集中講義 面接/Face-to-face 学則第9条の5対象:対象外/Not Applicable Article 9-5 of the Undergraduate Regulations applies 31691081-022 OResearch and Experiments I (E) -22 2単位/Unit 春集中/Spring Intensive 京田辺/Kyotanabe 実験/Experiment Research and Experiments I (E)-22 大崎 美穂

<概要/Course Content Summary >

In our laboratory, we develop technologies for machine learning, knowledge discovery, and multimedia understanding with the aim to improve human collaboration and productivity by supporting intellectual activities. We also apply the findings of the basic research to the fields of medical informatics and education. As a research environment, high performance cloud service platforms such as AWS and calculation servers equipped with many cores and GPUs are available to carry out computational experiments and simulations. Under the supervision of the professor, you will be part of the laboratory group, decide upon a research theme in the following list, and conduct your master's research on your own initiative. The specific steps in the research process are described below.

- [[Research Themes]]
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(1) Development of Machine Learning and Knowledge Discovery Methods

[Themes on Time Series]

(1)-1: Methods to analyze biomedical signals based on signal processing and time series deep learning.

(1)-2: Methods to generate basis functions based on deep unfolding and self-supervised learning.

[Themes on imbalance]

(1)-3: Deep neural networks for imbalanced data classification based on the confusion matrix.

(1)-4: Satellite image recognition using the imbalanced data classifier.

[Themes on dependence and causality]

(1)-5: Methods for nonlinear dependence discovery based on neural networks with the L1 regularization.

(1)-6: Methods for nonlinear causality discovery by the expansion of dependence discovery methods.

(2) Development of Multimedia Understanding Methods

[Themes on Cognitive System Modeling]

(2)-1: Matching of image regions and words/phrases based on attention mechanism.

(2)-2: Modeling of memory mechanism during video viewing.

(2)-3: Data augmentation by modeling human's imagination process.

[Themes on Multimodal Analysis]

(2)-4: Integration, imputation, and correspondence among data of different modalities.

(2)-5: Building a question-answering system based on data from multimodalities.

(2)-6: Intention inference through natural interaction between a user and a system.

(3) Development and Application of Intellectual Activity Support Systems to Medical Informatics and Education

[Themes on Medical and Health Care]

(3)-1: Brain occlusion inference using pulse waves.

(3)-2: Bone quality inference using ultrasonic waves.

(3)-3: Biomedical signal analysis with medical explainability.

[Themes on Education]

(3)-4: Data mining for STEM education.

(3)-5: Verification of knowledge consistency among different information sources.

[[Research Process]]

Step 1-2: Literature Survey and Self-directed Learning

Step 2-1: Conduction of Research (Generate ideas. Develop methods and systems.)

Step 2-2: Conduction of Research (Perform experiments. Analyze and consider the results.)

Step 2-3: Conduction of Research (Report the results so far in seminars. Discuss for improvement.)

Step 2-4: Conduction of Research (Repeat Steps 2-1, 2-2, and 2-3 while improving to achieve the goal.)

Step 3-1: Report of Research Results (Write conference papers. Present the results so far in conferences.)

Step 3-2: Report of Research Results (Write a master's thesis containing all the results.)

Step 3-3: Report of Research Results (Have a presentation for master's thesis defense.)

<到達目標/Goals,Aims >

You are expected to be able to identify and solve real problems by acquiring expertise in information science and technology through your master's research. By experiencing presentations at academic conferences and the master's thesis defense, you will be able to explain your expert knowledge and research findings precisely and clearly. By writing a master's thesis, you will develop skills to write well-organized logical documents on sciences and technologies and will be able to convey the value of your research.

< DO Week 期間の初回動画等の配信/The delivery of the first video, etc. during the "DO Week" >

2 L/Not deliver the video

<授業計画/Schedule >

	授業回/Number of Lesson	授業実施方法/How to Conduct a Lesson	授業実施時間数/Class Hours
実施時期/Wee	k 内容/Contents	•	
	授業計画外の学習/Assignme	nts	
第1週 DOW	eek		0 分/min.
			0分/min.
			0分/min.
			0 分/min.

This course consists of contents that require 90 hours of study as a research activity to write a master's thesis on your research theme.

授業実施方法/How To Conduct a lesson	授業実施時間数/Class Hours
面接/Face-to-face	0 分/min.
オンデマンド(動画視聴)/On-demand(watching video)	0 分/min.
オンデマンド(授業内課題)/On-demand(assignment in class)	0 分/min.
リアルタイム配信/Real-time online	0 分/min.
その他/Others	0 分/min.
総合計/Totlal Amount class hours	0 分/min.

アクティブラーニング/Active Learning

発見学習 / Discovery Learning, 体験学習 / Experiential Learning, 調査学習 / Research Based Learning, 課題解決型学習 / PBL (Project Based Learning), 問題解決型学習 / PBL (Problem Based Learning), 反転授業 / Flipped Classroom, ディスカッション / Discussion, ディベート / Debate, グループワーク / Group Work, プレゼンテーション / Presentation, 実習 / Practical Training, 実験 / Experiment, 実技 / Skill Practice

Step 1-1: Seminars and Workshops

使用システム/System tools

e-class, Teams, Panopto

<成績評価基準/Evaluation Criteria >

Research Activities 50%

Evaluation is done by the supervisor based on your attitude towards and performance in seminars, workshops, literature survey, selfdirected learning, and the conduction of research.

Research Contents and Results 50%

Evaluation is done by the supervisor and examiners based on whether your work presented in the master's thesis and defense is appropriate for a master's degree, regarding research ideas for problem solving, developed methods and systems, and performed experiments and analyses.

<連絡方法/Contact method >

科目担当者への連絡方法/Contact method from student to instructor

Face-to-face, Email, Microsoft Teams, Zoom, Slack etc.

科目担当者からの連絡方法/Contact method from instructor to students

Face-to-face, Email, Microsoft Teams, Zoom, Slack etc.