

Tamkang University Academic Year 111, 1st Semester Course Syllabus

Course Title	INTRODUCTION TO IMAGE PROCESSING AND COMPUTER VISION	Instructor	HO THI TRANG
Course Class	TEIBM1A MASTER'S PROGRAM, DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION ENGINEERING (ENGLISH-TAUGHT PROGRAM),	Details	<ul style="list-style-type: none"> ◆ General Course ◆ Selective ◆ One Semester
Relevance to SDGs	1A SDG4 Quality education SDG9 Industry, Innovation, and Infrastructure		
Departmental Aim of Education			
I. Cultivate the ability to conduct independent research and problem solving. II. 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:20.00) D. Research & development (R&D) ability in information engineering.(ratio:20.00) E. Project execution and control ability.(ratio:10.00) 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:20.00) 6. A cheerful attitude and healthy lifestyle. (ratio:10.00) 7. A spirit of teamwork and dedication. (ratio:10.00) 8. A sense of aesthetic appreciation. (ratio:10.00)			

Course Introduction	<p>This course introduces you about applying computer vision techniques to real-world problems. After completing this course, you will be able to cutting-edge research in computer vision starting from a refresher in the basics of image processing, machine learning, neural networks, and computer vision. This course does not require any prior Machine Learning or Computer Vision experience. However, some knowledge of the Python programming language and high school math is necessary.</p>
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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	Computer Vision Basics	Cognitive
2	Concepts of Machine Learning and Deep Learning	Cognitive
3	Concepts of Object Recognition	Cognitive
4	Applying Computer Vision Techniques to Real-world Problems	Cognitive

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

No.	Core Competences	Essential Virtues	Teaching Methods	Assessment
1	ABCDEF	1245678	Lecture, Discussion	Study Assignments, Discussion(including classroom and online), Report(including oral and written)
2	BCDF	25	Lecture, Discussion, Experience	Testing, Discussion(including classroom and online), Report(including oral and written)

3	ABCDE	235	Lecture, Discussion, Experience	Study Assignments, Discussion(including classroom and online), Report(including oral and written)
4	ACDE	25	Lecture, Discussion, Experience	Study Assignments, Discussion(including classroom and online), Report(including oral and written)

Course Schedule

Week	Date	Course Contents	Note
1	111/09/05 ~ 111/09/11	Course Introduction, Introduction to Computer Vision	
2	111/09/12 ~ 111/09/18	Computer Vision Basics (1): What is a Digital Image Loading, Displaying, and Saving Images Manipulating Images	
3	111/09/19 ~ 111/09/25	Computer Vision Basics (2): Kernels, Morphological Operations, Smoothing and Blurring, Lighting and Color Spaces, Thresholding, Contours, Histograms	Assignment 1
4	111/09/26 ~ 111/10/02	Image Classification and Machine Learning (1): Overview of Image Classification Image Classification Pipeline K-Nearest Neighbor Classification	
5	111/10/03 ~ 111/10/09	Image Classification and Machine Learning (2): Common Machine Learning Algorithms for Image Classification	
6	111/10/10 ~ 111/10/16	Image Classification and Machine Learning (3): K-mean Clustering Logistic Regression Training Gradient Descent Mini-Batch Gradient Descent SoftMax and Multi-Class Classification Image Features	Assignment 2
7	111/10/17 ~ 111/10/23	Neural Network and Deep Learning (1)	
8	111/10/24 ~ 111/10/30	Neural Network and Deep Learning (2)	
9	111/10/31 ~ 111/11/06	Tips for Training a Deep Learning Network: Learning RateSchedulers Underfitting vs Overfitting Checkpointing Models	
10	111/11/07 ~ 111/11/13	Midterm Exam Week	
11	111/11/14 ~ 111/11/20	Object Recognition (1)	
12	111/11/21 ~ 111/11/27	Object Recognition (2)	
13	111/11/28 ~ 111/12/04	ImageNet Data, Important CNN Architectures	

14	111/12/05 ~ 111/12/11	Data Augmentation	
15	111/12/12 ~ 111/12/18	Fine-tuning Networks	
16	111/12/19 ~ 111/12/25	Case Study: Object Detection using Mask R-CNN, Recent Research	
17	111/12/26 ~ 112/01/01	Final Exam: Project Presentation	
18	112/01/02 ~ 112/01/08	Final Exam: Project Presentation	
Requirement			
Teaching Facility	Projector		
Textbooks and Teaching Materials	Deep Learning (Adaptive Computation and Machine Learning series), Ian Goodfellow. Deep Learning with Python, François Chollet. Pattern Recognition and Machine Learning, Christopher Bishop		
References			
Number of Assignment(s)	2 (Filled in by assignment instructor only)		
Grading Policy	◆ Attendance : 10.0 % ◆ Mark of Usual : % ◆ Midterm Exam : 30.0 % ◆ Final Exam : 40.0 % ◆ Other 〈Assignment〉 : 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.		