance Topics in Deep Learning  10 14/09/26 Advance Topics in Deep Learning  11 14/09/26 Advance Topics in Deep Learning  12 14/09/26 Advance Topics in Deep Learning  13 14/09/26 Advance Topics in Deep Learning  14 14/09/26 Advance Topics in Deep Learning  15 14/09/26 Advance Topics in Deep Learning  16 14/09/26 Advance Topics in Deep Learning  17 14/09/26 Advance Topics in Deep Learning  18 14/09/26 Self-directed learning  19 14/09/26 Self-directed learning  19 14/09/27 Self-directed learning  10 Information Technology  10 Project implementation course  10 Project implementation course	14/03/15   Deep Learning Strategy / Optimization of Deep Neural Networks	3		Full-cycle of a Deep Learning Project
September   Deep Learning Strategy / Optimization of Deep Neural Networks	September   Networks	4		
Structured Neural Representations	Structured Neural Representations  Applications of Deep Learning - Translation  Applications of Deep Learning - Speech Recognition  Structured Neural Representation  Applications of Deep Learning - Speech Recognition  Course Project Topic Selection  Course Project Topic Selection  Course Project Topic Selection  Structured Neural Representation  Course Project Topic Selection  Course Project Topic Selection  Course Project Nodels  Advance Topics in Deep Learning  Course Project Presentation  Course Project Presentation  Structured Neural Representation  Structured Neural Representation  Structured Neural Representations  Structured Neural Representation  Structured N	5		
7   114,064/06   Structures Neural Representations     8   114,064/07   Applications of Deep Learning - Translation     9   114,064/12   Applications of Deep Learning - Speech Recognition     10   114,064/21   114,064/22   Generative Models     11   114,065/05   Generative Models     12   114,065/05   Generative Models     13   114,065/12   Advance Topics in Deep Learning     14   114,065/12   Advance Topics in Deep Learning     14   114,065/12   Advance Topics in Deep Learning     15   114,066/05   Advance Topics in Deep Learning     16   114,066/05   Advance Topics in Deep Learning     17   114,066/05   Advance Topics in Deep Learning     18   114,066/05   Flexible Week     18   114,066/05   Flexible Week     19   STEAM course (S-Science, T:Technology, EEngineering, M:Math, A field/Integration of Art and Humanist)     10   Project implementation course	Structured Neural Representations   Structured Neural Representation	6		Structured Neural Representations
8 114/04/13 Applications of Deep Learning - Translation 9 114/04/14 Applications of Deep Learning - Speech Recognition 10 114/04/27 Course Project Topic Selection 11 114/04/28 Generative Models 12 114/05/05 Ind/05/13 Generative Models 13 114/05/12 Advance Topics in Deep Learning 14 114/05/12 Advance Topics in Deep Learning 14 114/05/19 Ind/05/25 Advance Topics in Deep Learning 15 114/05/05 Advance Topics in Deep Learning 16 114/05/02 Advance Topics in Deep Learning 17 114/05/08 Advance Topics in Deep Learning 18 114/05/16 Course Project Presentation 19 114/05/16 Flexible Week 114/05/16 Information Technology Problem solving  STEAM course (S.Science, T.Technology, E.Engineering, M:Math, A field.Integration of Art and Humanist)  Project implementation course	Applications of Deep Learning - Translation	7		Structured Neural Representations
9 114/04/20 10 114/04/27 Course Project Topic Selection 11 114/05/28 Generative Models 12 114/05/04 Generative Models 13 114/05/13 Advance Topics in Deep Learning 14 114/05/25 Advance Topics in Deep Learning 14 114/05/26 Advance Topics in Deep Learning 15 114/05/26 Advance Topics in Deep Learning 16 114/05/01 Advance Topics in Deep Learning 17 114/05/09 Advance Topics in Deep Learning 18 114/06/16 Course Project Presentation 19 114/06/16 Flexible Week  Key capabilities Self-directed learning Information Technology Problem solving  STEAM course (S.Science, T.Technology, E.Engineering, M:Math, A field:Integration of Art and Humanist)  Project implementation course	9 14/04/20 Applications of Deep Learning - Speech Recognition  11 14/04/21 Course Project Topic Selection  11 14/04/28 Generative Models  12 114/05/05 Generative Models  13 114/05/12 Advance Topics in Deep Learning  14 114/05/13 Advance Topics in Deep Learning  15 114/05/26 Advance Topics in Deep Learning  16 114/05/06 Advance Topics in Deep Learning  17 114/05/05 Course Project Presentation  18 114/05/05 Flexible Week  Key capabilities  SEEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)  Distinctive  Project implementation course	8		Applications of Deep Learning - Translation
10 114/04/28 Generative Models  11 114/05/05 Generative Models  12 114/05/05 Advance Topics in Deep Learning  13 114/05/12 Advance Topics in Deep Learning  14 114/05/12 Advance Topics in Deep Learning  15 114/05/26 Advance Topics in Deep Learning  16 114/05/02 Advance Topics in Deep Learning  17 114/06/08 Advance Topics in Deep Learning  18 114/06/08 Flexible Week  Self-directed learning  Information Technology  Problem solving  STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)  Project implementation course	10 14/04/27 COURSE Project Topic Selection  11 114/04/28- 114/05/41 Generative Models  12 114/05/12- Generative Models  13 114/05/12- 114/05/13- Advance Topics in Deep Learning  14 114/05/15- 114/05/25- Advance Topics in Deep Learning  15 114/05/26- 114/05/02- Advance Topics in Deep Learning  16 114/05/02- Advance Topics in Deep Learning  17 114/06/03- Advance Topics in Deep Learning  18 114/06/03- Course Project Presentation  18 114/06/03- Flexible Week  Key capabilities Self-directed learning Information Technology Problem solving  Interdisciplinary STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)  Project implementation course	9		Applications of Deep Learning - Speech Recognition
11	11   114/05/04   Generative Models   12   114/05/05	10		Course Project Topic Selection
12   114/05/12   Generative Models  13   114/05/12   Advance Topics in Deep Learning  14   114/05/13   Advance Topics in Deep Learning  15   114/05/26   Advance Topics in Deep Learning  16   114/06/02   Advance Topics in Deep Learning  17   114/06/08   Advance Topics in Deep Learning  18   114/06/15   Course Project Presentation  18   114/06/16   Flexible Week  Key capabilities   Self-directed learning   Information Technology   Problem solving  Interdisciplinary   STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)    Distinctive   Project implementation course	12   114/05/11   Generative Models   114/05/12   114/05/12   Advance Topics in Deep Learning   114/05/13   114/05/13   Advance Topics in Deep Learning   114/05/25   Advance Topics in Deep Learning   114/05/25   Advance Topics in Deep Learning   114/05/26   114/05/26   Advance Topics in Deep Learning   114/06/08   Advance Topics in Deep Learning   114/06/08   114/06/08   Course Project Presentation   114/06/15   Flexible Week   Self-directed learning   116/06/15   Self-directed learning	11		Generative Models
13   114/05/18   Advance Topics in Deep Learning   14   114/05/19 -   114/05/25   Advance Topics in Deep Learning   15   114/05/26 -   114/06/01   Advance Topics in Deep Learning   16   114/06/02 -   114/06/08   Advance Topics in Deep Learning   17   114/06/09 -   114/06/15   Course Project Presentation   18   114/06/16 -   114/06/22   Flexible Week    Key capabilities   Self-directed learning   Information Technology   Problem solving    Interdisciplinary   STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)    Project implementation course    Project implementation course	13   114/05/18   Advance Topics in Deep Learning   14   114/05/19 -   114/05/25   Advance Topics in Deep Learning   15   114/05/26 -   114/06/01   Advance Topics in Deep Learning   16   114/05/02 -   Advance Topics in Deep Learning   17   114/05/08   Course Project Presentation   18   114/05/16 -   114/05/12   Flexible Week    Key capabilities   Self-directed learning   Information Technology   Problem solving    Interdisciplinary   STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)    Project implementation course	12		Generative Models
14   114/05/25   Advance Topics in Deep Learning   15   114/05/26 -	Advance Topics in Deep Learning  15	13		Advance Topics in Deep Learning
15   114/06/01   Advance Topics in Deep Learning   16   114/06/02   Advance Topics in Deep Learning   17   114/06/08   Course Project Presentation   18   114/06/15   Flexible Week    Key capabilities   Self-directed learning   Information Technology   Problem solving    STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)    Project implementation course    Distinctive   Project implementation course	15   114/06/01   Advance Topics in Deep Learning   16   114/06/08   Advance Topics in Deep Learning   17   114/06/09   114/06/15   Course Project Presentation   18   114/06/16   Flexible Week    Key capabilities   Self-directed learning   Information Technology   Problem solving    Interdisciplinary   STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)    Distinctive   Project implementation course    Projec	14		Advance Topics in Deep Learning
16   114/06/08   Advance Topics in Deep Learning   17   114/06/09~   114/06/15   18   114/06/22   Flexible Week    Key capabilities   Self-directed learning   Information Technology   Problem solving    Interdisciplinary   STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)    Project implementation course    Project implementation course	Advance Topics in Deep Learning  114/06/08  12	15		Advance Topics in Deep Learning
17   114/06/15   Course Project Presentation  18   114/06/16 ~   Flexible Week  Key capabilities   Self-directed learning   Information Technology   Problem solving  STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)  Project implementation course  Distinctive   Distinctive	17   114/06/15   Course Project Presentation    18   114/06/16~   114/06/22   Flexible Week    Key capabilities   Self-directed learning   Information Technology   Problem solving    STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)    Distinctive   Project implementation course	16		Advance Topics in Deep Learning
Self-directed learning   Information Technology   Problem solving	Self-directed learning   Information Technology   Problem solving	17	1 ' '	Course Project Presentation
Key capabilities  Information Technology Problem solving  STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)  Project implementation course  Distinctive	Key capabilities Information Technology Problem solving  STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)  Project implementation course  Distinctive	18		Flexible Week
Interdisciplinary Humanist)  Project implementation course  Distinctive	Interdisciplinary Humanist)  Project implementation course  Distinctive	Key capabilities		Information Technology
Distinctive	Distinctive	Interdisciplinary		
				Project implementation course

Course Content	Computer programming or Computer language (students have hands-on experience in related projects)  Logical Thinking  AI application
Requirement	
Textbooks and Teaching Materials	Using teaching materials from other writers:Presentations, Videos, Worksheets
References	
Grading Policy	<ul> <li>◆ Attendance: % ◆ Mark of Usual: 70.0 % ◆ Midterm Exam: %</li> <li>◆ Final Exam: %</li> <li>◆ Other ⟨Course project⟩: 30.0 %</li> </ul>
Note	This syllabus may be uploaded at the website of Course Syllabus Management System at <a href="http://info.ais.tku.edu.tw/csp">http://info.ais.tku.edu.tw/csp</a> or through the link of Course Syllabus Upload posted on the  home page of TKU Office of Academic Affairs at <a href="http://www.acad.tku.edu.tw/CS/main.php">http://www.acad.tku.edu.tw/CS/main.php</a> .   ** Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.

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