[Title]		[Instructor]				
	Large-s	scale Discrete Structure Processing	Koji Iwanum	na / Hidetom	o Nabeshima	
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]	
GTK501	2	Computer Science and Engineering	2nd Semester	Fri./I	Japanese	
[Outline and purpose] As the Internet explosively has spread, we have experienced a flood of information. Consequently, there is a growing demand for advanced computing techniques which effectively handle large-scale data as much as possible. The purpose of this course is to give students an understanding of large-scale discrete data structures and some core algorithms for efficiently compute them. The first half of this course introduces the basics of transaction data mining and some advanced topics for online approximation mining algorithms for data streams. In the second half of the course, modern algorithms on propositional logic which handle large-scale discrete data and their applications are introduced.						
 To under To learn To learn 	 [Objectives] To understand basic natures of huge transactional data and fundamental mining computation principles. To learn some state of the art technologies for online approximation computation of huge date stream mining. To learn modern algorithms on propositional logic for discrete data and their applications. 					
[Requireme	ents]					
A groundin information	g of linear a n theory, an	algebra, analytics, discrete mathematics, Boolean a d database	lgebra, algori	thms and da	ta structure,	
[Evaluation	1]					
Student	ts are evalu	ated primarily based on homework.				
[Textbooks]						
None						
[References	5]					
• J. Han a Pub.(ISB	and M. Ka N:1558609	mber, Data Mining – Concepts and Technique - 016)	– Second Edi	tion, Morga	n Kaufmann	
P. Tan, MArmin Bi	l. Steinbach ere et.al., I	n and V. Kumar, Introduction to Data Mining, Adisc Handbook of Satisfiability, IOS-Press (ISBN:158603	on-Wesley (ISI 9296)	BN:03214644	194)	
[Schedule]						
 Data n Discretion Discretion Discretion Discretion Discretion 	 Data mining: basic natures of huge transactional data, mining frameworks and principles (1). Data mining: basic natures of huge transactional data, mining frameworks and principles (2). Data mining: fundamental association rule mining. Data mining: advanced association rule mining. Data mining: measures for evaluating the interestingness of association rules Data mining: basic algorithms for mining a single data stream. Data mining: advanced online approximation algorithms for mining multi-dimensional data streams. Discrete algorithms: introduction of modern algorithms for discrete data. Discrete algorithms: fundamental of Boolean propositional satisfiability. Discrete algorithms: principles of modern SAT solvers. 					
12. Discret13. Discret14. Discret	te algorithr te algorithr te algorithr	ns: SAT encoding and SAT based constraint satisfac ns: introduction of BDD/ZDD. ns: applications of BDD/ZDD.	ction solvers.			

15. Summary.

[Title]			[Instructor]			
	Ad	vanced Software Engineering	Masa Yosh	akazu Takah nimichi Wata	ashi / inabe	
[Code]	[Credits]	[Program]	[Semester]	[Language of instruction]		
GTK502	2	Computer Science and Engineering	1st Semester	Mon. / II	Japanese	
[Outline and purpose] We aim to learn methods that are applied to develop software with high quality and functionality. Students will be able to acquire advanced requirements analysis and software design methods (structured method and object oriented method for real-time system) that are required to develop through lectures and exercises. Furthermore, we will discuss development planning, verification planning and quality management related to the development of such software. [Objectives] • To be able to create development and verification plans for real-time software. • To be able to analyze and design for real-time software. • To be able to manage quality and safety for real-time software. • To be able to manage quality and safety for real-time software. • To be able to manage quality and safety for real-time software. • IRequirements] Students are required to have knowledge of software engineering and programming. [Evaluation] • Homework 80% • Exercise 20%						
[Textbooks] Handouts a	nd related	research paper will be distributed.				
[References] • Derek Publish • Bruce Wesley	 [References] Derek J. Hatley and Imtiaz A. Pirbhai, Strategies for real-time system specification, Dorset House Publishing, 1988. Bruce Douglass, Real-time UML, 2nd edition, developing efficient objects for embedded systems, Addison Wesley Longman Inc., 2001. 					
(01) Planni (02) Structu (03) Structu (04) Structu (05) Structu (06) Exercis (07) Exercis (08) Exercis (09) Object (10) Object (11) Object (12) Object (13) Object (14) Lecturu (15) Lecturu	ng for softw ured Analys ured Analys ured Analys ured Analys se 1 (planni se 2 (analyz se 3 (design oriented de oriented de oriented de oriented de oriented de e by an exte	vare development and verification sis for real time systems 1 (sequential systems and sis for real time systems 2 (control flow diagrams) sis for real time systems 3 (activation tables and de sis for real time systems 4 (case studies) ng) ting requirements) sing architectures) evelopment for real time systems 1 (requirements n evelopment for real time systems 2 (analysis modeline evelopment for real time systems 3 (static analysis) evelopment for real time systems 4 (dynamic analysis) evelopment for real time systems 5 (class specification ernal lecturer (project management) ernal lecturer (tools for project management)	combination s cision tables) nodeling) ing) sis) ion design and	systems) I design qual	lity)	

[Title]			[Instructor]			
		Parallel Computing	Hidetoshi	Ando/ Tomo	hiro Suzuki	
[Code]	[Credits]	[Program]	[Semester] [Hours] [Languag			
GTK503	2	Computer Science and Engineering	2nd Semester	Tue.∕I	Japanese	
[Outline an	d purpose]					
Parallel cor GPUs. Th the large-so and knowle	nputing teo e practical cale scienti edge.	chnologies bring out high performance computation knowledge of parallel computing using such device fic computing, big data analysis and machine lear	power of mod es and its clus ning. This co	lern multi-co ster system o ourse provid	ore CPUs and contributes to es such skills	
[Objectives]]					
At the end optimizatio and unders	d of this c ns for rece tand the ty	course, the students should be able to: understant CPUs, understand the characteristic problems of pical pattern of parallel computing and its efficient	and the basic of parallel con ; implementat	c knowledge nputing and ions on the (e of program its solutions, GPU.	
Programmi	ng skill (C	or C++)				
[Evaluation	n]					
Homework	(Parallel C	omputing: 50%, GPU Computing: 50%)				
[Textbooks]						
[References	5]					
1. 片桐孝洋	,スパコン	プログラミング入門,東京大学出版会,ISBN:978-4- ⁻	13-062453-4			
2. 寒川光ほ	か,HPC ブ	ログラミング,オーム社, ISBN:978-4-274-20746-4				
[Schedule]						
 Introdu Fundar Paralle Paralle 	action to pa nentals of h l programin l programin	rallel and high-performance computing (Suzuki) high-performance computing (Suzuki) hg with OpenMP (Data parallel) (Suzuki) hg with OpenMP (Task parallel) (Suzuki)	A.			
 Paralle Paralle Paralle Paralle Paralle 	l programii l programii l matrix-ve l matrix-m	ng with MPI (Interprocess communication) (Suzuki ng with MPI (Asynchronous communication) (Suzuki ctor multiplication (Suzuki) atrix multiplication (Suzuki)) ki)			
9. Introdu 10. Fundar 11. Basic p	 Fundamentals of GPU programming (Ando) Fundamentals of GPU programming (Ando) Basic parallel patterns (Map. Stongil) (Ando) 					
12. Basic p 13. Advanc	 Basic parallel patterns (Reduction, Recurrence) (Ando) Advanced parallel patterns (SCAN) (Ando) Advanced parallel patterns (SCAN) (Ando) 					
14. Advanc 15. Advanc	 Advanced parallel patterns (Ballot) (Ando) Advanced topics on GPU computing (Ando) 					

[Title]		[Instructor]			
		Machine Learning	Mo	otonobu Hati	cori
[Code]	[Credits]	[Program]	[Semester] [Hours] [Languag instruction		
GTK505	2	Computer Science and Engineering	1st Semester	Tue./II	Japanese
[Outline an	d purpose]				
Based on various information obtained from the outside world, we humans classify a target and find the regularity behind the event. Machine learning is a technology that aims to give these capabilities to a computer, and it is applied in a wide range of fields such as pattern recognition, information retrieval, medical diagnosis, data mining, and so on. This course aims at understanding a fundamental theory and technique of machine learning and being able to apply the technique of machine learning to specific problems. [Objectives] 1. To be able to explain the classification, the basic procedure, and notes of machine learning methods					
3. To be at	ole to apply	an appropriate machine learning method to a spec	ific problem	ing methods	
[Requireme	ents]				
A grounding	g of linear a	algebra, calculus, discrete mathematics, probability	and statistics	s, and progra	amming
[Evaluation	n]				
Exams: 80%	6				
Small tests	: 20%				
[Textbooks]					
References					
Trevor Has	tie et. al.	The Elements of Statistical Learning, Data Mini	ng. Inference	. and Predic	ction. Second
Edition, Sp	ringer New	v York, 2009.		,	,
Christopher	r M. Bishop	o, Pattern Recognition and Machine Learning, Sprin	nger New Yorl	x, 2006.	
[Schedule]					
The class On-demand 1. Introdu 2. Linear	will be gi l lecture vio ction Regression	ven in Japanese, but the materials and examinates will be provided in English.	nation questi	ons will be	in English.
3. Linear	Discrimina	nt Function			
4. Linear	Discrimina	nt Analysis			
6 Naïve F	li irees Saves				
7. Multila	ver Neural	Networks			
8. Midterr	n Review a	nd Exam			
9. Support	t Vector Ma	achine			
10. Ensemb	ole Learnin	g			
11. Deep Le	earning1: I	oss functions, learning methods and their improven	ment		
12. Deep Le	earning2: E	Examples of deep neural networks and techniques for	or improving a	accuracy	
10. Uluster	iiig Ien-Loève F	Avnansion			
15. Course	Review and	d Final Exam			

15. Course Review and Final Exam

		[Title]		[Instructor]		
	Use	r-Centered Design Methodology	Kentaro Yu	Go / Masak ichiro Kinos	i Omata / hita	
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]	
GTK508	2	Computer Science and Engineering	1st Semester	Thu.∕I	Japanese	
[Outline an	d purpose]					
This graduate course is an introduction to User-Centered Design (UCD) methodology, a discipline concerned with the research, design, implementation, and evaluation of interactive products, systems, and services for human use based on users' requirements and context of use. The first part surveys the history of UCD and provides the overview of the discipline focusing on the viewpoint of design process and product. It specifically considers service concepts in HCD. The second part introduces Kansei engineering, a set of methodologies that translate users' impression or feelings into concrete product parameters and support future product design. The third part of the course focuses on user interface design based on the physiological properties of human senses.						
[Objectives]						
Upon comp. 1. Explain 2. Explain product 3. Describ on the b	 Upon completion of this course, the students are expected to be able to: 1. Explain the history and overview of UCD, specifically from the viewpoint of process, product, and services. 2. Explain the design procedure in Kansei engineering and utilise subjective evaluation data to design products and services. 3. Describe the physiological properties of human senses and explain the importance of user interface design on the basis of the properties. 					
[Requireme	ents]					
Undergradu	uate-level H	ICI and/or User interface design course(s)				
Basic statis	tics and lin	near algebra				
The followin First pa Second Third p	ng is the gr urt assignm part assign art assignn	rading scheme. The assignments include short repo ent(s): 35% ament(s): 35% nent(s): 30%	ts and/or quiz	zes.		
[Textbooks]						
N/A						
[References	5]					
 Yvonne Rogers, Helen Sharp, and Jenny Preece, Interaction Design: Beyond Human-Computer Interaction (3rd Edition), Wiley, 2011, ISBN-10: 0470665769. 長沢 伸也,神田 太樹(編),数理的感性工学の基礎—感性商品開発へのアプローチ,海文堂出版, 2010, ISBN-10: 4303723940. 舘 暲, 佐藤 誠,廣瀬 通孝 (監修),日本バーチャルリアリティ学会 (編集),バーチャルリアリティ学,コロナ社, 2010, ISBN-10: 4904490053. William Albert, Thomas Tullis, Measuring the User Experience, Second Edition, Morgan Kaufmann, 2013 ISBN-10: 0124157815. 						
[Schedule]						

First part

- 1. Overview of User-Centered Design (UCD) methodology (Kentaro Go)
- 2. UCD process (Kentaro Go)
- 3. Understanding and specifying the context of use and requirements (Kentaro Go)
- 4. Producing and evaluating design solutions (Kentaro Go)
- 5. Service design (Kentaro Go)

Second part:

- 6. Kansei engineering / subjective evaluation methods (Yuichiro Kinoshita)
- 7. Analysis of subjective evaluation data I (factor analysis) (Yuichiro Kinoshita)
- 8. Analysis of subjective evaluation data II (visualisation of subjective evaluation data) (Yuichiro Kinoshita)
- 9. Analysis of subjective evaluation data III (quantification theory) (Yuichiro Kinoshita)
- 10. Product design based on subjective evaluation data (Yuichiro Kinoshita)

Third part

- 11. Human senses and user interfaces I (physiological properties of human senses) (Masaki Omata)
- 12. Human senses and user interfaces II (input and output interfaces) (Masaki Omata)
- 13. Virtual reality and mixed reality (Masaki Omata)
- 14. User interface for smartphones (Masaki Omata)
- 15. Usability testing (Masaki Omata)

		[Title]		[Instructor]		
		Computer Vision	Xiaoyang I	Mao / Masah	iro Toyoura	
[Code]	[Credits]	[Program]	[Semester] [Hours] [Langua instruct			
GTK509	2	Computer Science and Engineering	2nd Semester	Thu.∕III	Japanese	
[Outline an	d purpose]					
[Outline and purpose] This course offers opportunity to learn both analysis and synthesis of visual information, namely, computer vision and 2D/3D computer graphics. (First half: Masahiro Toyoura) In the first half, the fundamental theories on computer vision, especially on 3D shape reconstruction, will be discussed. The latest topics of computer vision will be introduced, and unsolved problems will be overviewed. After learning about camera calibration, depth estimation by multiple cameras will be practically implemented. Human-centered image processing will be discussed through the topics on eye tracking, human vision, immersive video representation, and others. (Latter half: Xiaoyang Mao) The second half deals with visual information synthesis. Advanced filtering techniques for 2D images, image segmentation, stitching, texture analysis and transfer, and others will be discussed. [Objectives] 1. The student understands fundamental algorithms, and implements depth image reconstruction from video captured by multiple cameras. 2. The student understands human vision, and implements eye tracking by eye captured video and synthesizes/presents attractive video considering human vision. 3. The student is able to acquire newly available image analysis and synthesis methods on his/her own, benefit from and implement the methods.						
[Requireme	ents]	monifolder of linear algebra and calculus shills	in programm	ing (og h	uning C++	
MATLAB a know basics	nd python) s of image 1	as well as understanding of important algorithm processing techniques (e.g., image filtering) and con	s and data str nputer graphi	ructures. On cs.	e should also	
Students a	re evaluate	d by quizzes and reports that involves programmin	g.			
[Textbooks]		J J	8.			
None.						
[References	5]					
To be annou	unced.					
 Introduction on computer vision, guidance of the course Internal camera calibration External camera calibration Depth estimation with stereo vision (1) – rectification and feature point matching Depth estimation with stereo vision (2) – global optimization Eye tracking Human vision Camera models and immersive video presentation Fractals and natural images Texture synthesis Texture and image editing, advanced image filtering Gradient-domain image filtering Poisson editing and its applications Paper survey presentation (2) 						

[Title]			[Instructor]		
		Digital Speech Processing		Kenji Ozawa	a
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
GTK510	2	Computer Science and Engineering	2nd Semester	Thu.∕IV	Japanese
[Outline and purpose] Speech plays an important role in human communication and human-machine interface. Since audio signals including music and environmental sound are called speech signals in the media such as televisions, digital speech processing means acoustic signal processing in general. This course addresses the technology to perform the speech signal processing through programming exercises using Python language. [Objectives] 1. To understand the spectral analysis technology of sound by discrete Fourier transform. 2. To understand the function of digital filters and acquire techniques from filter design to execution. 3. To understand the basics of speech signals and acquire the technology to perform automatic recognition and synthesis. [Requirements] Integral and differential calculus, Introductory statistics, Introductory digital signal processing [Evaluation] Test: 40% Report: 30%					
[Textbooks Kenji Oza (2022).	wa, Introdu	ction to digital acoustical signal processing — Exe	ercise with Py	thon, Corona	a Pub., Tokyo
[Reference	s				
[Schedule]					
 Overvie Analog Fourier Fourier Complei Fourier Discrete Window Impulse Interim Digital Variou Speech Inversi Sound 	w of speech to digital con- series and s response and Fourie transform Fourie transform response and Evaluation filter (FIR s acoustical hone-array Recognition filtering Source Sepa	and acoustical information technology nversion pectrum ries and complex spectrum hsform nd convolution Summary filter, IIR filter) signal processing signal processing n and Synthesis			

		[Title]	[Instructor]					
Ν	atural Lar	guage and Image Media Processing	Ryutarou	Ohbuchi / F	umiyo Fukumoto			
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]			
GTK511	2	Computer Science and Engineering	1st Semester	Wed./ III	Japanese/English			
[Outline an	d purpose]							
This course This course	This course covers fundamental topics in Natural Language Processing (NLP) and Image media processing. This course is split into the first and the second half, and taught by two instructors.							
The first ha what is NL introduces	alf of the co P and intr recent trer	ourse addresses the issue of NL analysis and it roduce some computational models for langua nd on NLP, i.e., solutions on several NLP tasks	s applications ge analysis. 7 based on deep	. We begin v The latter ha p learning to	vith a discussion of alf of the first part echniques.			
The second 2D image, 3 by tradition then discu recognition	The second part of this source focuses on analysis and processing, namely, recognition, of scenes and objects in 2D image, 3D shape model, and other visual media. We first review basic concepts of image processing, followed by traditional approaches to image recognition by using interest points and local image feature aggregation. We then discuss approaches using deep learning, especially convolutional neural network (CNN), for scene recognition, object recognition and object detection.							
[Objectives]							
 To under To under To under To be abl and (2) or 	stand the stand som stand basi le to imple convolution	basics of NL analysis e deep learning techniques for NLP c techniques for image analysis and object reco ment basic object recognition algorithms that nal neural network.	ognition. employs (1) lo	ocal image f	eature aggregation			
[Requireme	ents]							
Integral an as clusterin It is highly Programing TensorFlow PyTorch, w	d different ng, support recommen g skills in 7 and Ker ould also h	tial calculus, Introductory statistics, Linear alg vector machine, and neural network will be he ded to take GTK505 "Machine Learning" class Python will be required for some assignment as deep learning frameworks. Familiarity we help.	gebra. Knowle elpful. a at the same t ts. It is bene vith other de	edge on mach time. ficial if you ep learning	nine learning, such are familiar with frameworks, e.g.,			
[Evaluation	1]	•						
* First Halt	f:							
Report 50% * Second H	5, Mini-exa alf:	mination (quiz) 50%	om 500/					
Toythooks		g programming in 1 ython, iteras, and rensorm	.0w 3070.					
* First half	•							
None, but t	he referen	ce 3 below is highly recommended.						
* Second half-								
None, but t	he referen	ce 3 below is highly recommended.						
References	5]							
 S. Naga Y. Saito Aurélie ISBN:9 Jan Eri 	ao, "Natura ph, "Deep I n Géron, 78-1-492-0 ik Solem, "	al Language Processing", Iwanami, ISBN:9784 Learning from Scratch", O'REILLY, ISBN-9784 "Hands-on machine-learning with Scikit-L 93264-9 'Programming Computer Vision with Python:	000103558 873117584 earn, Keras Tools and alg	& Tensorfl orithms for	ow", 2nd Edition, analyzing images",			
O'Reilly	y, ISBN:97	8-1449316549						

[Schedule]

Lectures 1 to 7: taught by Fumiyo Fukumoto Lectures 8 to 15: taught by Ryutarou Ohbuchi.

- 1. Introduction to Deep Learning and Natural Language Processing
- 2. Introduction to Colab and Python (Exercise)
- 3. Classification with Neural Network (Exercise)
- 4. Representation Learning of Words
- 5. Representation Learning of Words (Exercise)
- 6. (Deep Learning for NLP) RNN, CNN
- 7. (Deep Learning for NLP) RNN, CNN (Exercise)
- 8. Introduction to image recognition
- 9. Local features, interest point detectors
- 10. Local feature descriptor, coding and pooling,
- 11. Geometric verification, machine learning,
- 12. Classifiers, gradient descent method
- 13. Deep neural network, image recognition using CNN
- 14. Regularization, loss landscape, various CNN architectures
- 15. Unsupervised representation learning, practical aspects of CNN training

[Title]			[Instructor]				
	Glob	al Communication for Engineers	Keiko Okumura				
[Code]	[Credits]	[Program]	[Semester] [Hours] [Languag instruction				
GTK513	2	Computer Science and Engineering	Intensive	/	/		
[Outline an	d purpose]						
In a world of globalization and multiculturalism, communication becomes the vehicle that truly brings people together. This course will provide students with an understanding of international and intercultural communications to engage better with their global engineering colleagues. This course will be delivered online by means of interactive lectures with student presentations and student-led discussions in English. The weekly interactive lectures will introduce the key topics for discussion and provide the context for theoretical models and key terms of study.							
[Objectives]							
Upon comp 1. Identify (2. Identify (3. Develop (4. Consider [Requireme 1. We are nationality, 2. We shoul formulate a learning en [Evaluation Reflection I Active Class Group Pres 40% [Textbooks] Materials v	Intervention of the intervention models and not control of steady. [Objectives] Upon completion of this course students should be able to: 1. Identify elements of culture that impact interpersonal communication 2. Identify the challenges of being a competent communicator in intercultural settings 3. Develop and use the appropriate communication skills in intercultural settings 4. Consider various types of corporate culture and intercultural conflicts in the engineering workplacec [Requirements] 1. We are expected to show respect for each other irrespective of language ability, cultural beliefs, age, nationality, sexual orientation, etc. 2. We should be ready to give others equal opportunity to formulate and express opinions, experiences, and ideas. All students should be supportive of a cooperative learning environment [Evaluation] Reflection Papers and Reports (self-reflection, basic knowledge and understanding): 20% Active Class Participation: 40% Group Presentations (team work, analytical and problem solving skills, communication/presentation skills): 40% [Textbooks] Materials will be provided on Moodle or in the class.						
[Pofewanaaa]							
Gert Jan I cultures, In Helen Sper Cambridge Shaules, JJ 978-452317 [compiled b 9781285077	Hofstede, H tercultural ncer-Oatey, University oseph & A 5650, 2007 y] Larry A 7390, 2015	Paul B. Pedersen, Geert Hofstede, Exploring cul Press, 9781877864902, 2002. Daniel Z. Kadar, Intercultural politeness: man Press, 9781107176225, 2021 abe, Juri, Different realities: adventures in inter- . Samovar [et al.], Intercultural communication	ture: exercise aging relatio ercultural cor : a reader 14	es, stories a ns across co nmunication th ed, Cenga	nd synthetic ultures: hbk, , Nan'un-do, ge Learning,		

Week 1 (W1): Introduction to the course and each other

- W2: Cultural Identity
- W3: Cultural Iceberg Model-A model for Cultural Appreciation
- W4: Stereotypes
- W5: Intercultural Interaction; Verbal Communication
- W6: Intercultural Interaction: Non-verbal Communication
- W7: Diversity in the Workplace
- W8: Perception
- W9: Communication Styles including Directness, Use of Silence and Cognitive Styles
- W10: Communication Styles: High/Low Context and High/Low Involvement Cultures
- W11: Personal Values and Cultural Values

W12: Beliefs and Values

- W13: Culture Shock, Cultural Adaptation and Managing Differences
- W14 & W15 Group presentations and Summary

		[Title]		[Instructor]			
Adv	anced Topi	cs in Computer Science and Engineering I		()		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]		
GTK601	1	Computer Science and Engineering	Intensive	/	Japanese/ English		
[Outline an	d purpose]						
In this led institutions and learn a exchange of value of the	In this lecture, we invite technologists and researchers of universities, private companies and public institutions that are active at the cutting edge in related fields of computer science and engineering to lecturers and learn about the latest trend of research technology development. Through participation in this lecture and exchange of opinions directly with instructors, students will deepen their understanding of the significance and value of the thesis theme.						
Students w indicated in	vill unders n each lectu	tand the significance and value of their master are.	thesis them	e. Specific	goals will be		
-							
Requireme	ents]						
From the co	ontact pers	on, it is shown along with lecture announcement.					
[Evaluation	n]						
From the co	ontact pers	on, it is shown along with lecture announcement.					
[Textbooks]							
N/A							
[References	3]						
N/A							
[Schedule]							
Please note	that the le	ecture date and time will be posted on CNS.					

		[Title]	[Instructor]				
Adva	anced Topic	s in Computer Science and Engineering II]	ssei Fujishi	ro		
[Code]	[Credits]	[Program]	[Semester]	[Language of instruction]			
GTK602	1	Computer Science and Engineering	2nd Semester	Mon.∕Ⅱ	Japanese/ English		
[Outline an	d purpose]				•		
With the ac larger and visualizatio embedded representat dedicated t including a	With the advent of HPC, WSN, and GII, digital data to be simulated, measured, and retrieved has been getting larger and more complex. The main target of this course is a method of computing, called computer visualization, which provides insights gained through visual analysis of salient structures and behaviors embedded in such a data. After fundamental principles are surveyed, we place particular focus on representative techniques to visualize scalar fields in 2D, 3D, 3D+time, and multi-dimensions along the dedicated taxonomies. Up-to-date R&D topics are chosen to discuss the potentials of scalar data visualization, including advanced visual data mining based on differential topology and dimensional reduction schemes.						
Objectives							
 To be fan To acquir To be abl To acquir 	niliar with re proficien e to visuali re familiari	dedicated paradigm and taxonomies; cy in fundamental principles and representative ted ze practical datasets with standard tools such as Pa ty with recent R&D topics of computer visualization	chniques; araview; and n.				
[Requireme	ents]						
Prerequisit analysis.	e includes	basic knowledge about database, computer graph	hics, image p	rocessing, a	nd numerical		
[Evaluation	n]						
Short quizz datasets)	xes (50%: L	evel of understanding the content of each class) a	nd term repo	rt (50%: Vis	ualizing open		
[Textbooks]							
[References	3]						
 NIH/NSF Visualization Research Challenge Report January 2006. NVAC: Illuminating the Path: The Research and Development Agenda for Visual Analytics, 2005. T. Munzner: Visualization Analysis and Design, AK Peters/CRC Press, 2014. M. Nakajima and I. Fujishiro (eds.): Computer Visualization (in Japanese), Kyoritsu-Syuppan, 2000. 							
[Schedule]							
[Schedule] This course will be held online using Zoom live-streaming. 1: Orientation 2: Introduction to scientific visualization 3: Visualization paradigm and taxonomy 4: Marching Squares algorithm and its disambiguation 5: Indirect/direct volume visualization 6: Topologically accentuated volume rendering 7: Advanced volume visualization based on differential topology 8: Multidimensional data visualization							

[Title]			[Instructor]				
Adva	anced Topic	s in Computer Science and Engineering II	J	ssei Fujishii	ro		
[Code]	[Credits]	[Program]	[Semester] [Hours] [Langua instruct				
GTK602	1	Computer Science and Engineering	2nd Semester	Mon.∕Ⅱ	Japanese ⁄ English		
[Outline an	d purpose]						
With the advent of HPC, WSN, and GII, digital data to be simulated, measured, and retrieved has been getting larger and more complex. The main target of this course is a computing methodology, called computer visualization, which provides insights gained through visual analysis of salient structures and behaviors embedded in such a data. After fundamental principles are surveyed, we place particular focus on representative techniques to visualize scalar fields in 2D, 3D, 3D+time, and multi-dimensions along the dedicated taxonomies. Up-to-date R&D topics are chosen to discuss the potentials of scalar data visualization, including advanced values data mining based on differential tendlogy and dimensional reduction achemica.							
[Objectives]							
To be famili To acquire p To be able t To acquire f [Requirement	iar with deproficiency o visualize <u>familiarity</u> ents]	dicated paradigm and taxonomies; in fundamental principles and representative techn practical datasets with standard tools such as Para with recent R&D topics of computer visualization.	niques; aview; and				
Prerequisit	e includes	hasic knowledge about database computer grant	nics image n	rocessing a	nd numerical		
analysis.	e meruues	basic knowledge about database, computer graph	ines, image p	locessing, a	na numericar		
[Evaluation	n]						
Short quizz visualizing	zes: 50% (I practical d	Level of understanding the content of each c lass atasets)), Report: 50	0% (Literatu	are survey or		
[Textbooks]							
Handouts v	vill be distr	ibuted.					
[References]						
 NIH/NS NVAC: T. Mun: M. Nak 	 NIH/NSF Visualization Research Challenge Report January 2006. NVAC: Illuminating the Path: The Research and Development Agenda for Visual Analytics, 2005. T. Munzner: Visualization Analysis and Design, AK Peters/CRC Press, 2014. M. Nakajima and I. Fujishiro (eds.): Computer Visualization (in Japanese), Kyoritsu-Syuppan, 2000. 						
[Schedule]							
Please note 1: Orientati 2: Introduct 3: Visualiza 4: Marching 5: Indirect/0 6: Topologic 7: Advanceo 8: Multidim	[Schedule] Please note that the lecture date and time will be posted on CNS. 1: Orientation 2: Introduction to scientific visualization 3: Visualization paradigm and taxonomy 4: Marching Squares algorithm and its disambiguation 5: Indirect/direct volume visualization 6: Topologically accentuated volume rendering 7: Advanced volume visualization based on differential topology 8: Multidimensional data visualization						

[Title]			[Instructor]				
Ç	Seminar in	Computer Science and Engineering IA	all ac	ademic supe	rvisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]		
GTK603	1	Computer Science and Engineering	1st Semester		Japanese/ English		
[Outline an	d purpose]						
This exerci laboratories Students w relevant fie will also pa of fields an content and "research w academic su feedback to [Objectives] The goal is courses and	This exercise is conducted in small group and seminar format by cooperation of laboratory unit or a few laboratories. It is carried out in parallel with Research Work in Computer Science and Engineering IA. Students will select the themes to be studied, voluntarily and positively learn papers and other materials on the relevant fields, summarize the results in presentation materials, present at the seminar, and discuss. Students will also participate in planning related to other students' research topics, learn how to approach a wide range of fields and subjects, and learn how to communicate among researchers and work together. Although the content and target of this seminar are overlapped with the "research work" conducted at the same time, "research work" conducts intensive research work on his / her research subject mainly under the guidance of the academic supervisor. On the other hand, "seminar" shares the result in the laboratory, discusses it, and gives feedback to the research. [Objectives] The goal is to define the direction of new research to organize what students have learned in the undergraduate courses and to identify necessary topics in carrying out the research.						
[Requireme	nts]						
General kn	owledge of	computer science and engineering field					
[Evaluation	.]						
Based on achievemen	subjective t objective	learning and the participation situation of restare evaluated comprehensively.	search discu	ssions at s	eminars, the		
[Textbooks]							
Each acade	mic superv	isor will assign reading materials related to the res	search theme.				
[References]						
N/A							
[Schedule]							
 Selection Selection Selection Method of Survey of Survey of Survey of Survey of Acquisitie Acquisitie Acquisitie Acquisitie Reading Reading Reading Reading Reading Reading Reading Reading 	of research of research of collecting n previous n previous on of relate on of relate papers wr papers wr papers wr papers wr papers wr papers wr papers wr	n agenda #1 n agenda #2 data research #1 research #2 research #3 d knowledge #1 d knowledge #2 d knowledge #3 titten in foreign language and acquisition of related itten in foreign language and acquisition of related titten in foreign language and acquisition of related	knowledge #2 knowledge #2 knowledge #4 knowledge #4 knowledge #4 knowledge #6	L 2 3 4 5			

[Title]			[Instructor]			
ç	Seminar in	Computer Science and Engineering IB	all ac	ademic supe	rvisors	
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]	
GTK604	1	Computer Science and Engineering	2nd Semester		Japanese / English	
[Outline an	d purpose]					
This exercise is conducted in small group and seminar format by cooperation of laboratory unit or a few laboratories. It is carried out in parallel with Research Work in Computer Science and Engineering IB. Students make concrete and feasible plans for the themes selected in Seminar in Computer Science and Engineering IA, actually conduct preliminary research and surveys, and present the results at a presentation session including members of other laboratories. Although the content and target of this seminar are overlapped with the "research work" conducted at the same time, "research work" conducts intensive research work on his / her research subject mainly under the guidance of the academic supervisor. On the other hand, "seminar" shares the result in the laboratory, discusses it, and gives feedback to the research. [Objectives] The goal is to conduct preliminary research and surveys on the selected themes, and to make presentation the						
	. 1					
[Requireme	nts]	1 1				
General bas Results of Engineering	sic knowled Seminar ir <u>g Research</u>	lge in the field of computer science and engineering n Computer Science and Engineering IA and Res IA	earch Work i	n Computer	Science and	
[Evaluation	.]					
Based on achievemen	subjective it objective	learning and the participation situation of re s are evaluated comprehensively.	search discu	ssions at s	eminars, the	
[Textbooks]						
Each acade	mic superv	isor will assign reading materials related to the res	earch theme.			
[References]					
N/A						
[Schedule]						
1. Preparat	ion for prel	iminary research #1				
2. Preparat	ion for prel	iminary research #2				
3. Preparat	ion for prel	iminary research #3				
4. Prelimina	ary researc	h #1 h #9				
6 Prelimin	ary researd	h #2 h #3				
7. Prelimina	ary researc	h #4				
8. Prelimina	ary researc	h #5				
9. Prelimina	ary researc	h #6				
10. Prelimit	nary resear	rch #7				
11. Prepara	tion for mi	d-term presentation of master's thesis				
12. Prepara	tion for mi	d-term presentation of master's thesis				
13. Prepara	tion for mi	d-term presentation of master's thesis				
14. Mid-ter	m presenta	tion of master's thesis				
15. Mid-ter	m presenta	tion of master's thesis	posified 1-+-	(In the -t	ro aullahur i	
is assigned	to 11 to 15,	, but it may be conducted at other times, for example	le, in the mide	lle of the ser	nester.)	

		[Title]		[Instructor]		
S	Seminar in	Computer Science and Engineering IIA	All ac	ademic supe	rvisors	
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]	
GTK605	1	Computer Science and Engineering	1st Semester"		English⁄ Japanese"	
[Outline and purpose] This exercise is conducted in small group and seminar format by cooperation of laboratory unit or a few laboratories. It is carried out in parallel with Research Work in Computer Science and Engineering IIA. Based on the results of the preliminary research conducted in Seminar in Computer Science and Engineering IA and IB, the research theme will be reviewed and the policy will be revised if necessary. After clarifying the direction of master's thesis research, students will demonstrate their originality and work on research, and present the results at a presentation session including members of other laboratories. Although the content and target of this seminar are overlapped with the "research work" conducted at the same time, "research work" conducts intensive research work on his / her research subject mainly under the guidance of the academic supervisor. On the other hand, "seminar" shares the result in the laboratory, discusses it, and gives feedback to the research. [Objectives] The goals are to organize research results and reexamine research themes, to determine the theme of the master's thesis, and to conduct preliminary research.						
[Requireme Results of Engineerin [Evaluation Based on achievemen	[Requirements] Results of Seminar in Computer Science and Engineering I and Research Work in Computer Science and Engineering Research I [Evaluation] Based on subjective learning and the participation situation of research discussions at seminars, the					
[Textbooks]		s are evaluated comprehensively.				
Each ac	ademic sup	pervisor will assign reading materials related to the	e research the	me.		
[References]					
N/A						
[Schedule]						
 Examina Examina Examina Conducti Conduction Conducti Conduction Conduction	[Schedule] 1. Examination of result of preliminary research and planning of the present research #1 2. Examination of result of preliminary research and planning of the present research #2 3. Conducting research and investigation #1 4. Conducting research and investigation #2 5. Conducting research and investigation #3 6. Conducting research and investigation #4 7. Conducting research and investigation #5 8. Conducting research and investigation #6 9. Conducting research and investigation #8 11. Conducting research and investigation #8 12. Conducting research and investigation #1 13. Conducting research and investigation #10 13. Conducting research and investigation #11 14. Preparation for oral presentation 15. Oral presentation					

[Title]				[Instructor]		
S	Seminar in	Computer Science and Engineering IIB	All ac	ademic supe	rvisors	
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]	
GTK606	1	Computer Science and Engineering	2nd Semester''		"English⁄ Japanese"	
[Outline an	d purpose]					
This exerci laboratories Students w conduct res culmination work" cond subject mai in the labor [Objectives] The objective	This exercise is conducted in small group and seminar format by cooperation of laboratory unit or a few laboratories. It is carried out in parallel with Research Work in Computer Science and Engineering IIB. Students will examine the results obtained in Seminar in Computer Science and Engineering Exercise IIA and conduct research necessary to overcome the remaining problems. Write and present a master's thesis as a culmination of research. Although the content and target of this seminar are overlapped with the "research work" conducted at the same time, "research work" conducts intensive research work on his / her research subject mainly under the guidance of the academic supervisor. On the other hand, "seminar" shares the result in the laboratory, discusses it, and gives feedback to the research. [Objectives] The objectives are to write a master's thesis and to make a presentation of it.					
[Requireme Results of Engineering [Evaluation Based on achievemen [Textbooks] Each acade	[Requirements] Results of Seminar in Computer Science and Engineering IIA and Research Work in Computer Science and Engineering IIA. [Evaluation] Based on subjective learning and the participation situation of research discussions at seminars, the achievement objectives are evaluated comprehensively. [Textbooks] Each academic supervisor will assign reading materials related to the research theme.					
[References]					
N/A						
[Schedule]						
 Conducti Conducti Conducti Conducti Conducti Making t Making t Making t Writing h Writing h Writing h Writing h Writing h Prepara Prepara Prepara Oral pre 	ng research ng research ng research ng research he outline he outline his or her th his or her th his or her th his or her th his or her th this or her th this or her th his or her th	h and survey #1 h and survey #2 h and survey #3 h and survey #4 of his or her thesis #1 of his or her thesis #2 hesis #1 hesis #2 hesis #3 thesis #4 thesis #5 oral presentation #1 oral presentation #2 oral presentation #3				

[Title]				[Instructor]			
Rese	earch Work	in Computer Science and Engineering IA	All ac	ademic supe	ervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]		
GTK607	2	Computer Science and Engineering	1st Semester				
[Outline an	d purpose]						
This course in parallel v research th results, and voluntarily presentation research ov form of sen discussions research the [Objectives] The goals a pursued in	[Outline and purpose] This course is conducted in the laboratory under the guidance of each academic advisor, and will be conducted in parallel with Seminar in Computer Science and Engineering Exercise IA. Each student selects his or her own research theme, voluntarily and actively studies papers and other materials in related fields, summarizes the results, and presents them at seminars with deep discussion. Students select the theme to be studied, voluntarily and actively study treatises and other materials in related fields, summarize the results in presentation materials, present them at seminars, and hold discussions. Although the contents and goals of this research overlap with the "seminars" that are conducted at the same time, the "seminars" are conducted in the form of seminar in collaboration with each laboratory or a small number of laboratories, and presentation discussions are the main focus. On the other hand, research involves intensive research work on one's own research theme, mainly under the guidance of an academic advisor. [Objectives] The goals are to organize what each student has learned in the faculty, to set the direction of new research to be						
[Requireme	nts]						
General bas	sic knowled	ge in the field of computer science and engineering					
[Evaluation	.]						
Based on achievemen	subjective t objective	learning and the participation situation of restare evaluated comprehensively.	search discu	ssions at s	eminars, the		
[Textbooks]							
Each acade	mic superv	isor will assign reading materials related to the res	earch theme.				
[References]						
N/A							
[Schedule]							
 Selection of research subject #1 Selection of research subject #2 Method of collecting materials Survey on previous researches #1 Survey on previous researches #2 Survey on previous researches #3 Acquisition of related knowledge #1 Acquisition of related knowledge #2 Acquisition of related knowledge #3 Reading papers in foreign languages and acquisition of related knowledge #2 Reading papers in foreign languages and acquisition of related knowledge #3 Reading papers in foreign languages and acquisition of related knowledge #3 Reading papers in foreign languages and acquisition of related knowledge #3 Reading papers in foreign languages and acquisition of related knowledge #3 Reading papers in foreign languages and acquisition of related knowledge #4 Reading papers in foreign languages and acquisition of related knowledge #4 Reading papers in foreign languages and acquisition of related knowledge #5 Reading papers in foreign languages and acquisition of related knowledge #6 							

[Title]				[Instructor]]		
Res	earch Work	in Computer Science and Engineering IB	All ac	ademic supe	ervisors		
[Code]	[Credits]	[Program]	[Semester]	[Language of instruction]			
GTK608	2	Computer Science and Engineering	2nd Semester				
[Outline an	d purpose]						
This course in parallel feasible pla conduct pre- of other lak conducted a laboratory hand, resea academic ac [Objectives] The goal is results.	This course is conducted in the laboratory under the guidance of each academic advisor, and will be conducted in parallel with Seminar in Computer Science and Engineering Exercise IB. Students make concrete and feasible plans for the themes selected in Research Work in Computer Science and Engineering IA, actually conduct preliminary research and surveys, and present the results at a presentation session including members of other laboratories. Although the contents and goals of this research overlap with the "seminars" that are conducted at the same time, the "seminars" are conducted in the form of seminar in collaboration with each laboratory or a small number of laboratories, and presentation discussions are the main focus. On the other hand, research involves intensive research work on one's own research theme, mainly under the guidance of an academic advisor. [Objectives] The goal is to conduct preliminary research and surveys on the selected themes, and to make presentation the results.						
Requireme	entsl						
Incquireme							
Evaluation							
Based on achievemer	subjective at objective	learning and the participation situation of rest are evaluated comprehensively.	esearch discu	ssions at s	eminars, the		
[Textbooks]							
Each acade	mic superv	isor will assign reading materials related to the res	search theme.				
[References							
N/A							
[Schedule]							
 Preparat Preparat Preparat Prelimin Prelimin Prelimin 	 Preparation for preliminary research #1 Preparation for preliminary research #2 Preparation for preliminary research #3 Preliminary research #1 Preliminary research #2 						
7. Prelimin 8. Prelimin	ary researc ary researc ary researc	n #3 h #4 h #5					
9. Prelimin	9. Preliminary research #6						
11. Prepara	tion for mi	d-term presentation of master's thesis					
13. Prepara	12. Preparation for mid-term presentation of master's thesis 13. Preparation for mid-term presentation of master's thesis						
14. Mid-ter	m presenta	tion of master's thesis					
The timing is assigned	m presenta of the mid to 11 to 15,	tion of master's thesis -term presentation of the master's thesis will be sp but it may be conducted at other times, for examp	pecified later. le, in the mide	(In the abov dle of the ser	ve syllabus, it mester.)		

		[Title]	[Instructor]			
Rese	earch Work	in Computer Science and Engineering IIA	All ac	ademic supe	rvisors	
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]	
GTK609	2	Computer Science and Engineering	1st Semester"		English/ Japanese	
[Outline and purpose] This course is conducted in small group and seminar format by cooperation of laboratory unit or a few laboratories. It is carried out in parallel with Seminar in Computer Science and Engineering IIA. Based on the results of the preliminary research conducted in Research Work in Computer Science and Engineering IA and IB, the research theme will be reviewed and the policy will be revised if necessary. After clarifying the direction of master's thesis research, students will demonstrate their originality and work on research, and present the results at a presentation session including members of other laboratories. Although the content and target of this seminar are overlapped with the "seminar" conducted at the same time, "research work" conducts intensive research work on his / her research subject mainly under the guidance of the academic supervisor. On the other hand, "seminar" shares the result in the laboratory, discusses it, and gives feedback to the research. [Objectives] The goals are to organize research results and reexamine research themes, to determine the theme of the master's thesis and to conduct preliminary research						
[Requirements] Results of Seminar in Computer Science and Engineering I and Research Work in Computer Science and Engineering Research I [Evaluation] Based on subjective learning and the participation situation of research discussions at seminars, the achievement objectives are evaluated comprehensively. [Textbooks]						
[References N/A [Schedule] 1. Examina 2. Examina 3. Conducti 4. Conducti 5. Conducti 6. Conducti 7. Conducti 8. Conducti 10. Conducti 10. Conducti 11. Conducti 12. Conducti 13. Conducti 14. Prepara 15. Oral pre	j tion of resu ng research ng research ng research ng research ng research ng research ng research ting research	It of preliminary research and planning of the press of the press of the press of the press of and investigation #1 of and investigation #2 of and investigation #3 of and investigation #4 of and investigation #5 of and investigation #6 of and investigation #7 of and investigation #8 of and investigation #9 of and investigation #10 of and investigation #11 of presentation	ent research #	#1 #2		

		[Title]		[Instructor]	
Rese	earch Work	in Computer Science and Engineering IIB	All ac	ademic supe	rvisors
[Code]	[Credits]	[Program]	[Semester] [Hours] [L ir		[Language of instruction]
GTK610	2	Computer Science and Engineering	2nd Semester"		English/ Japanese
[Outline an	d purposel				•
This course is conducted in small group and seminar format by cooperation of laboratory unit or a few laboratories. It is carried out in parallel with Seminar in Computer Science and Engineering IIB. Students will examine the results obtained in Research Work in Computer Science and Engineering Exercise IIA and conduct research necessary to overcome the remaining problems. Write and present a master's thesis as a culmination of research. Although the content and target of this research work are overlapped with the "seminar" conducted at the same time, "research work" conducts intensive research work on his / her research subject mainly under the guidance of the academic supervisor. On the other hand, "seminar" shares the result in the laboratory, discusses it, and gives feedback to the research. [Objectives] The objectives are to write a master's thesis and to make a presentation of it.					
Requireme	ntsl				
Results of	Seminar ir	Computer Science and Engineering IIA and Res	earch Work i	n Computer	· Science and
Engineerin	g IIA.				
[Evaluation	l]				
Based on achievemer	subjective at objective	learning and the participation situation of rest are evaluated comprehensively.	search discu	ssions at s	eminars, the
[Textbooks]		1 V			
Each acade	mic superv	isor will assign reading materials related to the res	search theme.		
References]				
N/A	1				
[Schedule]					
 Conducting research and survey #1 Conducting research and survey #2 Conducting research and survey #3 Conducting research and survey #4 Making the outline of his or her thesis #1 Making the outline of his or her thesis #2 Writing his or her thesis #1 Writing his or her thesis #3 Writing his or her thesis #4 Writing his or her thesis #5 					
13. Prepara 14. Prepara 15. Oral pre	tion for an tion for an esentation	oral presentation #2 oral presentation #3			

[Title]				[Instructor]	
Adva	anced Topic	s in Computer Science and Engineering III			
[Code]	[Credits]	[Program]	[Semester] [Hours] [Languag instruction		
GTK611	1	Computer Science and Engineering	Intensive	/	Japanese
ICOURT Information Information Information Instruction GTK611 1 Computer Science and Engineering Intensive / Japanese [Outline and purpose] Institutions that are active at the cutting edge in related fields of computer science and engineering to lecturers and learn about the latest trend of research technology development. Through participation in this lecture and exchange of opinions directly with instructors, students will deepen their understanding of the significance and value of the thesis theme. [Objectives] Students will understand the significance and value of their master thesis theme. Specific goals will be indicated in each lecture. [Requirements] From the contact person, it is shown along with lecture announcement. [Evaluation] Freetbooks] N/A [References] N/A [Schedule] Please note that the lecture date and time will be posted on CNS.					

[Title]			[Instructor]		
Adva	anced Topic	es in Computer Science and Engineering IV			
[Code]	[Credits]	[Program]	[Semester] [Hours] [Langua instruct		
GTK612	1	Computer Science and Engineering	Intensive	/	Japanese/ English
[Outline an	d purpose]				
In this lee institutions and learn a exchange o value of the	cture, we s that are a bout the la f opinions o thesis the	invite technologists and researchers of university ctive at the cutting edge in related fields of comput- atest trend of research technology development. The directly with instructors, students will deepen their me.	sities, private cer science and rough partici r understandir	e companies d engineerin pation in thi ng of the sig	s and public g to lecturers is lecture and nificance and
[Objectives	 	,],] · · · · · · · · · · · · · · · · ·	.11	Q	1
Students v indicated in	n each lectu	tand the significance and value of their master ire.	thesis them	e. Specific	goals will be
Doguinomo	mtal				
From the co	ntact pers	on it is shown along with lecture announcement			
	1				
[Evaluation	1]				
From the co	ontact pers	on, it is snown along with lecture announcement.			
[Textbooks]					
N/A					
[References	3]				
N/A					
[Schedule]					
Please note	that the le	ecture date and time will be posted on CNS.			

[Title]			[Instructor]		
Adva	anced Topic	s in Computer Science and Engineering IV	I	ssei Fujishii	°0
[Code]	[Credits]	[Program]	[Semester] [Hours] [Langua instruc		
GTK612	1	Computer Science and Engineering	1st Semester	Fri./III	Japanese/ English
[Outline an The main t	d purpose] arget of th	is course is computer visualization, which is a mo	ethod of comp	outing to pro	ovide insights
gained thro course, fur visualizatio technology,	ndamental ndamental on are cove including v	analysis of salient structures and behaviors embed visualization techniques such as vector/scalar red, and then, several up-to-date R&D topics are o visual analytics, XR-based visualization, and Visual	field in large field visual chosen to disc lization & AI.	and complex ization and uss the pote	information entials of this
[Objectives]]				
1. To acquin	re proficien	cy in fundamental principles and representative teo	chniques;		
3. To acquir	e to visuali re familiari	ty with recent R&D topics of computer visualization	araview, and 1.		
[Requireme	ents]				
Prerequisit analysis.	e includes	basic knowledge about database, computer graph	nics, image p	rocessing, a	nd numerical
It is prefer	able to hav	e taken Advanced Topics in Computer Science and	Engineering l	II in 2021AY	•
Short quizz	nj zes (50%: L his course)	evel of understanding the content of each class) an	d term report	(50%: Level	of the entire
[Textbooks] Handouts v	vill be distr	ibuted.			
[References	ş]				
1. NIH/NS	SF Visualiz	ation Research Challenge Report January 2006.			
2. NVAC:	Illuminatiı znor: Viguo	ng the Path: The Research and Development Agend	a for Visual A	nalytics, 200)5.
4. M. Nak	ajima and	I. Fujishiro (eds.): Computer Visualization (in Japa	nese), Kyorits	u-Syuppan,	2000.
[Schedule]					
This course	will be hel	d online using Zoom live-streaming.			
2: Visualizi	ion ng vector fi	elds			
3: Visualizi	ng tensor f	ields			
4: Fundame	entals of in	formation visualization			
6: XR-based	6: XR-based visualization: Juxtaposition and multi-modality				
7: Visualiza	7: Visualization and AI				
8: Visualiza	8: Visualization and perceptive psychology				

[Title]			[Instructor]			
Adv	anced Topic	cs in Computer Science and Engineering V		()	
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]	
GTK613	2	Computer Science and Engineering	Intensive	/	Japanese	
[Outline an	d purpose]					
In this lect clarify wha safety anal (FTA), and	ure, variou t kind of fa ysis metho System The	s safety analysis methods will be explained. The p ailure will occur, and clarify what kind of impact w od will be explained; Failure Mode and Effects A eoretic Process Analysis (STPA).	ourpose of safe vill occur. In t analysis (FMI	ety analysis this lecture, EA), Fault 7	is as follows; the following Free Analysis	
[Objectives]						
Students w Students w	ill understa ill understa	and the necessity of the safety analysis. and the characteristics, applications, methods of FM	IEA, FTA, and	d STPA.		
[Requireme	ents]					
Experience This lecture This lecture	of the softw e will be con e will be con	vare development nducted using ZOOM. Students will have to prepar nducted in Japanese.	e own PC and	network.		
[Evaluation	1]					
Evaluation	will be con	ducted by the results of the reports (FMEA, FTA, a	nd STPA).			
[Textbooks]						
Distribute of	original ma	terials.				
References]					
N/A	.1					
10/11						
[Schedule]						
This lecture	e will be he	ld during the summer vacation. Please note the CN	S notice.			
 Outline Outline Case St Case St 	 Outline of Safety Analysis Method Outline of Failure Mode and Effects Analysis (FMEA) Case Study of FMEA (1) Case Study of FMEA (2) + Practice of FMEA (1) 					
6. Outline	 5. Practice of FMEA (2) + Presentation & Discussion 6. Outline of Fault Tree Analysis (FTA) 7. Case Study of FTA (1) 					
8. Case St 9. Practice	 Case Study of FTA (1) Case Study of FTA (2) + Practice of FTA (1) Practice of FTA (2) + Presentation & Discussion 					
10. Outline 11. Outline	 Outline of System-Theoretic Process Analysis (1) Outline of System-Theoretic Process Analysis (2) 					
12. Case St	udy of STP	A (1)				
13. Case St	udy of STP	A (2)				
14. Practice	e of STPA (1)				
15. Practice	e of STPA (2	2) + Presentation & discussion				

	[Title]	[Instructor]			
Advanced Topics in Computer Science and Engineering VI			Hiromitsu Nishizaki		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
GTK614	1	Computer Science and Engineering	Intensive	/	English
[Outline and purpose]					
With the evolution of information and communication technology (ICT), multimedia information (sound (voice), text, and images (video)) processing technologies are rapidly developing. Besides, in recent years, artificial intelligence (AI) technology has been widely spread among the general public, and deep learning technology for multimedia data processing and analysis has been driving the development of AI field. Therefore, this course aims to provide advanced knowledge of deep learning techniques with a focus on applications to multimedia information (sound, natural language text, and images) processing. Students will learn practically with demonstrations and exercises.					
[Objectives]					
 To learn the basics of deep learning and to be able to use it to solve various problems in the field of multimedia processing. To understand information processing for multimedia information, and to acquire artificial intelligence techniques for this purpose. 					
Linear algebra Calculus Discrete Mathematics Probability and Statistics Programming Machine Learning					
Initial algebra, calculus, Discrete Mathematics, 1105ability and Statistics, 1105ramming, Machine Learning					
[Evaluation]					
Report					
[Textbooks] N/A					
[References]					
N/A					
[Schedule]					
 Introduction of AI and deep learning Machine learning with neural network Introduction of deep learning programming Neural network for image Convolutional neural network Introduction of image processing, classification and regression model Tips for deep learning Recurrent neural network Introduction of speech processing Audio signal classification Introduction of text processing, and word embedding Automatic sentence generation Encademideadem model and machine translation 					
14. Attention mechanism 15. Summary and evaluation					