AY2020 Plans of Creative Factory Seminar
2020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	Tracking with Wearable Sensing Technology	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	Development of Autonomous driving Algorithms on Embedded Systems	OKUYAMA, Y. SUZUKI, T. ASAI, N. BEN, A.
CFS06	Data curation and Tool development in Space projects; Machine Learning for TANPOPO1/2 on Intl. Space Station and CG expressions in AiGIS for data analysis of small body explorations 宇宙プロジェクトにおけるデータキュレーションとツール開発； 国際宇宙ステーションたんぽぽ1/2のための機械学習と小天体データ解析のための地理情報システムAiGISによるCG表現	DEMURA, H. HIRATA, N. 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25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 25 (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 15 – September 18 * Production creation: July 1 – September 14
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 * Production creation: June 1 – September 30
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	Tracking with Wearable Sensing Technology
Instructors	JING, L.
Course Schedule	Seminar Schedule: stage 1 (Jul. 1~15) : Project understanding, definition of the minimal system, task assignement, make the development plan. stage 2 (Jul. 16~Aug.31) : minial system development stage 3 (Sep.1~Sep.13) : development and presentation
Abstract	Tracking the position and activities are the key issue for the active services in the fields like human computer/robot interaction, healthcare, safety and secuity, and so on. Wearable sensing technology provides a low cost, mobile, and scalable solution for the tracking applications. In this course, students will develop some tracking application with Wonder Sense which is developed by our lab. For example, the sensor can be fixed on the shoes and detect the indoor postion, or put the sensor on the wrist or arm to detect the daily behavior like walking, running, sleeping. Through the project, students are expected to learn the following knowledge and skills: - processing of time-series data - fundamental machine learning method - basic python programming - public python modules for data analysis

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	September 2 – September 4 * Production creation:　September 7 – September 16
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

CFS 5	Development of Autonomous driving Algorithms on Embedded Systems
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 FPGAs and GPGPUs are indispensable for this realization. In this class, we aim to develop an implementation of vision based algorithms on embedded devices 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 part of these algorithms on programmable SoC or embedded GPGPU 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) August: Self working September 6th: Deadline of the project assignment. September 18th: Deadline of project poster and reports.

CFS 6	**Data curation and Tool development in Space projects; Machine Learning for TANPOPO1/2 on Intl. Space Station and CG expressions in AiGIS for data analysis of small body explorations** **宇宙プロジェクトにおけるデータキュレーションとツール開発；国際宇宙ステーションたんぽぽ 1/2 のための機械学習と小天体データ解析のための地理情報システム AiGIS による CG 表現**
Instructors	DEMURA, H., HIRATA, N., 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	This course sets two themes; Data curation and Tool development. Both sides change opinions and research and develop own topics. This course divides into groups according to students' requests. A group of TANPOPO1/2 on Intl. Space Station is mainly defined as data curation, which is machine learning for identification/classification of microscopic images. If you'd like to develop TANPOPO-DB with visualization of data, we would set a team.Another group of AiGIS (3D-GIS for small bodies) is categorized into two; Data preparation and Tool development with visualizations. 本コースは、データキュレーションとソフトウエア開発の2テーマを用意し、双方でやり取りしながら研究開発を進める。受講生の希望に沿って班分けを行う。 国際宇宙ステーションたんぽぽ1／2は主にデータキュレーションとし、取得した顕微鏡画像データの分類識別を目的とした機械学習を行う。 データを可視化しつつ検索できる DB ツール開発を希望する学生がいれば追加する。小天体用地理情報システム AiGIS については、表示するデータセットの整備と、ツール新機能追加。