

Course Title	Deep Learning		
Department/Course	Graduate School of Marine Science and Technology Master's Course		
Category/Specializations	<Graduate School Subjects>, <Other Courses' Subjects>		
Year Offered	1st	Class	10
Required or Elective	elective	Credit	2
Semester	First Semester	Course Type	
Day/Period	TUE5	Lecture Room	
Chief Instructor	Takenawa Tomoyuki		
Instructors	Takenawa Tomoyuki		
Theme & Objects	<p>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.</p>		
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	<ol style="list-style-type: none"> <li>1. Introduction to deep learning</li> <li>2. Basics in machine learning and information theory</li> <li>3. Neural networks and loss functions</li> <li>4. Backpropagation</li> <li>5. Two-layer neural networks</li> <li>6. Multi-layer neural networks</li> <li>7. Optimization methods and initial values of parameters</li> <li>8. Batch normalization and Dropout</li> <li>9. Convolution and Pooling</li> <li>10. Convolutional neural networks (CNN)</li> <li>11. Generative models and general object detection</li> <li>12. Recurrent neural networks (RNN)</li> <li>13. Natural language processing</li> <li>15. Reinforcement learning</li> </ol>		
Prerequisites			
Textbook / References	<p>Materials of the course are distributed from <a href="http://www2.kaiyodai.ac.jp/~takenawa/learning/">http://www2.kaiyodai.ac.jp/~takenawa/learning/</a></p> <p>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</p> <p>or</p> <p>Ian Goodfellow and Yoshua Bengio and Aaron Courville, "Deep Learning", 2016, MIT Press, You can read freely at <a href="https://www.deeplearningbook.org/">https://www.deeplearningbook.org/</a></p>		
Preparation & Review	<p>Each class session will include about one hour of discussion to deepen your understanding. In addition, study the following.</p> <p>It is assumed that students can use Python and NumPy in this class, so students are expected to study the preparatory materials on the lecture page in advance.</p> <p>Watch the lecture materials and videos in advance and run the notebooks beforehand for each session. Answer the questions for the exercises in each session.</p>		
Assessment and Examinations	<p>Attendance and commitment to the course 30%</p> <p>Answers to problems 30%</p> <p>Final Assignment 40%</p>		
Evaluation Criteria	<p>Able to answer questions in lectures.</p> <p>Able to design Convolutional neural networks.</p>		
Teaching activities & methods			
Instructor Contact Information	takenawa@kaiyodai.ac.jp		
Other Information	<p>Lectures are given in Japanese language, but English materials are also provided.</p> <p>This lecture is held at the same hour with "Deep Learning", a common subject of Master course. You can only take one of them.</p>		
URL	<a href="http://www2.kaiyodai.ac.jp/~takenawa/learning/">http://www2.kaiyodai.ac.jp/~takenawa/learning/</a>		
Code	EF46V5141JH0		
Teaching Language	Japanese and English		
Workload Calculation	<ol style="list-style-type: none"> <li>(1)Teaching hours in class: 30h</li> <li>(2&gt;Contact hours (Laboratory time): 0h</li> <li>(3)Preparation hours before classes: 25h</li> <li>(4)Review hours after classes: 25h</li> <li>(5)Preparation hours for presentation: 10h</li> <li>(6)Preparation hours for Examination: 0h</li> <li>(7)Supervised Study Hours (Meeting with the course instructor or TA): 0h</li> <li>(8)Participation in related seminars: 0h</li> <li>(9)Other activities: 0h</li> <li>(10)Total Work Load: 90h</li> </ol>		

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: <input type="radio"/> (2) An extensive range of expertise related to basic science and applied science: <input checked="" type="radio"/> (3) The ability to explain research results logically, and ethics with regard to academic research: <input type="radio"/>
Relation to SDGs	Select 1 to 3 applicable items and delete the non-applicable items. After selecting, please delete this description. 4 Quality education 9 Industry, innovation and infrastructure