TUAT AIMS Programme 2014/15 Department of Computer and Information Science

Course Name [科目名]	Artificial intelligence
Instructor Name [教員]	Yoshiyuki Kotani
Office Hours and Contact Information [オフィスアワー、連絡先]	N/A
Course Structure [授業形態]	Lecture
Term, Meeting Days, Time and Location [開講時期、時間、場所]	Autumn and Winter Semester, 2014-2015
Course Credits [単位数]	3
Course Overview [概要]	The course has the aim of actually creating artificial intelligence with hands actually. In other words, It will be explained how to express on a computer algorithm and data as the intelligent processing. Can the human intelligence be replicated on computers? This is the challenge of eternity. I want to try to touch clues on this question in the lecture. Is it true that computers cannot have intelligence because they work totally based on human coding? What will happen if you write a program which makes a computer learn by itself?
Course Key Words [キーワード]	
Academic Goal [目標]	To create artificial intelligence
Course Schedule [授業内容]	1. What is "artificial intelligence? ": history of artificial intelligence, Turing test, related fields, whether or not machines can learn. 2. Problem solving: state space, depth-first search, breadth-first search, search algorithm, a recursive algorithm, best-first search 3. Game playing artificial intelligence: classification of games, game tree search , AND / OR game tree 4. Game tree search 1: minmax strategy, αβ pruning strategy, static evaluation function, strong game system 5. Game tree search 2: Monte Carlo search, multi-armed bandit, proof-number search 6. Evolutional computation: from the search to genetic algorithm, hill-climbing method, simulated annealing 7. Knowledge representation 1: semantic network, frame, conceptual hierarchy, inheritance 8. Knowledge representation 2: examples of knowledge representation , the relationship between the natural language processing 9. Natural language understanding: morpheme analysis, syntax analysis , semantic analysis 10. Predicate logic: propositional logic , predicate logic , resolution , unification 11. Growing artificial intelligence: neural network: mechanism of neural network, perceptron, back propagation 12. Growing artificial intelligence: state space learning: Q learning, the time difference learning Artificial Intelligence 3 to 13. Growing artificial intelligence: data mining: information theory, decision tree learning, naive Bayes method 14. Growing artificial intelligence: self- growth , knowledge acquisition , machine creativity 15. Review and test, etc
Textbooks, References, and Supplementary Materials [テキスト、参考書、その他]	
Grading Philosophy (Percentage / Criteria / Methodology) [成績評価の方法]	
Other (i.e. Expectations on Classroom Conduct and Decorum etc.) [その他]	

TUAT AIMS Programme 2014/15 Department of Computer and Information Science

Course Name [科目名]	Signal Analysis and Pattern Recognition
Instructor Name [教員]	Truong Quang Dang, Khoa
Office Hours and Contact Information [オフィスアワー、連絡先]	N/A
Course Structure [授業形態]	Lecture
Term, Meeting Days, Time and Location [開講時期、時間、場所]	Autumn and Winter Semester, 2014-2015
Course Credits [単位数]	3
Course Overview [概要]	This course presents an understandings of digital signals, biomedical signals, and provides techniques of signal processing in time, frequency, and phase-space domain. In addition, this class also covers models of pattern recognition, such as neural networks, support vector machines, and clustering methods.
Course Key Words [キーワード]	
Academic Goal [目標]	An understandings of digital signals, biomedical signals
Course Schedule [授業内容]	1. Overview of signal analysis [1][2] 2. Digital filters [1][2] 3. Fourier Transform [1][2] 4. FFT and EEG signal processing [3] 5. Wavelets [1][2] 6. Fractals [4] 7. Exercise/Student presentation 1 8. Overview of Pattern recognition [6] 9. Neural networks [5] 10. Supervised learning [5] 11. Unsupervised learning [5] 12. Clustering method [6] 13. Support Vector Machine [6] 14. Exercise/Student presentation 2 15. Final Exam
Textbooks, References, and Supplementary Materials [テキスト、参考書、その他]	[1] Eugene N. Bruce, Biomedical Signal Processing and Signal Modeling, Wiley, 2000. [2] John L. Semmlow, Biosignal and Medical Image Processing, CRC press 2008. [3] Saeid Sanei, Jonathon Chambers, EEG signal processing, Wiley 2007 [4] T. Higuchi, Approach to an irregular time series on the basis of the fractal theory, Physica D: Nonlinear Phenomena 1988, 31(2):277-283 [5] Phil Picton, Introduction To Neural Networks, Macmillan, 1994 [6] Duda, Richard O., Peter E. Hart, and David G. Stork. Pattern Classification. New York, NY: John Wiley & Sons, 2000.
Grading Philosophy (Percentage / Criteria / Methodology) [成績評価の方法]	Participation, Exercise, Student presentation, and Final Exam.
Other (i.e. Expectations on Classroom Conduct and Decorum etc.) [その他]	

TUAT AIMS Programme 2014/15 Department of Computer and Information Science

Course Name [科目名]	Logic Design and Computer Architecture
Instructor Name [教員]	Hironori Nakajo
Office Hours and Contact Information [オフィスアワー、連絡先]	N/A
Course Structure [授業形態]	Lecture
Term, Meeting Days, Time and Location [開講時期、時間、場所]	Autumn and Winter Semester, 2014-2015
Course Credits [単位数]	3
Course Overview [概要]	In this lecture, we focus on the basis configuration of a computer which we usually utilize in our daily life. It consists of the computing methodology of a computer, execution of a program in a computer, CPU (Central Processing Unit), memory subsystem, which are key technologies of a computing system. The purpose of the lecture is to understand the inner configuration of a computer as well as the overall configuration of a whole computer system.
Course Key Words [キーワード]	
Academic Goal [目標]	Understanding the inner configuration of a computer as well as the overall configuration of a whole computer system
Course Schedule [授業内容]	1. Achievements: (1) Acquiring knowledge of digital circuits to understand a computer system (2) Explaining performance of a computer system (3) Explaining the behavior of a CPU (4) Explaining memory subsystem in a computer system (5) Explaining technologies to accelerate a computer 2. Contents (1) Basic configuration of a computer: 1 (2) Digital circuits used in a computer system: 3 (3) Arithmetic and logic operation of a computer: 2 (4) Performance of a computer system: 2 (5) Instruction Set Architecture (ISA) of a CPU: 2 (6) Memory subsystem #1 (cache memory): 2 (7) Memory subsystem #2 (virtual memory): 2 (8) Other important technologies: 1
Textbooks, References, and Supplementary Materials [テキスト、参考書、その他]	Essentials of Computer Architecture / Douglas E. Comer
Grading Philosophy (Percentage / Criteria / Methodology) [成績評価の方法]	Intermediate and final exams to check acquisition
Other (i.e. Expectations on Classroom Conduct and Decorum etc.) [その他]	

TUAT AIMS Programme 2014/15 Department of Computer and Information Science

Course Name [科目名]	Research Activity in a Specific Area
Instructor Name [教員]	N/A
Office Hours and Contact Information [オフィスアワー、連絡先]	N/A
Course Structure [授業形態]	Exercise
Term, Meeting Days, Time and Location [開講時期、時間、場所]	Autumn and Winter Semester, 2014-2015
Course Credits [単位数]	3
Course Overview [概要]	This course aims to develop the very basic research skills. Students 1) specify a research topic based on their interests, 2) conduct the state of the art survey on the topic, 3) investigate a solution that performs equivalently or better than existing ones, and 4) evaluate the solution. The results will be presented by oral presentation at the end of the course as well as by a written report. This course will be given by a professor whose expertise matches your interest as personal coaching.
Course Key Words [キーワード]	
Academic Goal [目標]	Developing the very basic research skills
Course Schedule [授業内容]	Lectures in the class are given as follows. 1. Introductions and Orientation 2.-14. Specifying a research topic, Surveying the state of the art, Finding a solution, Implementation, Experiments and Evaluation 15. Final Presentation
Textbooks, References, and Supplementary Materials [テキスト、参考書、その他]	Given by your professor
Grading Philosophy (Percentage / Criteria / Methodology) [成績評価の方法]	Attendance (25%), Participation in Discussions (25%), Report (25%) and Presentation (25%)
Other (i.e. Expectations on Classroom Conduct and Decorum etc.) [その他]	According to the selected theme, it can be compatible to the appropriate course name such as Operating System, Mathematical Optimization, Computer Network, Computer Architecture, Ubiquitous Computing and so on.

TUAT AIMS Programme 2014/15 Department of Computer and Information Science

Course Name [科目名]	Advanced Computer Mathematics
Instructor Name [教員]	Fumihiko Yamaguchi
Office Hours and Contact Information [オフィスアワー、連絡先]	N/A
Course Structure [授業形態]	Lecture
Term, Meeting Days, Time and Location [開講時期、時間、場所]	Autumn and Winter Semester, 2014-2015
Course Credits [単位数]	2
Course Overview [概要]	Computers can perform only discrete and finite computation, theoretically. In contrast with this, mathematics sometimes treats continuity and infinity, especially in differentiation and integration. In this course we focus on computation around differential and integral calculus. And symbolic computation is also overviewed.
Course Key Words [キーワード]	
Academic Goal [目標]	Understanding the mathematical concept of continuity and infinity, and the limitation of computability.
Course Schedule [授業内容]	- Mathematical Concepts: Epsilon-Delta, Limits, Continuity - Mathematical Concepts: Differentiation, Integration - Calculation methods - Numerical Computation: Floating point number - Numerical Error - Symbolic Computation - Predicate Logic and Automated Proving
Textbooks, References, and Supplementary Materials [テキスト、参考書、その他]	None
Grading Philosophy (Percentage / Criteria / Methodology) [成績評価の方法]	Some (4 or 5 times) mini tests are imposed during lecture. 20-25% each.
Other (i.e. Expectations on Classroom Conduct and Decorum etc.) [その他]	

TUAT AIMS Programme 2014/15 Department of Computer and Information Science

Course Name [科目名]	Advanced Information Theory
Instructor Name [教員]	Shinya Sugiura
Office Hours and Contact Information [オフィスアワー、連絡先]	N/A
Course Structure [授業形態]	Lecture
Term, Meeting Days, Time and Location [開講時期、時間、場所]	Autumn and Winter Semester, 2014-2015
Course Credits [単位数]	2
Course Overview [概要]	The purpose of this lecture is to provide advanced understanding of the information and coding theory, which are useful for studying state-of-the-art communication systems.
Course Key Words [キーワード]	Information theory, coding theory, channel coding
Academic Goal [目標]	Understanding the state-of-the-art error-correcting codes
Course Schedule [授業内容]	Several topics are introduced in the lecture. The following subjects and schedule are tentative: 1. Course guidance 2. Error-correcting codes and real channels 3. Hash codes 4. Binary codes 5. Very good linear codes exist 6. Further exercises on information theory 7. Message passing 8. Constrained noiseless channels 9. Exact marginalization 10. Exact marginalization in Trellises 11. Exact marginalization in graphs 12. Low-density parity-check codes 13. Convolutional codes and turbo codes 14. Repeat-accumulate codes 15. digital fountain codes
Textbooks, References, and Supplementary Materials [テキスト、参考書、その他]	David MacKay, Information Theory, Inference, and Learning Algorithms, http://www.inference.phy.cam.ac.uk/itila/
Grading Philosophy (Percentage / Criteria / Methodology) [成績評価の方法]	Attendance (30%), Participation in Discussions (30%) and Presentation (40%)
Other (i.e. Expectations on Classroom Conduct and Decorum etc.) [その他]	