UNIVERSITÉ DE NANTES

Master 2 M2 Visual Computing (VICO)

Année universitaire 2021-2022

Information générale

Objectifs	
Responsable(s)	PEIRREIRA DA SILVA Matthieu RICORDEL VINCENT
Mention(s) incluant ce parcours	master Informatique
Lieu d'enseignement	
Langues / mobilité internationale	
Stage / alternance	
Poursuite d'études /débouchés	
Autres renseignements	
Conditions d'obtention de l'année	L'année est validée si la partie théorique est validée en première ou deuxième session (moyenne supérieure ou égale à 10/20) et si l'UE correspondant au stage est également validée avec une note supérieure ou égale à 10/20.

Programme

1er SEMESTRE	Code	ECTS	CM	CI	TD	TP	Distanciel	Total
Groupe d'UE : S3 VICO (30 ECTS)								
Advanced image and video processing		6	0	28	0	14	6	48
Perceptual computing		6	0	28	0	14	6	48
Machine learning for computer vision		6	0	28	0	14	6	48
3D Computer Graphics		6	0	28	0	14	6	48
Multimedia Communication		3	0	14	0	7	3	24
Human-Computer Interaction		3	0	14	0	7	3	24
Groupe d'UE : Option pour non francophones (0 ECTS)								
French langage and European culture		0	0	0	48	0	0	48
	Total	30					30.00	**288.00**

2ème SEMESTRE	Code	ECTS	CM	CI	TD	TP	Distanciel	Total
Groupe d'UE : S4 VICO (30 ECTS)								
Internship (VICO)		30	0	0	0	0	0	0
	Total	30					0.00	**0.00**

Modalités d’évaluation

Mention Master 2ème année | Parcours : M2 Visual Computing (VICO) | Année universitaire 2021-2022

Responsable(s) : PEIRREIRA DA SILVA Matthieu, RICORDEL VINCENT

REGIME ORDINAIRE

					PREMIERE SESSION							DEUXIEME SESSION							TOTAL	
					Contrôle continu			Examen				Contrôle continu			Examen				Coeff.	ECTS
	CODE UE	INTITULE	UE non dipl.		écrit	prat.	oral	écrit	prat.	oral	durée	ecrit	prat.	oral	écrit	prat.	oral	durée		
Groupe d'UE : S3 VICO																				
3		Advanced image and video processing	N	obligatoire	1.5		1.5	3				1.5		1.5	3				6	6
3		Perceptual computing	N	obligatoire	1.5		1.5	3				1.5		1.5	3				6	6
3		Machine learning for computer vision	N	obligatoire	1.5		1.5	3				1.5		1.5	3				6	6
3		3D Computer Graphics	N	obligatoire	1.5		1.5	3				1.5		1.5	3				6	6
3		Multimedia Communication	N	obligatoire	0.75		0.75	1.5				0.75		0.75	1.5				3	3
3		Human-Computer Interaction	N	obligatoire	0.75		0.75	1.5				0.75		0.75	1.5				3	3
Groupe d'UE : Option pour non francophones																				
3		French langage and European culture	N	optionnelle															0	0
Groupe d'UE : S4 VICO																				
4		Internship (VICO)	N	obligatoire	7.5	15	7.5					7.5	15	7.5					30	30
																		TOTAL	60	60

A la seconde session, les notes de contrôle continu correspondent à un report des notes de CC de la première session.

DISPENSE D'ASSIDUITE

					PREMIERE SESSION							DEUXIEME SESSION							TOTAL	
					Contrôle continu			Examen				Contrôle continu			Examen				Coeff.	ECTS
	CODE UE	INTITULE	UE non dipl.		écrit	prat.	oral	écrit	prat.	oral	durée	ecrit	prat.	oral	écrit	prat.	oral	durée		
Groupe d'UE : S3 VICO																				
3		Advanced image and video processing	N	obligatoire				6							6				6	6
3		Perceptual computing	N	obligatoire				6							6				6	6
3		Machine learning for computer vision	N	obligatoire				6							6				6	6
3		3D Computer Graphics	N	obligatoire				6							6				6	6
3		Multimedia Communication	N	obligatoire				3							3				3	3
3		Human-Computer Interaction	N	obligatoire				3							3				3	3
Groupe d'UE : Option pour non francophones																				
3		French langage and European culture	N	optionnelle															0	0
Groupe d'UE : S4 VICO																				
4		Internship (VICO)	N	obligatoire															30	30
																		TOTAL	60	60

A la seconde session, les notes de contrôle continu correspondent à un report des notes de CC de la première session.

Description des UE

	Advanced image and video processing
Lieu d'enseignement	Polytech Nantes
Niveau	Master
Semestre	3
Responsable de l'UE	GUEDON JEAN-PIERRE
Volume horaire total	**TOTAL :** 48h Répartition : **CM :** 0h **TD :** 0h **CI :** 28h **TP :** 14h **EAD :** 6h
Place de l'enseignement	
UE pré-requise(s)	
Parcours d'études comprenant l'UE	M2 Visual Computing (VICO)
Evaluation	
Pondération pour chaque matière	Advanced image and video processing **100%**
Obtention de l'UE	
Programme	
Objectifs (résultats d'apprentissage)	At the end of this course, the students will be able to: • Understand the digital objects that constitutes the basis for computation in any image field. Discrete topology theorems, algorithms for line drawing, convex shape or distance maps, morphological tools and discrete reconstruction are presented in order to be able to manage an image problem via these tools • Manipulate the discrete geometry concepts in a real applicative environment either for medical imaging (image acquisition, tomography, quantizing image information) or for image analysis (medical, materials, ...). A large set of examples is available from the teams projects and are applied with the previous concepts in real time constraints environments
Contenu	Discrete geometry topics : • Discrete topology • Discrete line, surface and volume • Mathematical morphology • Discrete measures • Discrete reconstruction Image analysis applications topics: • medical imaging • materials imaging • art imaging
Méthodes d'enseignement	
Langue d'enseignement	Anglais
Bibliographie	

	Perceptual computing
Lieu d'enseignement	Polytech Nantes
Niveau	Master
Semestre	3
Responsable de l'UE	PEIRREIRA DA SILVA Matthieu
Volume horaire total	**TOTAL :** 48h Répartition : **CM :** 0h **TD :** 0h **CI :** 28h **TP :** 14h **EAD :** 6h
Place de l'enseignement	
UE pré-requise(s)	

Parcours d’études comprenant l’UE	M2 Visual Computing (VICO)
Evaluation	
Pondération pour chaque matière	Perceptual computing **100%**
Obtention de l’UE	Continuous assessment based on presentations that will allow the evaluate the capacity of the student to write a scientific document (presentation material), his/her oral presentation skill and the quality of the work done. Final exam is an individual presentation of a scientific article that the student has to study beforehand.
Programme	
Objectifs (résultats d'apprentissage)	At the end of this course, the student will be able to design an experiment that allows him to measure some properties of the human visual system. He should be able to analyse these measure in order to create some theoretical or computational models. He / she will also be able to reuse the theoretical and practical knowledge acquired during this course in order to design and evaluate image and video processing algorithms that take into account the properties of the human visual system.
Contenu	1. Visual perception: physiology and theories • The physics of vision and physiological basis of visual perception (retina, visual pathways, visual cortex) • Spatial vision, Color perception, Depth perception, Visual motion perception • Shape and object perception. Visual perception theories: Gestalt, Brunswik's probabilistic functionalism, neurophysiological approach, Gregory's theory, Gibson's theory, Marr's computationnal approach 2. Visual Experiments and modeling • Fundamentals of psychophysics, visual perception experiments with humans • Visual attention and eytracking experiments, cognitive aspects 3. Applications: perceptual based processing • Perceptual watermarking, Video and image quality assessment, Perceptual image and video coding • 3D, stereo and autostereo applications
Méthodes d’enseignement	
Langue d’enseignement	Anglais
Bibliographie	

	Machine learning for computer vision
Lieu d’enseignement	Polytech Nantes
Niveau	Master
Semestre	3
Responsable de l’UE	MOUCHERE HAROLD
Volume horaire total	**TOTAL :** 48h Répartition : **CM :** 0h **TD :** 0h **CI :** 28h **TP :** 14h **EAD :** 6h
Place de l’enseignement	
UE pré-requise(s)	
Parcours d’études comprenant l’UE	M2 Visual Computing (VICO)
Evaluation	
Pondération pour chaque matière	Machine learning for computer vision **100%**
Obtention de l’UE	Continuous assessment in the form of a project that allows to judge of the capacity of developing a pattern recognition algorithm as well as the capacity to write a scientific communication material. The continuous assessment is also done through scientific articles presentations (oral skills). Written exam for the 1st and 2nd sessions.
Programme	

Objectifs (résultats d'apprentissage)	At the end of this course, the student will be able to go through the differents steps of a computer vision process : - define the subtasks a complete process - choose the appropriate datasets, apply necessary preprocessings - train, optimize and use classical machine learning tools (GMM, MLP, SVM, deeplearning) - evaluate the spatial relations between objects - understand a grammar based system to parse complex objects
Contenu	• Data preprocessing (normalization), Feature extraction • Classification : - Mixture models (GMM), Bayesienne decision - Neural Networks (from MLP to deep-learning), Kernel Machines (SVM), Semi-supervised learning - Structure recognition (spatial relation analysis, 1D / 2D grammar based system, CYK parsing) - Data set properties (size, diversity, labeling cost) • Applications : - Offline and Online Handwriting recognition - Visual object recognition
Méthodes d'enseignement	
Langue d'enseignement	Anglais
Bibliographie	

	3D Computer Graphics
Lieu d'enseignement	Polytech Nantes
Niveau	Master
Semestre	3
Responsable de l'UE	PICAROUGNE FABIEN
Volume horaire total	**TOTAL :** 48h Répartition : **CM :** 0h **TD :** 0h **CI :** 28h **TP :** 14h **EAD :** 6h
Place de l'enseignement	
UE pré-requise(s)	
Parcours d'études comprenant l'UE	M2 Visual Computing (VICO)
Evaluation	
Pondération pour chaque matière	3D Computer Graphics **100%**
Obtention de l'UE	Each student will make one or two presentation during the course. Projects will imply 2 or 3 students designing an experimental application related to VR or AR.
Programme	
Objectifs (résultats d'apprentissage)	At the end of this course, the student must know the visual human mechanisms involved in the depth perception. He will be able to use basic lightning algorithms and basic shaders programming. The student will also be able to take a critical look to 3D application and their use: he will be able to choose the interaction devices adapted to the type of rendering used and he will be able to choose a visual representation mode adapted to the a defined task with defined interaction device.
Contenu	1. Realtime 3D general concepts 2. 3D Perception • Visual depth perception • 3D and Interaction 3. Computer graphics • Overview and Basic Math for 3D programming • OpenGL, Lighting and shadowing • Introduction of Shaders programming 4 Camera calibration • Extrinsic and intrinsic parameters • Multi camera 5 Applications (projcet) • Virtual reality at scale 1:1 • Augmented Reality with dedicated peripherals

Méthodes d’enseignement	
Langue d’enseignement	Anglais
Bibliographie	

	Multimedia Communication
Lieu d’enseignement	Polytech Nantes
Niveau	Master
Semestre	3
Responsable de l’UE	RICORDEL VINCENT
Volume horaire total	**TOTAL :** 24h Répartition : **CM :** 0h **TD :** 0h **CI :** 14h **TP :** 7h **EAD :** 3h
Place de l’enseignement	
UE pré-requise(s)	
Parcours d’études comprenant l’UE	M2 Visual Computing (VICO)
Evaluation	
Pondération pour chaque matière	Multimedia Communication **100%**
Obtention de l’UE	Session 1 - Continuous assessment for the « cryptography » part of the cours, based on scientific articles presentations. Written exam for the « image and video coding part ». Session 2 - Continuous assessment scores of first session are not reused for 2nd session. Written exam for the whole teaching unit.
Programme	
Objectifs (résultats d'apprentissage)	Multimedia communications require a careful design of source coding and security. For this purpose, this module gives advanced notions in Image and Video Coding, and in Cryptography. At the end of this course, the student will be able : In the Cryptography domain: • To provide principles, theory and methods for designing data security and chaos-based data security. • To be able to design, realize and analyse a chaos-based cryptographic systems. • To know applications: Images and videos security ; Network security and Network access control ; Internet of Things (IoT) security ; Mobile security. In the image and video coding domain: • To know the fundamental principles, methods and technics of image and video compression • To describe the caracteristics of the main image/video compression standards (JPEG, JPEG2000, H26X, MPEG-X video) • To implement a complete video coding/decoding chain
Contenu	Cryptography: • Pseudo-chaotic number generators • Symetric and Asymetric Ciphers • Hash Functions • Steganography Systems Image and video coding : • Principles, methods and technics of image and video compression • Image and video compression standards • Advanced image/video coding (scalability, rate-distortion optimization, coding strategy, multi-views) • Next generation of image and video coding (for immersive video formats)
Méthodes d’enseignement	
Langue d’enseignement	Anglais
Bibliographie	

	Human-Computer Interaction
Lieu d'enseignement	Polytech Nantes
Niveau	Master
Semestre	3
Responsable de l'UE	PRIE YANNICK
Volume horaire total	**TOTAL :** 24h Répartition : **CM :** 0h **TD :** 0h **CI :** 14h **TP :** 7h **EAD :** 3h
Place de l'enseignement	
UE pré-requise(s)	
Parcours d'études comprenant l'UE	M2 Visual Computing (VICO)
Evaluation	
Pondération pour chaque matière	Human-Computer Interaction **100%**
Obtention de l'UE	Each student will make one or two presentation during the course. Projects will imply 2 or 3 students designing an experimental setting and running à small evaluation to answer an HCI related question Written exam at the end.
Programme	
Objectifs (résultats d'apprentissage)	At the end of this course, the student will be able to design an interactive system using adequate design methods. He will we able to choose an evaluation method and to carry out the evaluation of the system. He will be able to reuse the theoretical (HCI discipline, its history, its main concepts, principles and methods) and practical knowledge acquired during this course in order to write a paper in HCI.
Contenu	1- Human Computer Interaction: from intervention to UX to interaction to interfaces 2- Designing HCI: understanding situations and humans, modeling users and interaction, prototyping and iterating 3- Evaluating HCI: the many facets of HCI evaluation, from expert evaluations to experiments 4- Novel interactions: gesture, voice, touch, haptic-based interactions + AR/VR (see 3D computer graphics) 5- Project. 10 sessions of 2 hours each, 20 hours individual work, 20 hours project work Each student will make one or two presentation during the course. Each project will imply 2 or 3 students designing an experimental setting and running à small evaluation to answer an HCI related question
Méthodes d'enseignement	
Langue d'enseignement	Anglais
Bibliographie	

	French langage and European culture
Lieu d'enseignement	
Niveau	Master
Semestre	3
Responsable de l'UE	
Volume horaire total	**TOTAL :** 48h Répartition : **CM :** 0h **TD :** 48h **CI :** 0h **TP :** 0h **EAD :** 0h
Place de l'enseignement	
UE pré-requise(s)	
Parcours d'études comprenant l'UE	M2 Visual Computing (VICO),M2 Data Science (DS)

Evaluation	
Pondération pour chaque matière	French langage and European culture **100%**
Obtention de l'UE	
Programme	
Objectifs (résultats d'apprentissage)	Upon completing the course in French as a foreign language, students will be able to : • introduce themselves giving basic information about their country, family, studies • greet native speakers in an appropriate way • interact with native speakers in routine basic tasks (shopping, ordering at a restaurant) • fill in registration forms
Contenu	Grammar • tenses : présent, futur proche, passé proche, the imperative • questions and negations • pronouns (subject and object) • some irregular verbs (être, avoir, prendre, faire, aller, venir) Vocabulary • days of the week, months, numbers, jobs, food items, clothes, modes of transportation, nationalities... Phonetics • difficult vowel and consonant sounds • liaisons Culture and civilization • the outdoor market, Christmas, food and meals, the pace of life in France
Méthodes d'enseignement	
Langue d'enseignement	Français
Bibliographie	

	Internship (VICO)
Lieu d'enseignement	Polytech Nantes
Niveau	Master
Semestre	4
Responsable de l'UE	
Volume horaire total	**TOTAL :** 0h Répartition : **CM :** 0h **TD :** 0h **CI :** 0h **TP :** 0h **EAD :** 0h
Place de l'enseignement	
UE pré-requise(s)	
Parcours d'études comprenant l'UE	M2 Visual Computing (VICO)
Evaluation	
Pondération pour chaque matière	Internship (VICO) **100%**
Obtention de l'UE	
Programme	
Objectifs (résultats d'apprentissage)	At the end of the intership, the student should be able to: 1. 1. Identify and refine a research question or puzzle within an existing field of scientific inquiry and devise a plan for investigating it. 2. Formulate a program of reading in consultation with a professional scientist to provide context for the investigation 3. Develop a time-line for the research project and manage work to that time-line 4. Communicate research results –both orally and in writing – in a style consistent with scientific standards 5. Work as part of a research team
Contenu	During the internship, the student will conduct a research work either in a university lab or in a private companie's R&D department.

Méthodes d’enseignement	
Langue d’enseignement	Anglais
Bibliographie	

Dernière modification par ISABELLE BEAUDET, le 2021-06-10 16:19:07