Course	Biological Learning and Control
Course No.	02RB231
Credits	2.0Credits
Grade	1, 2Year
Timetable	FallAB Tue3,4
Instructor	, Masahiko Morita
Course Overview	The brain is a learning machine. We have a brain in order to generate adaptive motor movements to fit a task and an environment. For instance, although a kid initially shows awkwardness in throwing a ball, he/she will acquire a well-coordinated smooth throwing skill immediately after a descent amount of practices. How does the brain achieve these motor learning and what is the computational mechanism behind this process? This course will provide a framework to address these outstanding issues. We first learn a basics in machine learning, a mathematical framework to understand learning and adaptation, with which we will find similarities and differences between the human brain and the machine. The students will learn a basics of machine learning that is practically useful for data analysis and building adaptive robots. The students will also learn properties of motor memories which we need to remember when we design a system that interacts with humans.
Remarks	Those who do not belong to the PhD program in Empowerment Informatics need the permission of the instructor to register.
Course Type	lectures
Course Remarks	A minimum of two students are required. Lecture in English.
Relationship to EMP Educational Objectives	Interdisciplinary ability:Broad specialist knowledge and experience
Course Objectives	
Course Schedule	1)A Introduction to Biological Motor Learning 2)Basics in Machine Learning 3)Biological Learning and Machine Learning 4)Neural Representation of Motor Memory 5)Bayesian Brain 6)Dynamics of Motor Memory 7)Cerebellum as Internal Model of Body 8)Rewards, Reinforcement Learning, and Basal Ganglia 9)Laboratory Works in Motor Adaptation Study
Graduating Methods and Criteria	Homework(60%) Lab work(10%) Final quiz(30%)
Homework	
Textbook	
References	1. The Computational Neurobiology of Reaching and Pointing, Reza Shadmehr and Steven P.Wise (MIT Press) 2. Biological Learning and Control, Reza Shadmehr and Mussa-Ivaldi (MIT Press) 3. , ( )

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Messages for Students	
Teaching Fellow / Teaching Assistant	
Keywords	Linear,algebra,Differential,Equation,Programming(Matlab)