Course Title	Deep Learning		
Department/Course	Graduate School of Marine Science and Technology　Master's Course		
Category/Spacializations	<Graduate School Subjects>,<Other Courses' Subjects>		
Year Offered	1st	Class	10
Required or Elective	elective	Credit	2
Semester	First Semester	Course Type	
Day/Period	TUE 4 ,TUE 5	Lecture Room	
Chief Instructor	Takenawa Tomoyuki		
Instructors	Takenawa Tomoyuki		
Theme & Objects	The aim of this course is to understand theories and to be able to use neural networks, especially deep learning. Using Python and NumPy, we implement neural networks, backpropagation, optimal methods, convolutional neural networks. Lectures and exercises on recurrent neural networks and reinforcement learning are also included. Google Colaboratory is used as platform.		
Learning Outcomes	To understand theories and to be able to use neural networks, especially deep learning.		
Styles of Class	combination: online classes(real-time/on-demand)		
Course Contents	1. Overview of deep learning 2. Fundamentals of machine learning and information theory 3. Neural networks and error functions 4. Two-layer neural network 5. Multi-layer neural network 6. Optimization in neural networks 7. Regularization in Neural Networks 8. 8. Convolutional neural network (CNN) 9. Development of CNN 10. Generative model and general object detection 11. Recurrent coupled neural network (RNN) 12. natural language processing 12. Natural language processing 13. Reinforcement learning		
Prerequisites			
Textbook / References	Materials of the course are distributed from http://www2.kaiyodai.ac.jp/~takenawa/learning/ Text: 斎藤 康毅 著「ゼロから作るDeep Learning ―― Pythonで学ぶ 　　ディープラーニングの理論と実装」オライリージャパン or Ian Goodfellow and Yoshua Bengio and Aaron Courville, "Deep Learning", 2016, MIT Press, You can read freely at https://www.deeplearningbook.org/		
Preparation & Review	Each time, a few students will be asked to explain the Python or other exercises that have been assigned in advance. In addition to this, students should also do the following. ・The lectures will be given on the assumption that students can use Python and NumPy, so study the preparatory materials on the lecture page in advance. ・Understand the lectures and notebooks for each session. ・Answer the quizzes or small assignments for each session.		
Assessment and Examinations	Attendance and commitment to the course 30% Answers to problems 30% Final Assignment 40%		
Evaluation Criteria	Able to answer questions in lectures. Able to design Convolutionnal neural networks.		
Teaching activities & methods			
Instructor Contact Information	takenawa@kaiyodai.ac.jp		
Other Information	Lectures are given in Japanese language, but English materials are also provided. This lecture is held at the same hour with "Applied Analysis", a common subject of Master course. You can only take one of them.		
URL	http://www2.kaiyodai.ac.jp/~takenawa/learning/		
Code	EF46V5141JH0		
Teaching Language	Japanese and English		
Workload Calculation	(1) Teaching hours in class: 30h (2) Contact hours (Laboratory time): 0h (3) Preparation hours before classes: 25h (4) Review hours after classes: 25h (5) Preparation hours for presentation: 0h (6) Preparation of final assignment:　10h (7) Supervised Study Hours (Meeting with the course instructor or TA): 0h (8) Participation in related seminars: 0h (9) Other activities: 0h (10) Total Work Load: 90h		
Related Degree Awarding Policy	(1) The ability to understand the social background, academic significance and practical value of research topics and to promote research appropriately: ○ (2) An extensive range of expertise related to basic science and applied science: ◎ (3) The ability to explain research results logically, and ethics with regard to academic research: ○		
Relation to SDGs	Select 1 to 3 applicable items and delete the non-applicable items. After selecting, plase delete this description. 4 Quality education 9 Industry, innovation and infrastructure		