AY2023 Plans of Creative Factory Seminar
2023年度創造工房セミナーについて

Code	Theme	Instructors (main instructor)
CFS01	Human Activity Analysis and Recognition using Machine Learning Techniques	SHIN, J.
CFS02	Let's launch the environment of Integrated Visualization and Analysis for Lunar and Martian Rovers using JupyterLab, Python ! JupyterLab(Python)で月火星ローバーデータの統合表示・解析環境を作ってみよう！	DEMURA, H., OHTAKE, M., OGAWA, Y., YAMADA, R., HONDA, C.,
CFS03	Multimodality Medical Data Analysis for Predicting Neurological Recovery from Coma After Cardiac Arrest	ZHU, X., PEI, Y. LYU, Guo-Wei
CFS04	Object Recognition with Tactile Data Glove	JING, L. LI, X. SUZUKI, D.
CFS05	Methods, Tools, & Devices to Design and Produce 3D Objects: Haptic Modeling and Rapid Prototyping (“3D Printing”) 立体形状デザインと造形のための手法と技術: 触覚モデリングとラピッドプロトタイピング	COHEN, M., YOSHIOKA, R
CFS06	Performance Improvement of an Application Using an FPGA Board	SAITO, H., KOHIRA, Y., TOMIOKA, Y.
CFS07	Developing Spark-Inmemory Big Data Analytical Framework to Find Spatiotemporal Trends in Japan's Air Pollution Database	RAGE, U. K.

セミナーの成果を発表する「ポスターセッション（9月15日（金）開催予定）」への参加が必須です。

成績はポスターセッション終了後に決定されます（確定は10月）。

Students are required to participate in Poster Session scheduled on September 15 (Fri).

Grades will be determined after the Poster Session in October.

CFS 1	Human Activity Analysis and Recognition using Machine Learning Techniques
Instructors	SHIN, J.
Course Schedule	June 8 – September 15 * Product creation: June 8 – September 15
Abstract	In recent years, human activity analysis and recognition based on video analysis or sensor data analysis has attracted considerable attention in research and industrial community. This course aims the human activity analysis and recognition using machine learning techniques. The applications of human activity analysis and recognition are spreading in various fields, such as detecting suspicious behavior in public areas, healthcare, elderly people monitoring, fitness tracking, working activity monitoring, human computer interaction, intelligent video surveillance, human-robot interaction, human disorder identification and so on. The purpose of this course is to study feature extraction, selection and machine learning algorithms and use those algorithms to develop human activity analysis and recognition system. In the case of applications, we will mainly focus on human neurological disorder identification and gesture recognition. The basic procedure of a system is as following: 1. Human activity data collection (video based or sensor based) 2. Feature extraction and selection 4. Build the classification or matching or clustering or regression model 5. Take the unknown person data 6. Test and evaluate the model Through this course, we can learn the fundamental knowledge of data analysis, pattern matching, and pattern recognition in the area of human activity analysis and recognition.

CFS 2	**Let's launch the environment of Integrated Visualization and Analysis for Lunar and Martian Rovers using JupyterLab, Python ! JupyterLab(Python)で月火星ローバーデータの統合表示・解析環境を作ってみよう！**
Instructors	（Main）DEMURA, H. （Sub）OHTAKE, M., OGAWA, Y., YAMADA, R., HONDA, C.,
Course Schedule	June 9 – July 28 * Product creation： June 9 – September 15
Abstract	Students first learn examples on JupyterLab(Python) for visualization and analysis along the traverses of Moon and Mars rovers (* Stein+ 2023, Zhou+ 2023, etc.). Next, students will interview Japanese rover researchers to define the requirements for Japanese missions and make a prototype of a part of the system. This course collaborates with another PBL by Prof. Ohtake, FY2022-2024 Coordination Funds for Promoting AeroSpace Utilizaiton MEXT. *References Stein+ (2023) 54th Lunar and Planetary Science Conf. 2023 "Updates to the PDS Analyst's Notebook" https://www.hou.usra.edu/meetings/lpsc2023/pdf/2194.pdf Zhou+ (2023) 54th Lunar and Planetary Science Conf. 2023 "The PDS MSL Analyst's Notebook Map Tool" https://www.hou.usra.edu/meetings/lpsc2023/pdf/2166.pdf 本 PBL では、まず月火星ローバーの公開データの経路に沿って可視化・解析する環境を JupyterLab(Python)で実装した例(*Stein+ 2023, Zhou+ 2023 ほか)を学ぶ。次いで、受講生らが日本のローバー研究者にヒアリングしながら日本のミッションにおける要件定義を行い、その一部を試作する。令和4−6年度宇宙航空科学技術推進委託費(5)「AI・デジタル化×宇宙」技術革新人材育成プログラムに採択された、月火星箱庭教育プログラムによる宇宙情報系人材の育成（代表：大竹）と連携して実施する。

CFS 3	Multimodality Medical Data Analysis for Predicting Neurological Recovery from Coma After Cardiac Arrest
Instructors	(Main) ZHU, X. (Sub) PEI, Y., LU, G.
Course Schedule	June 12 – September 15 * Product creation： June 12 – September 13
Abstract	Background More than 6 million cardiac arrests happen every year worldwide, with survival rates ranging from 1% to 10%. Severe brain injury is the most common cause of death for patients surviving initial resuscitation, and most survivors admitted to an intensive care unit (ICU) are comatose. Brain monitoring with electroencephalography aims to remove subjectivity in neurologic prognostication following cardiac arrest. Clinical neurophysiologists have come to recognize numerous patterns of brain activity that help to predict prognosis following cardiac arrest, including the presences of reduced voltage, burst suppression (alternating periods of high and low voltage), seizures, and a variety of seizure-like patterns. Automated analysis of continuous EEG data has the potential to improve prognostic accuracy and to increase access to brain monitoring where experts are not readily available. International Cardiac Arrest REsearch consortium (I-CARE) assembled a large representative set of EEG data and neurologic outcomes from comatose patients who underwent EEG monitoring following cardiac arrest. I-CARE provides a large multicenter international database with more than 1,000 subjects who together underwent over 50,000 hours of EEG monitoring. Goal The goal of this venture factory is to use the data of Physionet 2023 Challenge to use longitudinal EEG recordings for predicting good and poor patient outcomes after cardiac arrest. Data This database consists of data from 1,020 adult patients with out-of-hospital or in-hospital cardiac arrest who had return of heart function (“return of spontaneous circulation”, ROSC) but remained comatose (defined as inability to follow verbal commands). All patients were admitted to an ICU and had their brain activity monitored with 19-channel continuous EEG. Monitoring is typically started within hours of cardiac arrest and continues for several hours to days depending on the patients’ condition, so recording start time and duration varied from patient to patient. The Challenge includes EEG data obtained up to 72 hours from ROSC.

CFS 4	Object Recognition with Tactile Data Glove
Instructors	(Main) JING, L. (Sub) LI, X., SUZUKI, D.
Course Schedule	July 1 – September 15
Abstract	When people grasping an object with hand, they can tell the object with the tactile feedback, even closing their eyes. In this project, we will challenge the possibility to tell the object with a tactile glove. The glove is attached with dozens of pressure sensors, and the students need to train a model, which take the time series pressure data as input, and the object ID as the output. More specifically, we may develop an assemble support system for the LEGO blocks, for which we also need a 3D UI to show the assemble process. In this project, the students can expect to learn the following knowledge and skills: - fundamental working mechanism of the tactile glove - recognition model of the time series data like LSTM or TimesNET - Unity Seminar Schedule: stage 1 (Jul. 1~15) : Project understanding, definition of the system, task assignment, make the development plan. stage 2 (Jul. 16~Aug.31) : system development and evaluation stage 3 (Sep.1~Sep.15) : summary on the project and prepare the pr

CFS 5	**Methods, Tools, & Devices to Design and Produce 3D Objects: Haptic Modeling and Rapid Prototyping (“3D Printing”); 立体形状デザインと造形のための手法と技術: 触覚モデリングとラピッドプロトタイピング**
Instructors	(Main) COHEN, M. (Sub) YOSHIOKA, R.
Course Schedule	August 30 – August 31 * Product creation: September 1 – September 15
Abstract	The lecture will consist of an introductory-level lecture and hands-on exercise on haptic modeling using Geomagic FreeForm software and Phantom Omni haptic device. The students will understand the basic concepts and techniques of haptic modeling necessary for getting started in modeling their own designs. The students will also understand features of modeling that will influence the 3D printing process so that they may effectively model 3D print-ready models. Additional workstations will be provided by Data Design Inc. for the lecture to supplement the two workstations installed at UoA.

CFS 6	Performance Improvement of an Application using an FPGA Board
Instructors	SAITO, H., KOHIRA, Y., TOMIOKA, Y.
Course Schedule	Middle of June to middle of September * Product creation: Middle of June to middle of September
Abstract	Objective: The main objective of this seminar is to accelerate an application using a field programmable gate array (FPGA) board. Through this seminar, students learn circuit design, performance improvement, or power optimization. Moreover, students learn how to use a tool such as Electronic Design Automation (EDA) tool for their development. Through the seminar, students study 1. how to model an application using a language 2. how to use a tool 3. how a synthesized circuit or a program code works on an FPGA board 4. evaluation of the developed circuit or code Method: 1. Selection of an application such as an image processing 2. Modeling of the application using a language 3. Synthesis of an integrated circuit using Intel Quartus Prime or Xilinx Vitis 4. Simulation of the synthesized circuit or the program code using a simulator 5. Execution of the synthesized circuit or the program code

CFS 7	Developing Spark-Inmemory Big Data Analytical Framework to Find Spatiotemporal Trends in Japan's Air Pollution Database
Instructors	RAGE, U. K.
Course Schedule	June 15 – September 15 * Product creation: July 1 – September 15
Abstract	Air pollution is major cause for many cardiorespiratory problems in Japan. Every year at least 60,000 Japanese are dying due to air pollution. To confront this problem, Ministry of Environment, Japan has set up a nation-wide sensor network, called SORAMAME, to record air pollution levels throughout Japan on an hourly basis. The raw data generated by this sensor network naturally exist as Spatiotemporal big data. Useful information that can empower the users (e.g., environmentalists and policy-makers) lies in this big data. The objective of this course is to develop a tool kit that can facilitate the experts to find useful information hidden in the big air pollution data. In this Create Factory Seminar, students will first develop a Big Data Air Pollution Analytical Framework using Hadoop, HBase, and Spark system. Next, students will develop ETL (Extraction, Transformation, and Load) technologies to store the SORAMAME data into the developed big data information. Next, students will develop novel distributed pattern mining algorithms to discover patterns in the big air pollution data. Next, students will evaluate their distributed algorithms against the state-of-the-art sequential/distributed algorithms.