Tamkang University Academic Year 113, 1st Semester Course Syllabus

Course Title	DEEP LEARNING	Instructor	YU, KUO-CHUNG
Course Class	TKFXB3A DEPARTMENT OF ARTIFICIAL INTELLIGENCE, 3A	Details	◆ General Course ◆ Required ◆ One Semester ◆ 3 Credits
Relevance to SDGs	SDG3 Good health and well-being for people SDG4 Quality education SDG9 Industry, Innovation, and Infrastructure		

Departmental Aim of Education

Ⅰ. Students may analyze problems in applied science based on the fundamental knowledge of programming, mathematics, and artificial intelligence.

Ⅱ. Students may plan and implement an AI system following the procedures of problem analysis, experiment testing, data visualizing, derivation and deduction.

Ⅲ. Educate the students to be AI engineers who may accomplish their missions indepedently and may collaborate with their colleagues in the workplace.

Ⅳ. Students may have basic skills and global competence for career diversification, and may keep lifelong learning.

Subject Departmental core competences

A. Professional analysis.(ratio:25.00)

B. Practical application.(ratio:35.00)

C. Professional attitude.(ratio:30.00)

D. Global Mobility.(ratio:10.00)

Subject Schoolwide essential virtues

1. A global perspective. (ratio:10.00)
2. Information literacy. (ratio:30.00)
3. A vision for the future. (ratio:10.00)
4. Moral integrity. (ratio:5.00)
5. Independent thinking. (ratio:20.00)
6. A cheerful attitude and healthy lifestyle. (ratio:5.00)
7. A spirit of teamwork and dedication. (ratio:15.00)
8. A sense of aesthetic appreciation. (ratio:5.00)

Course Introduction	This course introduces both the theory and practice of Deep Learning. The course content covers everything from the basic operations of neurons, single-layer neurons, multi-layer neurons, learning mechanisms of neural networks, to the introduction of important deep neural network architectures such as CNN, RNN/LSTM, Auto-Encoder, GAN, Transformer, UNet, YOLO, 3DCNN, and Siamese Neural Network. Furthermore, we will discuss how these networks handle data such as text, images, speech, videos, and other types of data.

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	Students will be able to understand the principles of deep learning and the basic network architectures.	Cognitive
2	Students will be able to use deep learning development tools.	Psychomotor
3	Students will be able to apply deep learning models to solve problems.	Affective

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

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

Course Schedule			
Week	Date	Course Contents	Note
1	113/09/09 ~ 113/09/15	深度學習介紹/Pytorch開發環境介紹	
2	113/09/16 ~ 113/09/22	CNN網路發展歷程及重要的CNN模型/Pytorch預訓練模型	
3	113/09/23 ~ 113/09/29	YOLO介紹/YOLOv7使用與訓練/影像物體偵測	
4	113/09/30 ~ 113/10/06	RNN/LSTM介紹/時間序列預測	
5	113/10/07 ~ 113/10/13	深度學習學習機制探討/溫度與刻度關係預測	
6	113/10/14 ~ 113/10/20	神經網路超參數調整/訓練自建簡單神經網路	
7	113/10/21 ~ 113/10/27	建構複雜神經網路-以ResNet為例	
8	113/10/28 ~ 113/11/03	3DCNN與影片分類	
9	113/11/04 ~ 113/11/10	Midterm Exam Week	
10	113/11/11 ~ 113/11/17	Auto-Encoder網路架構/Latent Space/Stable Diffusion 影像生成	
11	113/11/18 ~ 113/11/24	Seq2Seq網路/Attention機制/Transformer架構介紹	
12	113/11/25 ~ 113/12/01	BERT模型介紹/情緒分析/句向量文字搜尋	
13	113/12/02 ~ 113/12/08	生成對抗網路GAN運作原理/臉部影像生成	
14	113/12/09 ~ 113/12/15	大語言模型LLM介紹/ChatGPT使用/GPT2金庸小說訓練與生成	
15	113/12/16 ~ 113/12/22	增強式學習原理/DQN電腦打遊戲	
16	113/12/23 ~ 113/12/29	骨架關節點提取原理/OCR文字偵測與文字辨識	
17	113/12/30 ~ 114/01/05	Final Exam Week	
18	114/01/06 ~ 114/01/12	Flex week, learning activities should be arranged.	

Key capabilities	self-directed learning Information Technology Problem solving Interdisciplinary
Interdisciplinary	STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)

Distinctive teaching	Project implementation course
Course Content	Computer programming or Computer language (students have hands-on experience in related projects) AI application
Requirement	學生最好具備Python與機器學習之基礎
Textbooks and Teaching Materials	Self-made teaching materials:Handouts Name of teaching materials: 自編講義及程式碼
References	
Grading Policy	◆ Attendance： 5.0 % ◆ Mark of Usual：25.0 % ◆ Midterm Exam： 25.0 % ◆ Final Exam： 25.0 % ◆ Other〈實習課〉：20.0 %
Note	This syllabus may be uploaded at the website of Course Syllabus Management System at http://info.ais.tku.edu.tw/csp or through the link of Course Syllabus Upload posted on the home page of TKU Office of Academic Affairs at http://www.acad.tku.edu.tw/CS/main.php . **※ Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.**