

Course Form for PKU Summer School International 2018

Course Title	Deep Learning
	深度学习
Teacher	TANG Jian
First day of classes	July 3, 2018
Last day of classes	July 8, 2018
Course Credit	2 credits
Course Description	
Objective	
Deep learning has achieved tremendous success in many applications. This course aims to introduce the fundamental concepts, methods, and applications of deep learning. The first part of the course focuses on the theory and methods; the second part provides an introduction to the widely used deep learning framework TensorFlow; the last part introduces the applications of deep learning to various domains including computer vision, natural language understanding, information network analysis, and recommendation.	
Pre-requisites /Target audience	
Data Structures and Algorithm, Probability and Mathematical Statistics. Undergraduate students.	
Proceeding of the Course	
None	
Assignments (essay or other forms)	
Reading, Assignment and Programming	
Evaluation Details	
Attendance and Reading: 30% Programming Project: 40% Presentation: 30%	
Text Books and Reading Materials	
<ol style="list-style-type: none">1. Ian Goodfellow, Yoshua Bengio, Aaron Courville. Deep Learning. MIT Press, 2016.2. Christopher Bishop. Pattern Recognition and Machine Learning. Springer, 2013.3. Trevor Hastie, Robert Tibshirani, Jerome Friedman. The Elements of Statistical Learning. Springer, 2016.	

4. Jure Leskovec, Anand Rajaraman, Jeffery D. Ullman. Mining of Massive Datasets. Cambridge University Press, 2010.
5. Alex Smola and S.V.N. Vishwanathan. Introduction to Machine Learning. Cambridge University Press, 2010.
6. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. MIT, 2012.
7. Mehryar Mohri, Afshin Rostamizadeh. Foundations of Machine Learning. MIT, 2012.
8. Tom M. Mitchell. Machine Learning. McGraw-Hill Education, 1997.
9. Elad S. Abu-Mostafa, Malik Magdon-Ismail, Hsuan-Tien Lin. Learning from Data. AML Book, 2012.

Academic Integrity (If necessary)

CLASS SCHEDULE

(Subject to adjustment)

Session 1: *Math and Machine Learning Basics*

Date: 7/2

【Description of the Session】 (purpose, requirements, class and presentations scheduling, etc.)

Introduce math and machine learning basics, such as probabilistic theory and matrix computation.

【Questions】

【Readings, Websites or Video Clips】

【Assignments for this session (if any)】

Session 2: *Feedforward Neural Networks*

Date: 7/2

【Description of the Session】 (purpose, requirements, class and presentations scheduling, etc.)

Introduce history of deep learning and some simple neural network structures.

【Questions】

【Assignments for this session (if any)】	
Session 3: <i>Optimization and Tricks</i>	Date:7/3
【Description of the Session】 (purpose, requirements, class and presentations scheduling, etc.) Introduce optimization methods in deep learning and effective tricks.	
【Questions】	
【Readings, Websites or Video Clips】	
【Assignments for this session (if any)】	
Session 4: <i>Convolutional Neural Networks</i>	Date:7/3
【Description of the Session】 (purpose, requirements, class and presentations scheduling, etc.) Introduce convolutional neural networks and its applications.	
【Questions】	
【Readings, Websites or Video Clips】	
【Assignments for this session (if any)】	
Session 5: <i>Recurrent Neural Networks</i>	Date:7/4

【Description of the Session】 (purpose, requirements, class and presentations scheduling, etc.)

Some basics of RNN and corresponding applications in NLP.

【Questions】

【Readings, Websites or Video Clips】

【Assignments for this session (if any)】

Session 6: *Introduction to TensorFlow*

Date:7/4

【Description of the Session】 (purpose, requirements, class and presentations scheduling, etc.)

Introduce how to use TensorFlow.

【Questions】

【Readings, Websites or Video Clips】

【Assignments for this session (if any)】

Session 7: *Deep Learning for Natural Language Understanding*

Date:7/5

【Description of the Session】 (purpose, requirements, class and presentations scheduling, etc.)

Use deep learning solve NLP tasks.

【Questions】

【Readings, Websites or Video Clips】

【Assignments for this session (if any)】	
Session 8: <i>Deep learning for network analysis</i>	Date:7/5
【Description of the Session】 (purpose, requirements, class and presentations scheduling, etc.) Application of deep learning in network embedding and network data mining.	
【Questions】	
【Readings, Websites or Video Clips】	
【Assignments for this session (if any)】	
Session 9: <i>Deep learning for recommendation and Student Presentation</i>	Date:7/6
【Description of the Session】 (purpose, requirements, class and presentations scheduling, etc.) Application of deep learning in recommendation task.	
【Questions】	
【Readings, Websites or Video Clips】 Yi Lu, Andrea Montanari, Balaji Probhakar, Sarang Dharmapurikar, and Abdul Kabbani. Counter Braids: A Novel Counter Architecture for Per-Flow Measurement. ACM SIGMETRICS, 2008.	
【Assignments for this session (if any)】	