深度學習應用於電腦視覺

Deep Learning in Computer Vision

Course Information	
Course title	Deep Learning in Computer Vision
Semester	114-2
Designated for	COLLEGE OF ENGINEERING　DEPARTMENT OF CIVIL ENGINEERING
Instructor	RIH-TENG WU
Curriculum Number	CIE5151
Curriculum Identity Number	521EU9310
Class	
Credits	3.0
Full/Half Yr.	Half
Required/ Elective	Elective
Time	Monday 6(13:20~14:10) Thursday 5,6(12:20~14:10)
Remarks	Restriction: within this department (including students taking minor and dual degree program) The upper limit of the number of students: 50.
Course introduction video	
Table of Core Capabilities and Curriculum Planning	Association has not been established
Course Syllabus	
Please respect the intellectual property rights of others and do not copy any of the course information without permission	
Course Description	This course introduces the fundamental theory/background knowledge of prevalent machine learning (ML) and computer vision (CV) algorithms. Relevant applications in the broad domain of the engineering community will be introduced to motivate the students. The first half of the semester will focus on the reasoning of artificial intelligence, several ML algorithms, model evaluation, deep learning (DL) and reinforcement learning. The rest of the semester will have emphasis on the reasoning of image processing, image feature extractions and pairing, as well

<table>
<tr><td></td><td>as image-based sensing. After taking this course, students are expected to be equipped with basic knowledge and implementation skills to develop ML, DL or CV based approaches for applications in engineering.</td></tr>
<tr><td>Course Objective</td><td>Upon taking this course, students are anticipated to be well-prepared in the following items:
1. Understand the fundamental principles that support the ML/DL algorithms.
2. Be able to reasoning the performance of ML/DL models.
3. Be able to implement ML/DL algorithms.
4. Understand the fundamental principles that support the CV algorithms.
5. Understand the image representations of the world.
6. Be able to implement CV algorithms.</td></tr>
<tr><td>Course Requirement</td><td>Prerequisites: Calculus, Computer Programming</td></tr>
<tr><td>Student Workload (Expected weekly study hours before and/or after class)</td><td>4hrs</td></tr>
<tr><td>Office Hours</td><td>Thu. 14:30~16:30 Note: Absence of the class will be allowed only if the student informed the instructor in advance. Contact(TA) : r13521629@ntu.edu.tw</td></tr>
<tr><td>Designated reading</td><td></td></tr>
<tr><td>References</td><td>Several excellent online sources are:
1. A Course in Machine Learning, electronic source available at: http://ciml.info/
2. Christopher Bishop (2006), Pattern Recognition and Machine Learning, Springer
3. Goodfellow et. al (2016), Deep Learning, MIT Press, electronic source available at: https://www.deeplearningbook.org/</td></tr>
<tr><td>Grading</td><td>
<table>
<tr><th>No.</th><th>Item</th><th>%</th><th>Explanations for the conditions</th></tr>
<tr><td>1.</td><td>Term project</td><td>30%</td><td></td></tr>
<tr><td>2.</td><td>Assignment</td><td>35%</td><td></td></tr>
<tr><td>3.</td><td>Midterm</td><td>30%</td><td></td></tr>
<tr><td>4.</td><td>Participation</td><td>5%</td><td></td></tr>
</table>
1. NTU has not set an upper limit on the percentage of A+ grades.
2. NTU uses a letter grade system for assessment. The grade percentage ranges and the single-subject grade conversion table in the NATIONAL TAIWAN UNIVERSITY Regulations Governing Academic Grading are for reference only. Instructors may adjust the percentage ranges according</td></tr>
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	to the grade definitions. For more information, see the Assessment for Learning Section.
Adjustment methods for students	Teaching methods: Assisted by recording, Assisted by video, Provide students with flexible ways of attending courses Assignment submission methods: Mutual agreement to present in other ways between students and instructors Exam methods: Others:

Progress

Week	Date	Topic
Week 1	2/23, 2/26	Introduction to artificial intelligence, machine learning, and deep learning
Week 2	3/2, 3/5	Data representations; Evaluation of machine learning models
Week 3	3/9, 3/12	Support vector machine
Week 4	3/16, 3/19	Support vector machine (Cont.); k-nearest neighbor
Week 5	3/23, 3/26	Decision tree; Fully-connected neural network
Week 6	3/30, 4/2	Fully-connected neural network (Cont.)
Week 7	4/6, 4/9	4/6 (break); Introduction to image basics, image-based sensing, image filtering
Week 8	4/13, 4/16	Image filtering (Cont.); Convolutional neural network
Week 9	4/20, 4/23	Convolutional neural network (Cont.)
Week 10	4/27, 4/30	Transfer learning; Auto-encoder
Week 11	5/4, 5/7	Generative adversarial network; Midterm (5/1)
Week 12	5/11, 5/14	Object classification, detection and segmentation
Week 13	5/18, 5/21	Feature extraction and pairing
Week 14	5/25, 5/28	Digital image correlation and image stitching
Week 15	6/1, 6/4	World-image correspondence
Week 16	6/8, 6/11	3D reconstruction (optional)