AY2019 Plans of Creative Factory Seminar
2019年度創造工房セミナーについて

Code	Theme	Instructors (main instructor)
CFS01	Performance Improvement of an Application using an FPGA Board	SAITO, H. KOHIRA, Y. TOMIOKA, Y.
CFS02	Deep learning in medical image analysis	ZHU, X. PEI, Y.
CFS03	Hand Motion Capture and Interaction with VR Contents	JING, L.
CFS04	Methods, tools, and devices to design and produce 3D objects 立体形状デザインと造形のための手法と技術	COHEN, M. YOSHIOKA, R.
CFS05	Automatic Detection / Prediction of Human Neurological Disorder based on Handwriting and Hand Gesture Analysis using Machine Learning Techniques	SHIN, J.
CFS06	Development of Autonomous driving Algorithms on Programmable SoC	OKUYAMA, Y. SUZUKI, T. ASAI, N. BEN, A.
CFS07	Tool Development and Data Curation for Small Body Exploration Missions 小天体探査のためのツール開発及びデータキュレーション	HIRATA, N. DEMURA, H. OGAWA, Y. HONDA, C. KITAZATO, K. OKUDAIRA, K. ISHIBASHI, S.

セミナーの成果を発表する「ポスターセッション（9月20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 20 (Fri).

Grades will be determined after the Poster Session in October.

CFS 1	Performance Improvement of an Application using an FPGA Board
Instructors	SAITO, H, KOHIRA, Y., TOMIOKA, Y.
Course Schedule	June 17 – September 20 * Production creation: July 1 – September 13
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 Altera Quartus Prime or Xilinx Vivado 4. Simulation of the synthesized circuit or the program code using a simulator 5. Execution of the synthesized circuit or the program code

CFS 2	Deep learning in medical image analysis
Instructors	ZHU, X, PEI, Y.
Course Schedule	June 1 – September 30 (Details are to be informed by course instructor.)
Abstract	With the development of imaging technology and deep learning, physicians and radiologists have realized the necessary of medical image interpretation using deep learning. Our research team is performing collaboration researches with Fukushima Medical University, Toho University, and Huazhong University of Science and Technology in the automatic interpretation of endoscopy images, CT/MRI images, and ultrasonic images. In order to improve the efficiency of interpreting medical images, we expect to develop a computer-aided diagnosis system based on deep learning. In this creative factory seminar, students will learn how to build a medical image database using open database and clinical database, learn the knowledge of machine learning and deep learning, and implement AI technology to clinical medicine. A seminar will be given by a guest lecturer to introduce the basic knowledge and technology of deep learning. <Schedule> June-July Learn basic knowledge about medical image processing, confirm the type of images for processing and analysis, build the database of medical images, and learn basic knowledge and skills of deep learning July-August Build a computer-aided diagnosis system using deep learning frameworks such as Torch, Tensoflow, and etc. for medical image analysis August-September Evaluate the system, and prepare the poster and document for the final presentation.

CFS 3	Hand Motion Capture and Interaction with VR Contents
Instructors	JING, L.
Course Schedule	August 1 – September 13 *Product Creation Period: September 1 – September 13
Abstract	Virtual Reality is a promising technology to change many field like game, movie, robot control, and so on. But currently, the interaction method is limited to traditional controller, which is not intuitive to operate the virtual objects. Therefore, in this CFS, we kick start a brand-new project to provide a natural interaction method with the virtual objects. We will make use the wearable motion capture method to detect the natural hand motion with a digital glove, so that people can operate the virtual objects in the same way as they operate the real objects. The course will take 5 days in the end of August. Through the course, we can learn the fundamental knowledge on the data processing, space motion tracking, and 3D representation. Most important, we can experience how to make use of the learned knowledge and skills to solve the practical problems and how to build a end-to-end system from the sketch. It is more like a hackathon, and we hope any students with strong motivation to join and enjoin. Students will be divided into VR and Glove two groups and the course formed with three stages Seminar Schedule: stage 1 (Aug. 1~9): Project understanding, definition of the minimal system, task assignment, make the development plan. stage 2 (Aug. 12~Aug.31): minimal system development stage 3 (Sep.1~Sep.13): development and presentation

CFS 4	Methods, tools, and devices to design and produce 3D objects; 立体形状デザインと造形のための手法と技術
Instructors	COHEN, M., YOSHIOKA, R.
Course Schedule	formal lectures: 2 days during Sept. 3-6 studio time (flexible workshop hours): Sept. 9-13 model printing (attendance not required): Sept. 17-20 poster presentation: Friday, Sept. 20
Abstract	この講義ではハプティックモデリングについて学ぶとともに、Geomagic 製 Phantom Omni 触覚デバイスとモデリングソフト Freeform / Claytools による 3 次元触覚モデリング、constructive solid geometry などについて学びます。大部分をしめる演習では受講者が実際に上記ツールでモデリングを行い、技術への理解を深めると共にこれら技術の特徴を生かした造形物の創造プロセスを体験します。 この技術で作成される造形物には多様な用途があり、印鑑、フォント、彫刻、様々な装飾や土産物などへの応用がこれまでに試みられています。また、モデリングソフトで作成したモデルは、ラピッドプロトタイピング用3D プリンター（Ultimaker2+またはUltimaker3）を利用して造形を行います。 The lectures will include a review of haptic modeling, including CAD authoring tool "Freeform / Claytools" for Geomagic Phantom Omni force-display interface, and suggestions for advanced techniques, including constructive solid geometry (CSG). There will also be "hands-on" sessions, in which each participant uses the described software to make their own creation. These objects can be applicable in many applications as new hankos, fonts, sculptures, decorations, and souvenirs. Models created by the participants will be printed using a 3D printer (Ultimaker2+ or Ultimaker3) for rapid prototyping. Relevant links: Administration: http://www.u-aizu.ac.jp/en/graduate/curriculum/guide/seminar-cis.html#CFS http://www.u-aizu.ac.jp/graduate/curriculum/guide/seminar-cis.html#CFS Rapid prototyping: http://en.wikipedia.org/wiki/Rapid_prototyping http://ja.wikipedia.org/wiki/ラピッドプロトタイピング Home page of publisher of main CAD software: https://www.3dsystems.com/software/geomagic-freeform https://ja.3dsystems.com/software/geomagic-freeform https://ja.3dsystems.com/press-releases/geomagic/releases-new-freeform-and-claytools-3d-modeling-softwar http://support1.geomagic.com/Support/5605/5668/en-US/Article/Folder/346/Geomagic-Claytools

CFS 5	**Automatic Detection / Prediction of Human Neurological Disorder based on Handwriting and Hand Gesture Analysis using Machine Learning Techniques**
Instructors	SHIN, J.
Course Schedule	June 11 – September 20 (Details are to be informed by the course instructor.)
Abstract	This course aims the automatic prediction and detection of human neurological disorder based on handwriting and hand gesture analysis using machine learning. We perform the quantities and reliable kinematic feature extraction for human disorder using handwriting and hand gesture. The purpose of this study is to establish a technological infrastructure with feature extraction and identification algorithm development to generate quantitative, reliable and reasonable evaluation index by utilizing sensor technology, data science and machine learning technology to evaluate cognitive and motor symptoms of human disorder. The basic procedure of system is as following; 1. Handwriting and hand gesture data collection of disorder & normal subject 2. Kinematic parameter extraction 3. Feature extraction 4. Train the classification model 5. Unknown person data using pen tablet 6. Testing/classification 7. Identify the disorder Through this course, we can learn the fundamental knowledge of data analysis, pattern matching, and pattern recognition using handwriting and hand gesture.

CFS 6	Development of Autonomous driving Algorithms on Programmable SoC
Instructors	OKUYAMA, Y., SUZUKI, T. ASAI, N. BEN, A.
Course Schedule	June 13- July 11 * Production creation: July 12 – September 18
Abstract	Multiple companies develop vehicles capable of autonomous driving. These vehicles can run autonomously without any drivers. Currently, self-driving technologies employ some specialized devices such as GPS, maps, LiDARs, and other sensors. The fully automated driving/piloting vehicles must have a responsibility of protecting humans with a general monocular camera and image recognition for multiple tolerance. However, existing embedded processor systems have a difficulty of real-time image recognition due to the calculation complexity of algorithms. Technological innovation by FPGA and programmable SoC is indispensable for this realization. In this class, we aim to develop an implementation of vision based algorithms on embedded programmable device required for safety autonomous driving/piloting. Participants who join in this class must have following previous knowledge about Python, C language, and FPGA development. Participants will learn about data recording/playing, camera calibration, and path following and vehicle control. After that, participants will solve project-based assignment selected by following topics. 1. Map generation and localization 2. Object detection and traffic light detection 3. Path generation and path planning 4. Neural network algorithms related with self-driving Participants must implement a circuit of a part of these algorithms on programmable SoC board. Schedule June: (a) Understanding about data recording/playing, camera calibration (b) Path following and vehicle control. July: (a) Practical exercise using Self-driving AI car(b) Project selection and Implementation (two times project meetings per week) e

CFS 7	Tool Development and Data Curation for Small Body Exploration Missions 小天体探査のためのツール開発及びデータキュレーション
Instructors	HIRATA, N., DEMURA, H, OGAWA, Y., HONDA, C., KITAZATO, K., OKUDAIRA, K., ISHIBASHI, S.
Course Schedule	Meekly or biweekly meeting will be held during the 2nd quarter (including August and September). We will ask students' preference to decide detailed schedule of the course. 学期中（8 月・9 月を含む）毎週または隔週程度の頻度でミーティングを実施する。 詳細スケジュールは受講生の都合を配慮して決定する。
Abstract	In this course, students will develop tools or utilities to analyze and visualize data obtained by small body exploration missions. Data curation (selection, collection, and conversion of data) for those tools is also the scope of the course. AiGIS by ARC-Space/the University of Aizu (https://arcspace.jp/) and Small Body Mapping Tool by JHU/APL (SBMT, http://sbmt.jhuapl.edu) are examples of existing tools. This course is supported by FY2017-19 Coordination Funds for Promoting AeroSpace Utilization MEXT, Japan. 本コースでは、小天体探査データの解析・可視化を行うためのツール・ユーティリティの開発、既存のツールの改良や、ツールで利用するのに適したデータの選定・収集・調整を行う。既存のツールとしては会津大学で開発・公開している AiGIS (https://arcspace.jp/) や APL/JHU で開発・公開している Small Body Mapping Tool (SBMT, http://sbmt.jhuapl.edu) などがある。 本コースは文科省宇宙航空科学技術推進委託費に基づいて行われる。