1. Course Code

2287

2. Course Title

G91e: Artificial Intelligence

3. Teacher

KOSHIO, Atsushi

4. Term

Spring 2

5. Course Requirements (Courses / Knowledge for this course) and Important Information

Students should have reached the learning objectives of "Fundamentals of Computer Programming Python".

6. Course Overview and Objectives

Purpose of the course
The purpose of this course is to deepen students' understanding of AI-related technologies, which have a great impact on ICT and software development in recent years, and to think about their social implementation. In this course, students will learn to design AI systems and projects by improving their technical insight and experiencing AI development through hands-on lectures.
Course Outline
The lectures consist of inputs on technological trends and basic principles, hands-on experience in building machine learning systems through practical lectures on AI development, and outputs in the form of AI system/project design. The lecture will start with an explanation of the latest trends and concepts in machine learning, and an introduction to theoretical foundations and papers, followed by a case study of an actual project application. In the practical training, students will implement AI using Google Colaboratry to implement image recognition and natural language processing, and in the AI system project design, students will develop specifications for AI software in their area of interest, create an implementation plan, and study business models.

7. Course Outline

1 Introduction to AI
2 Case studies of Frontier of AI aplication
3 Workshop on Potential Applications of Artificial Intelligence
4 Fundamentals of Data Science
5 Fundamentals of Data Science Practice
6 Fundamentals of Deep Learning
7 Implementation of Image Recognition Using Deep Learning
8 Fundamentals of NLP and LLM
9 Practical usage of LLM
10 AI System Design
11 Designing AI Systems
12 AI project design
13 AI project design Practice
14 Presentation of AI application 1
15 Presentation of AI application 2
16

8. Textbooks (Required Books for this course)

None in particular

9. Reference Books (optional books for further study)

I'll give you instructions during the lecture.

10. Course Goals (Attainment Targets)

(1) Be able to determine the scope of application of AI
(2) Be able to perform basic data science analysis
(3) Understand the fundamentals of deep learning and be able to perform simple implementations
(4) Understand the fundamentals of natural language processing and be able to perform simple implementations
(5) To be able to create specifications for AI systems
(6) To be able to consider business models for AI systems
(7)
(8)

11. Correspondence relationship between Educational goals and Course goals

Educational goals of the school			Course Goals
High level ICT skills	Basic academic skills		(1)(2)
	Specialized knowledge and literacy		(3)(4)
Human skill (Tankyu skill)	Ability to continually improve own strengths		
	Ability to discover and resolve the problem in society	Problem setting	(1)
		Hypothesis planning	(1)
		Hypothesis testing	(2)
		Practice	(5)(6)
	Fundamental Competencies for Working Persons	Ability to step forward	(1)
		Ability to think through	(5)(6)
		Ability to work in a team	
Professional ethics			

12. Evaluation

Goals	Evaluation method & point allocation					
	Examination	Quiz	Reports	Presentation	Deliverables	Other
(1)						○
(2)			○			○
(3)					○	
(4)					○	
(5)				○		
(6)				○		
(7)						
(8)						
Allocation			10	40	40	10

13. Evaluation Criteria

Examination	
Quiz	
Reports	Able to perform basic data science analysis and execute the learned analysis appropriately.
Presentation	Be able to plan AI system specifications, implementation plans, and business model plans based on your own issues.
Deliverables	Be able to appropriately execute the codes learned in the lecture on image recognition and natural language processing.
Other	

14. Active Learning

Hourly percentage of active learning within the whole class time		50%
1	Active learning such as problem solving assignment using the knowledge and skills acquired in class.	All the time
2	Active learning such as group works and discussions.	Sometimes
3	Outcome presentations and feedbacks.	All the time
4	Students actively make decisions on how the class should be conducted.	All the time

15. Notes

16. Course plan

(Notice) This plan is tentative and might be changed at the time of delivery

Lessen 1: Introduction to AI	lecture 60 min. Exercise 30 min.

An overview of the current state of AI, including the scope of AI research, explanations of each area, and the current state of the machine learning field, will be provided, followed by exercises to deepen understanding.

Lessen 2: Case studies of AI state-of-the-art	lecture 60 min. Exercise 30 min.

Case analysis of AI will be conducted while providing cutting-edge examples of AI applications. In the second half, students will understand the scope of AI applications by conducting their own case analysis.

Lessen 3:Workshop on Potential Applications of Artificial Intelligence	Exercise 90 min.

Following the content of one or two lectures, we will conduct an exercise to consider the possibility of using AI. In the first half of the class, we will collaborate in group work. In the second half, students will discuss their own ideas for utilization.

Lessen 4: Intrroduction to Data Science	Lecture 90 min.

Learn key concepts in data science, methods of data processing, multivariate analysis, clustering, neural networks, and other concepts and theories.

| Lessen 5: Introduction to Data Science Practice | Exercise 90 min. |

By actually practicing the content of the fourth session, students will be able to consolidate their knowledge and deepen their practical understanding.

| Lessen 6: Fundamentals of Deep Learning | Lecture 90 min. |

This lecture will introduce examples of deep learning applications, explain the algorithm structure in simple terms, and deepen the technical understanding. The procedures for implementing deep learning will also be explained.

| Lessen 7: Implementation of image analysis using deep learning | Exercise 90 min. |

Using Google Colaboraty, image analysis is actually performed.

| Lessen 8: Fundamentals of NLP and LLM | Lecture 90 min. |

To explain the history of natural language processing and the basics of natural language processing and Large Language Model using deep learning. To explain the basic analysis techniques and terminology of natural language processing, and theories related to LLM.

| Lessen 9: Practical usage of LLM | Exercise 90 min. |

Using actual data and case, we will actually perform Large Language Model for several tasks using Google Colaboraty.

| Lessen 10: Designing AI systems | Lecture 90 min. |

This course explains how to formulate specifications, draw system structure diagrams, and implement the actual system required for designing AI systems.

| Lessen 11: AI system design practice | Exercise 90 min. |

Conceptualize and develop specifications for an AI-based system for your own issues.

Lessen 12: Designing AI Projects   Lecture 90 min.

While explaining the frameworks that are effective for designing AI projects, we will discuss points to consider when implementing them.

Lessen 13: Designing AI project practice   Exercise 90 min.

Create a structure for your own project, using a framework that is effective for designing AI projects.

Lessen 14: Presentation of AI system design 1   Presentation 90 min.

Present and discuss the AI system project outline built through 10-13 lectures and assinment.

Lessen 15: Presentation of AI system design 1   Presentation 90 min.

Present and discuss the AI system project outline built through 10-13 lectures and assinment.