ETIS

2020

$V_A = [0.1, 14.0]$
$\epsilon = [0.01, 0.032]$
$N_{privacy} = 10^{12}$
$v_{el} = 0.041$
$\eta = 0.606$
$\alpha = 0.2$

$\beta = 0.80$

$\beta = 0.84$

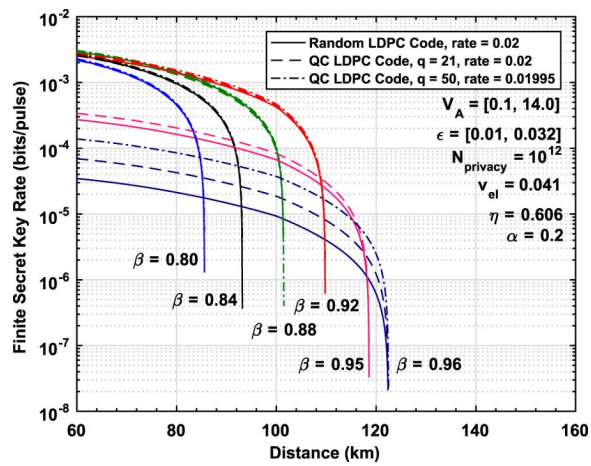$\beta = 0.92$

$\beta = 0.88$

$\beta = 0.95$

$\beta = 0.96$

Activity report

Editorial of Olivier Romain

2020 was a rich year in events for the ETIS laboratory, starting with its new five-year contract (2020 – 2024) initiated on 1 January 2020. The unit has defined an original roadmap for the next 5 years, which are based on existing or future partnerships. It proposes a global systemic approach around intelligent and communicating systems, with a major theme of learning, and drawing on all the skills of the four teams. It also addresses complementary issues around AI, security, health, IoT and new mobilities. Thus, the teams are focused on their disciplinary field, in-order to respond to problems defined at the unit level.

2020 was also marked by the global health crisis of COVID-19 which had an impact on the laboratory, mainly in terms of international outreach, with conferences, visiting professors and co-tutored theses. At the same time, the year 2020 was marked by excellent results. The CELL team continues to grow in the field of intelligent embedded systems in health, security and IoT; 2 INEX and EUTOPIA Co-funded theses with the VUB, 2 CIFREs, 5 ANRs projects submitted and in progress and 1 DIM RFSI 2020 have been obtained. The ICI team continues its scientific excellence in information processing and wireless communications; 3 INEX funding (PhD and Emergence) including an INEX AMBITION project (400k) on physical layer security, a PHC Maimonide, INS2I Emergence (single call), and 1 ANR JCJC. 7 new ANR projects were submitted. Finally, a new MCF Sara Berri joined the ICI team in September 2020. In robotics and cognitive sciences, 1 DIM RFSI funding was obtained on physical interactions. The INEX Neuroscience and Robotics Chair has made it possible to recruit a new PU (Lola Cañamero on September 1st, 2020) and a new MCF, Laura Cohen has also joined the NEURO team. A new PHD from the IDF region is awaiting funding (complementary list). Finally, the data mining theme has also been supported by several INEX and ED EM2PSI grants (doctoral scholarship). The MIDI teams continue their involvement in the digital humanities with the Equipex+ Espadon team, and projects financed within the framework of Labex Patrima and DIM MAP. The team strengthens its research activities in Deep Learning and explainability, through new projects and the arrival of a new PU (Vassilis Christophides) and an MCF (Xuan Son Nguyen). The actions with the IDHN were accompanied by the financing of an 80'PRIME and PHD2 thesis by the IDF region. To strengthen the dynamics at the team interfaces, two internal Springboard projects were initiated on mobility and unconventional cameras (Unique INS2I). Concerning the international development of the laboratory, ETIS has been working with IPAL since April 2020, to launch co-financed doctoral programs (INEX and ASTAR - NUS) on AI topics. Finally, for the 2019/2020 recruitment campaign, 5 recruitments have been made (2 PU positions (MIDI and Neuro) and 3 MCF (ICI, MIDI and Neuro).

In-order-to develop its 5-year project, while ensuring a certain continuity, 2020 was the year of changes at the laboratory level; change of management, change of supervisory authority with CY Paris Université, change of laboratory

2

bodies, change of internal regulations and change of internal management with the appearance of the COMPIL (steering committee), of projects at the interfaces (TREMPLIN), of the strategic orientation council, and of the plenary session renamed PILE.

Thus, the year 2020 was a very special year that will be remembered. We have managed to get through it together, while maintaining our dynamism and the high quality of the research we carry out. On several occasions, our scientific excellence has stood out through collaborative projects (Equipex+, INEX, ANR, DIM), and has been recognized through scientific events and awards. Many other remarkable events can be found in this report. These excellent results are the fruit of our joint endeavors. I would like to thank every one of you and encourage you to continue on this path.

Thank you for your confidence and support.

Olivier ROMAIN

Équipes Traitement de l'Information et Systèmes
CY Cergy Paris Université / ENSEA / CNRS UMR 8051

Équipes Traitement de l'Information et Systèmes

CY Cergy Paris Université / ENSEA / CNRS UMR 8051

KPI 2020

➡ **Structure of the lab**

Direction and administrative	
Olivier ROMAIN – DU	Véronica Belmega - DUA
Administrative	Annick Bertinotti (ENSEA)
	Astrid Montelimard (CNRS)
	Aude Marquet (CYU)
	Anthony Carqueijeiro (ENSEA)
Group leaders	
CELL	Aymeric Histace
ICI	Arsenia Chorti
MIDI	Dan Vodislav
NEURO	Alexandre Pitti
Project managers	
International development	Inbar Fijalkow
Communication & Impact	Maria Malek
Scientific dissemination	Sylvain Reynal
Early career academics	Stéphane Zuckerman
Engineer group	
Head	Boris Borzic
	Arnaud Blanchard

		Cedric Dessennes
		Frédéric De Melo
	Informatic	Michel Jordan
	Informatic	Clément Pariset
	Head of Informatic	Laurent Protois

Human Resources

	145 members	**59 Permanents**
	o 30 UCP	o 13 Professors
	o 23 ENSEA	o 36 Associate Professors
	o 6 CNRS	o 2 CNRS researchers
		o 10 engineers and technicians
	2 IUF	**13 associated members**
Average age: 48.3 years		

Pyramide des âges

homme

femme

- 41 men ⇔ 68%
- 19 women ⇔ 32%

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In	Out
• Lola Canamero (NEURO, Chaire Neuroscience) • Vassilis Christophides (MIDI) • Sara Berri (ICI) • Laura Cohen (NEURO) • Xuan Son Nguyen (MIDI) • Amine Khelif (CELL – ESIEE-IT) • 13 new PhD Students	• Claudia Marinica (MCF MIDI) • Sarra Djemili (PhD MIDI) • Yoan Espada (PhD CELL-NEURO) • Pierre Jacob (PhD CELL-MIDI) • Saoussen Mili (PhD MIDI) • Aliaa Moualla (PhD NEURO) • Marie Morgane Paumard (PhD MIDI)

Thesis and post-doc

- 46 PhD students
- 9 Thesis defended in 2020
- Average length in 2020: 51 months
- 9 post-docs
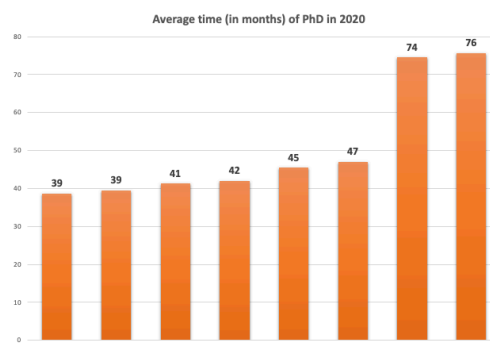
2 HDR

- A. Chorti – October 2020
- N. Nguyen – September 2020

Average time (in months) of PhD in 2020

Devenir des doctorants
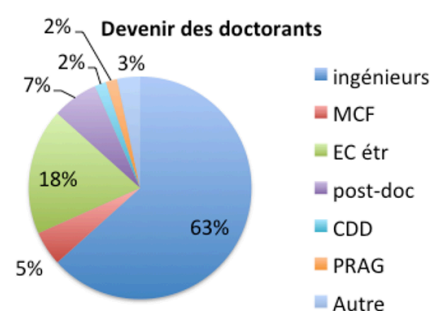
Publications

Teams	Journal Papers	Conference papers	National conferences	Dissemination	Book	Book Chapters	Patents	Thesis	Others
CELL	12	14	-	1	-	-	2	2	1
ICI	26	22	-	-	-	2	-	3	1
MIDI	16	6	-	-	2	4	-	3	1
NEURO	6	10	-	16	-	-	1	4	-
TOTAL TEAM	58	52	0	17	2	6	2	12	3
Inter-team	4	2	-	-	-	-	1	2	-
ETIS	54	50	0	17	2	6	2	10	3

Publications with others teams of ETIS

Team	Journal Papers	Conferences	National	Dissemination	Book	Chapter	Patent	Thesis	Others
CELL	2 with ICI 1 with MIDI	1 with NEURO	-	-	-	-	1 with NEURO	1 with MIDI 1 with NEURO	-
ICI	2 with CELL	-	-	-	-	-	-	-	-
MIDI	1 with NEURO 1 with CELL	1 with NEURO	-	-	-	-	-	1 with CELL	-
NEURO	1 with CELL 1 with MIDI	1 with MIDI	-	-	-	-	-	1, with CELL	-
Total	4	2	-	-	-	-	1	2	-

Publication

Équipes Traitement de l'Information et Systèmes

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Publication Interteam

Équipes Traitement de l'Information et Systèmes

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Publications ETIS

	2019	2020
ETIS - conference	72	50 (-31%)
ETIS - Journal	42	54 (+24%)

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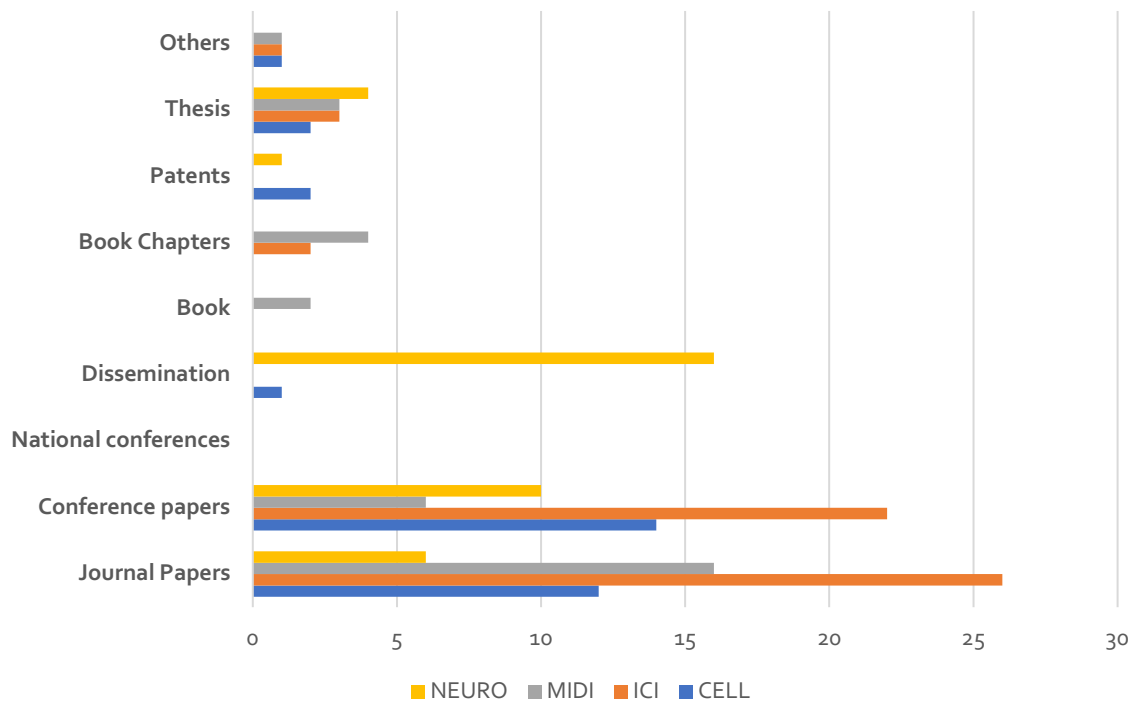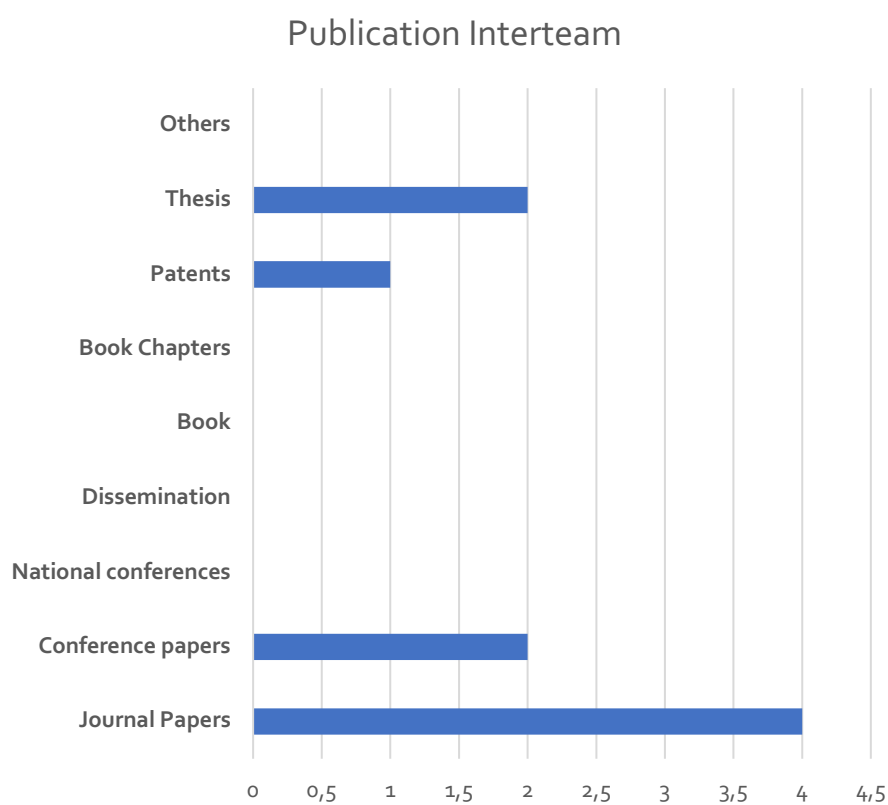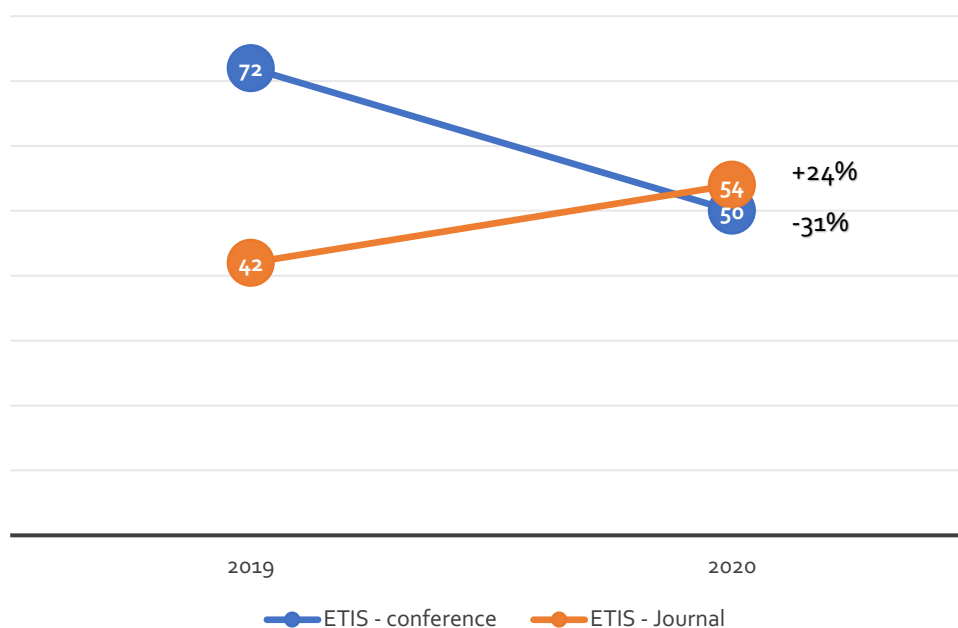
Platforms and equipement

	• 79 measurement and experimentation equipment	
	• 1 Humanoid platform	• EQUIPEX ROBOTEX
	• 1 Data-H platform	• EQUIPEX PATRIMEX
		• EQUIPEX+ ESPADON
	• 5 platforms at ENSEA	• Embedded systems for Health, ARVA 3D, IoT, Wizarde, RF
	• 3 platforms at St Martin	• MOCAP, Robotex Tino, Reachy

Ongoing contracts

	2020		
	CYU	ENSEA	CNRS
Call for proposals			
Public partners – ANR	2	2	1
Public partners – DIM RFSI -COMUE – Autres		2	2
Public partners – Europe	4		
Public partners – LABEX			
Public partners – ADEME		1	
INEX			
EUR			
INEX	9	4	
Hors AAP			
Collaboration/thesis/NDA/MTA… (private sponsors)	5	5	
Collaboration/theses/NDA/MTA…- (public sponsor)	1	3	4

Services (private customer)		1	1
Services (public customer)			
Total	21	18	8
Total for the 3 sponsors of the lab: 47			

Budget – Sponsors

Budget / sponsors

Equipement

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Fonctionnement

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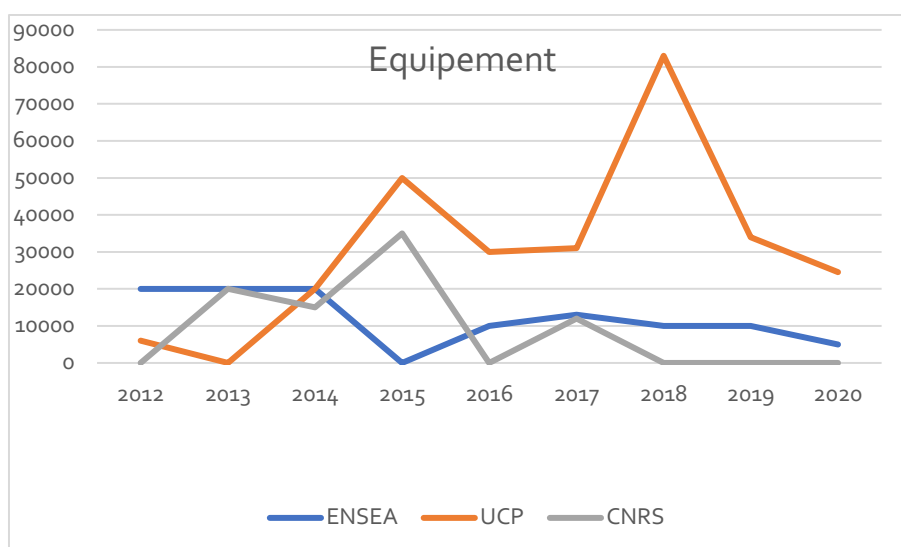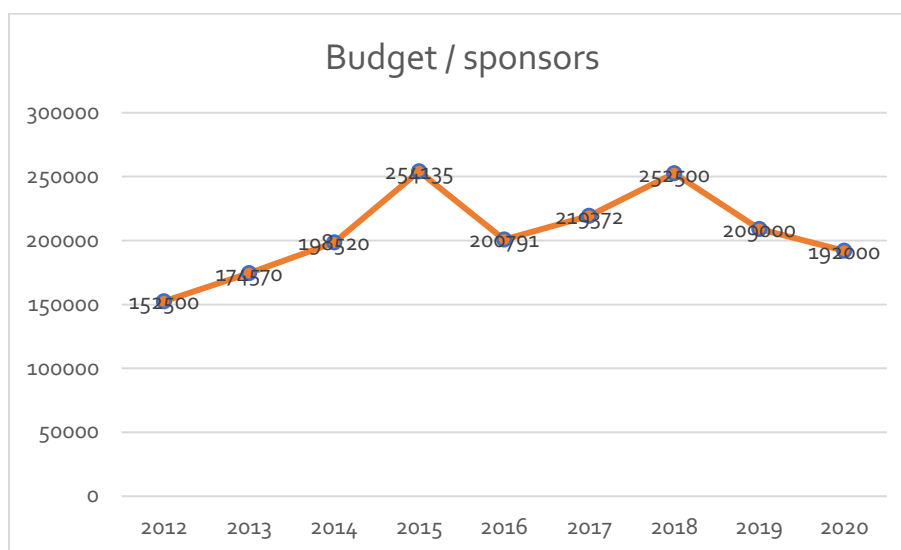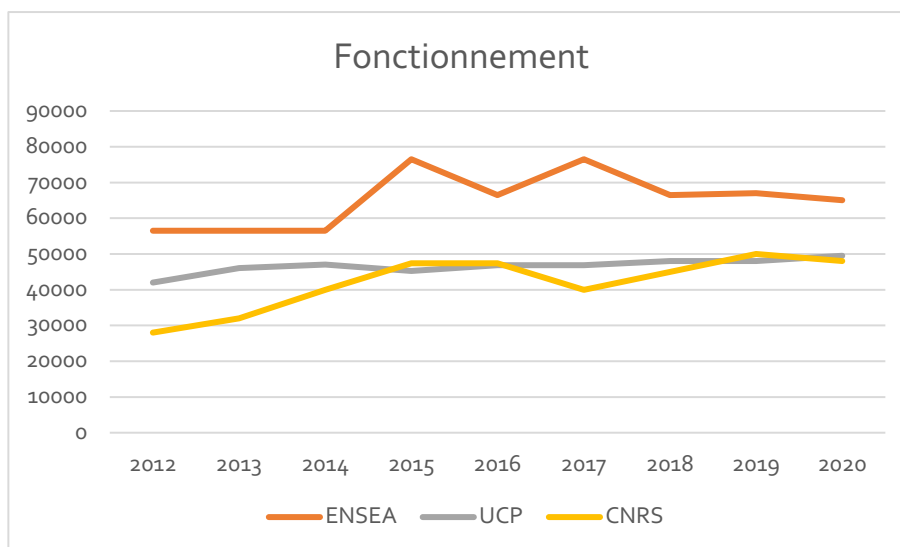
Highlights

- New five-year contract
- COVID-19
- Covert communication research axis (INEX Ambition program and ANR JCJC)
- Collaboration with IPAL (ETIS@Singapour, INEX Program)
- First PhD EUTOPIA programs
- Chair Robotics and Neurosciences
- Equipex+ Espadon
- Creation of the 2nd Spin-off of ETIS: SEQUENCIA
- 5 news colleagues (2 Professor and 3 Assistant Professors)

Innovation in 2020

- **Creation of the 2nd Spin-off of ETIS with the help of the TTO ERGANEO (SATT) – Boris Borzic (MIDI Team)**

SEQUENCIA: Sequencia is developing a solution to analyze, sequence and index in a multimodal way (text, image, sound (ou audio) and animation) any type of streaming or local videos to offer a multicriteria search engine monitored (or controlled) by a remote control (pause, fast forward/rewind, summary, zapping, playlist, DVD-like chaptering). The innovation lies in the total automation of the video content analysis processing chain, which aims to bring together the different points of view of each modality by integrating them into a distributed indexing process.

- **L'Oréal-UNESCO Young Talents Award for Women in Science 2020 - Marie-Morgane PAUMARD (MIDI - Team)**

Her work, carried out in the ETIS laboratory with the help of the GEC laboratory, the LRMH and the C2RMF, concerns the development of a method of automatic reconstruction of objects from fragments in order to facilitate the work of archaeologists.

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ETIS in 2020

General presentation

The laboratory was created in 1980 at the Ecole Nationale Supérieure de l'Electronique et de ses Applications (ENSEA) as the Image Processing Team, then ETIS with the addition of the Signal component. In 1991, ETIS became a joint team of ENSEA and the University of Cergy-Pontoise (UCP). Since 2002, ETIS is a joint research unit (UMR 8051) under the supervision of ENSEA, UCP and CNRS. At the CNRS, ETIS is mainly attached to the National Institute of Information Sciences and their Interactions (INS2I), and secondarily to the National Institute of Engineering Sciences (INSIS). Following the arrival in 2006 of three lecturer-researchers in databases (from the former Laboratoire d'Informatique de Cergy-Pontoise), then in 2009 of seven academics in analogue electronics (from the former EA ECIME), ETIS changed its name to Equipes Traitement de l'Information et Systèmes (Information Processing and Systems Teams), while retaining its ETIS acronym. The laboratory was successively directed by Jean-Pierre Cocquerez (1989-1999), Didier Demigny (2000-2004), Inbar Fijalkow (2005-2012) and Mathias Quoy (2013-2019). Since the 1st January 2020, the laboratory is jointly directed by Olivier Romain (DU) and Véronica Belmega (DUA). The laboratory is located on the premises of ENSEA (1135 m2) and UCP (677 m2 in Saint-Martin, and 90 m2 in Neuville).

Scientific activities

The laboratory carries out both theoretical and experimental research with a view to enabling information processing systems to acquire autonomy capacities. Autonomy is understood here to include learning and adaptation to the environment (including the user), as well as decision-making and low energy consumption or computing power, for example. The systems designed at ETIS are therefore intended to perform intelligent processing for systems that are increasingly complex. The fields concerned are reconfigurable system-on-chip, data analysis, image indexing, developmental robotics, information theory, wireless security and telecommunications.

Teams

Équipes Traitement de l'Information et Systèmes

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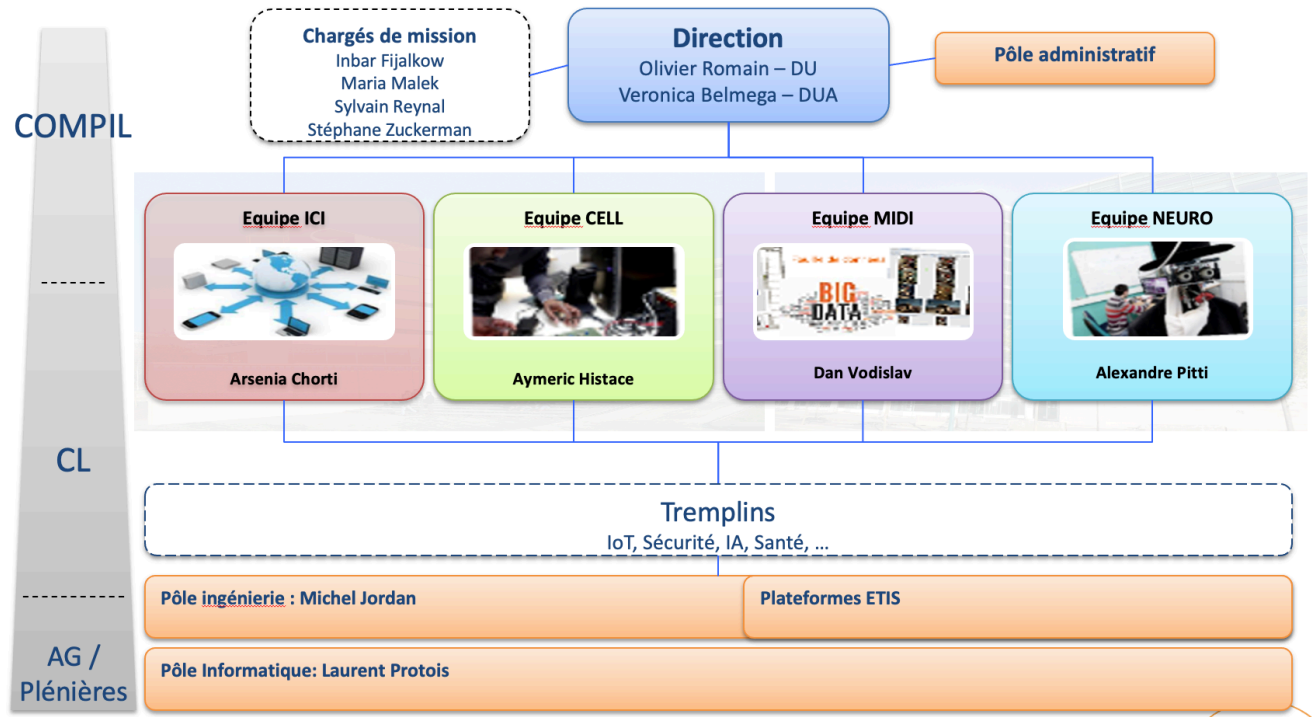
CELL

General presentation

The CELL team is a multidisciplinary team in the field of intelligent embedded systems. It brings together academics from the fields of electronics (microelectronics, analogue, digital and wave electronics), signal and image processing (computer vision in general) and computer science. The work carried out in the team concerns fundamental subjects related to embedded systems (reliability, energy, reconfigurability, processing under computing resource constraints, non-conventional sensors, communication protocol) embodied through application projects in the fields of health, safety, and communicating systems (IoT, autonomous vehicle).

This particularity leads the team to develop several projects in collaboration with the other teams of the laboratory (embedded ML with the MIDI team, Adéquation Algorithme Architecture for error correcting codes with the ICI team, event camera with the Neurocybernetics team) and in connection with experts in the targeted application domains. Thus, the team welcomes several associated researchers or external partners including a PU-PH from the APHP at 100% of its research time, an EC from the University of Glasgow in the field of UWB, and members of the Pôle judiciaire de la gendarmerie nationale (PJGN) located in Pontoise. Since 2019, the team also welcomes associate researchers from CY-Tech (CY Paris Cergy University) and ESIEE-IT.

Highlights in 2020

- April 2020: Start of the CIFRE thesis (NEOXIA Company) of Clara BREMOND on image analysis of brain organoids in microscopy.

- June 2020: Start an industrial contract with the Technopole of the Réunion for the study of a LORA anti-shark barrier.

- September 2020: Start of the CIFRE thesis (IDEMIA Company) of Loïc JEZEQUEL on the automatic detection of anomalies in computer vision with application to the anti-face fraud (joint work with the MIDI team).

- October: Start of the INEX thesis co-financed by APSYS Airbus of Théo SERRU on the convergence between security and safety of complex systems.

- November:

  o Launch of the "DeepTera" project with the University of Mauritius (Mauritius) jointly with IRD Montpellier whose objective is the monitoring of hematophagous dipteran populations using Deep Learning methods applied to Wings Interference Patterns images.

  o Adam TALBI's thesis, financed by the Pôle Judiciaire de la Gendarmerie Nationale (PJGN), on static analysis of binary code and machine learning for vulnerability detection, started.

The team has also submitted in 2020: 5 collaborative projects in phase 1 of the ANR (generic call 2021) and 1 European project showing the dynamism both internally but also the dynamism of its national and international network:

- The PRC "Reeduc@Home" (resp Institut du Mouvement Marseille) on the use of virtual and augmented reality for home rehabilitation.

- PRC "MuMoCo" (resp CRAN Laboratory, Nancy) on the development of a multimodal imager in videocolonoscopy.

- The PRCE "SafeTwin" (Nga NGUYEN) "Formal Framework for Verifiable and Certifiable Integration of System, Safety, Security and Multi-Physics Models in a Digital Twin".

- The JCJC "MEDIC" (Florian Kolbl CELL) proposing to study the differentiation of stem cells by spectroscopic impedance at very high frequency.

- The PRCE "SmartGait" (Olivier ROMAIN) proposing to develop a new non-conventional camera for the identification and characterization of the gait of Elderly, in nursing house.

- The European project INOVEC (IRD) in the framework of the RISE calls, for the implementation of an international Europe-Africa consortium (more than 25 public-private partners) on the monitoring of populations of hematophagous dipterans carrying diseases such as Dengue, Zika, etc. (Selected on the waiting list for the RISE call). (Selected on waiting list in June 2020).

- 1st round of funding for the start-up "Augmented-Endoscopy

- SmartGait: The new multimodal platform for the analysis and estimation of gait, sponsored by INS2I, CYU and ENSEA.

Synthesis of the research activity in 2020

Since March 2019, the team is organized into three research axes: (i) the "Reconfigurable Trustable Architectures" (RTA) axis, the "Agile Circuit for Telecommunications" (ACT) axis and the "Smart Embedded Systems" (SES) axis. Each of them allows to create a core of expertise around a common theme and to organize the interaction at the scientific strategy level of each of them internally to the team and with the other teams of ETIS.

The activities of the year 2020 have of course been largely impacted by the international health situation. Several thesis projects requiring material experiments on site had to be postponed for the time of the strict confinement and two requests for extension have been sent to the doctoral school (6 months and 1 year) in order to allow these works to be pursued under better conditions. The trips abroad have been entirely cancelled for the year 2020, and several events programmed in terms of scientific animation have had to be postponed to 2021 in the hope that the situation will improve.

Nevertheless, by setting up and reinforcing access to remote resources in a very short time thanks to the reactivity of the laboratory and its institutions, it has been possible to maintain a satisfactory level of research activity. A particular follow-up of the doctoral students has been set up in order to identify as quickly as possible any critical situation requiring a particular accompaniment.

KPI of CELL in 2020

Since March 2019, the team has been organized into three research areas: (i) the "Reconfigurable Trusted Architectures" (RTA) axis, the "Agile Circuit for Telecommunications" (ACT) axis and the "Smart Embedded Systems" (SES) axis. Each of them enables the creation of a core of expertise around a common theme and the organization of interaction at the scientific strategy level of each of them within the team and with the other ETIS teams.

Members

- At the 31 December 2019, the team consisted of 36.5 members:
  - o   15.5 permanents:

- 4 Full Professors (1UCP, 2 ENSEA et 1 Central)
- 11 Assistant Professor with 3 HDR
- ½ CNRS Engineers

- 21 non-permanents:
  - 2 contractual members (CDD)
  - 2 engineers/post-doc
  - 2 associate researchers
  - 1 PU-PH of the APHP-Saint Antoine Hospital
  - 1 CY Tech Teacher/Researcher (Ex EISTI) since March 2019.
  - 13 PhD students (all types of funding) 2 associates (CDD)

In – Out

- In :
  - Amine Khelif – CDI MCF ESIEE-IT
  - Juan Angelo Castillo – Ex-EISTI
  - Clara Bremond – PhD (NEOXIA – CIFRE)
  - Theo Serru – PhD (CY - INEX)
  - Loïc Jezequel – PhD (IDEMIA - CIFRE)
  - Adam Talbi – PhD (PJGN)

- Out:
  - Pierre Jacob
  - Yoan Espada

The year 2020 saw the arrival of an EC from CY-Tech (ex-EISTI) as a research associate of the laboratory in the field of high-performance computing.

Amine Khelif, a doctoral student in the team in the field of embedded systems security / IoT has also been recruited within ESIEE-IT (Cergy-St Christophe site, CCI) as a teacher-researcher. He thus benefits from the status of associate researcher of ETIS within the team, through an agreement established with his home institution.

The number of thesis is stable with 2 defenses compensated by the arrival of 2 new theses (2 CIFRE financing).

New PhD

Name	Supervisor	Partner	Type	Start	Title
BREMOND	SIMON-CHANE HISTACE CLOUCHOUX	NEOXIA	CIFRE	01/04/2020	*Extraction and characterization of 3D shapes for regional quantification of massive data.*

DILLEN	GHAFFARI ROMAIN	VUB	EUTOPIA	21/09/2020	Brain-Computer Interface for real-life applications
JAKUPOV	ZEDDINI LONGHI ROMAIN	EXPERTIME	CIFRE	06/04/2020	From knowledge extraction to decision support: combining deep learning and NLP techniques
JEZEQUEL	VU HISTACE	IDEMIA	CIFRE	01/09/2020	Spoof detection by semi-supervised deep learning

Ongoing PhD

Name	Supervisor	Partner	Type	Start	Title
ABDELWAHED	PITTI ROMAIN	VEDECOM	CIFRE	18/10/2018	Adaptive Impedance Spectroscopy for Characteristic Extraction and Exploitation of Artificial Skin: Application to Mobile Robotics as autonomous vehicule
BARRIERE	DUPERRIER ARIAUDO	-	ED	19/09/2019	New architecture of power amplifiers for 5G applications
BESNIER	PICARD HISTACE	VALEO	CIFRE	21/11/2019	Safety of automotive systems using Machine Learning
COLOMER	CUPERLIER BRESSON ROMAIN	VEDECOM	CIFRE	05/11/2019	Integrated neuro-robotic approaches for autonomous vehicle localisation and navigation.
ELOUARET	ZUCKERMAN KESSAL ROMAIN	VEDECOM	INEX	03/12/2018	Online scheduling of software and hardware tasks for FPGA-based architectures
KHELIF	LORANDEL ROMAIN	IDEMIA PJGN	INEX	01/09/2017	Digital Architecture for security vulnerability identification: Application to forensics
LEENHARDT	DRAY HISTACE	-	APHP	02/12/2019	Development of automated computer assisted diagnosis tool for small bowel capsule endosocpy.
REGNACQ	KOLBL	ANR	ANR BIOTIF	21/11/2019	Modeling an Design of a focal stimulator for

	ROMAIN				the peripheral nervous system based on non conventional waveforms.
SASSI	NGUYEN CHELOUAH	PJGN	PJGN	19/09/2019	Artificial intelligence for intrusion detection via connected objects
SERRU	NGUYEN	-	INEX	14/09/2019	Security and Safety of Complex Systems with AltaRica
TALBI	NGUYEN	PJGN	PJGN	19/10/2019	Static Bytecode Analysis and Machine Learning for Backdoor Detection
THOMET	GHAFFARI ROMAIN	ST Micro	CIFRE	06/02/2019	Enhanced Observation Framework for embedded systems exposed to radiations

PhD Defended

Name	Supervisor	Partner	Type	Start	Date of defended	Length	Title
ESPADA	CUPERLIER ROMAIN	VEDECOM	CIFRE	03/10/2016	16/11/2020	47 months	visual localisation by neuromimetic approach in a context of delegated driving
JACOB	KLEIN HISTACE PICARD	PJGN	R2S	16/02/2017	08/09/2020	42 months	high-order statistics for image representations in metric learning

HDR Defended

Name	Responsible	Date of defended	Title
NGUYEN	ROMAIN	21/09/2020	Safety and security of embedded systems: from modeling to verification and validation.

Publications

Journal Papers	Conferences	National	Dissemination	Book	Chapter	Patent	Thesis	Others
12	14	-	1	-	-	2	2	1

Publications with others teams of ETIS

Journal Papers	Conferences	National	Dissemination	Book	Chapter	Patent	Thesis	Others
2 with ICI 1 with MIDI	1 with NEURO	-	-	-	-	1 with NEURO	1 with MIDI 1 with NEURO	-

New contracts – funding

Name	Sponsor	Type	PI	Start	Length	Budget	Budget (ETIS)
SMARTNET	Contract	IE	ROMAIN	01/10/2020	8 months	20 000€	20 000€
NEOXIA	Contract	CIFRE	HISTACE	01/04/2020	3 years	45 000€	45 000€
HAPIVULN	DIM RFSI	Scientific equipment	LORANDEL	15/09/2020	25 months	6822€	6822€
EXPERTIME	ANRT	Thesis CIFRE	ROMAIN	15/03/2020	3 years	45 000€	45 000€
SMARTSTIM	DR15	PRIME80, National Team Project	ROMAIN	12/02/2020	10 months	4 000€	4 000€
TREMPLIN	AAP INS2I	Equipment	ROMAIN	02/03/2020	9 months	10 000€	10 000€
SMARTGAIT	DIM RFSI	Platform	ROMAIN	20/12/2020	12 months	27 720€	27 720€
DEEPTERA	CYU / University of Mauritius	Travel	HISTACE SIMON-CHANE	01/09/2020	12 months	20 000€	20 000€
SMARTNET	Technopole de la Réunion	Industrial Contract	LORANDEL ROMAIN	01/06/2020	13 months	20 000	20 000

Ongoing contracts

Name	Sponsor	Type	PI	Start	Length	Budget	Budget (ETIS)
SSA (Securiry and Safety Analysis)	INEX APP	Financement Contrat Doctoral	NGUYEN	1/10/2019	3 years	274 210 €	60 000€
QCSP	ANR 2019	Post-Doc	GHAFFARI	01/10/2019	4.5 years	787 608€	80 000 €
SmartStim	CNRS 80'	Travels	ROMAIN	01/10/2019	2 years	18 000€	4400 €
Safe ML for Autonomous Vehicle	CIFRE VALEO	Thesis	HISTACE	4/11/2019	3 years	379 800€	45 000€
BioTIF	ANR CRCNS 2019	Thesis	ROMAIN	20/03/2019	3 years	178 300€	178 300€
Plateforme Indentification	Fondaction UCP	Equipment	LORANDEL	09/04/2019	1 year	3 500 €	3 500€
PHC	Campus France	Mobility	ROMAIN	31/12/2019	1 year	2 400 €	2 400€
VEDECOM	VEDECOM	Thesis S. Colomer	ROMAIN	01/09/2019	3 years	150 000€	45 000€
INEX SEEING	PIA	Thesis	KOLBL	01/02/2019	3 years	117 500€	117 500 €
INEX CARING	PIA	Post-doc	ROMAIN	01/07/2019	2 years	106 000€	106 000€
VALEO	VALEO	Thesis CIFRE	HISTACE	4/11/2019	3 years	82 000€	45 000€
INEX Smart video colonoscopy	ANR PIA	Post-doc	HISTACE	01/10/2017	2.5 years	150 000€	106 000€
IDEMIA	CYU	Thesis	ROMAIN	01/10/2017	36 months	60 000 €	52 500 €

Équipes Traitement de l'Information et Systèmes
CY Cergy Paris Université / ENSEA / CNRS UMR 8051

ALICE	*CYU – M2M*	*Thesis*	*HISTACE*	*01/01/2017*	*36 months*	*60 000€*	*52 500€*
NOC Cognitif	*INEX*	*Thesis*	*LORANDEL*	*11/09/2017*	*36 months*	*112 500€*	*112 500€*
I-Polyp	*SATT ERGANEAO*	*Post-doc*	*ROMAIN*	*12/02/2016*	*36 months*	*138 000€*	*138 000€*
INSECT	*DIM RFSI*	*Intership*	*SIMON-CHANE*	*01/02/2018*	*30 months*	*12 000€*	*12 000€*
Reliability	*St Microelectronic*	*Thesis CIFRE*	*GHAFFARI*	*03/12/2018*	*36 months*	*52 300€*	*52 300€*

Scientific Dissemination

Event Organization

Name	Type	Role	Involved	Date	Country
DFM20: 8th International Workshop on Data-Flow Models for Extreme-Scale Systems	*Workshop*	*Chairman*	*ZUCKERMAN*	*July 2020*	*Madrid, Espagna*
Euromicro DSD ASHWAPA 2020	*Special session*	*PC Committee member*	*ROMAIN*	*August 2020*	*Chalkidiki, Greece*
Journée GDR SoC2 – GDR Réparer l'Humain	*Workshop*	*Chairman*	*ROMAIN*	*October 2020*	*Paris*

PhD and HDR juries

Name	Type	Role	Involved	Date	Where
Salam SAMIEI	*PhD*	*Reviewer*	*HISTACE*	*July 2020*	*Université d'Angers (LARIS)*
Ye Tian	*PhD*	*Reviewer*	*ROMAIN*	*June 2020*	*Université Rennes 1*
Joel Ortiz Sosa	*PhD*	*Reviewer*	*ROMAIN*	*December 2020*	*Université*

					Rennes 1
Nicolas Gac	*HDR*	*Reviewer*	*ROMAIN*	*November 2020*	*Université Paris Saclay*

New Platform

- Inauguration of the platform "IoT: Connected greenhouse" platform carried by Camille Simon-Chane on the ENSEA site in the presence of Mrs Ciavecci (Val d'Oise department)

- Financial support for the launch of the "Movement" platform by the CNRS in the framework of the unique call 2021 and CYU.

Research perspectives for 2021

The development of high-performance, intelligent, reliable, and low-resource-consuming embedded systems constitutes a set of both upstream and applied issues that will remain at the heart of the CELL team's activities over the coming year. The targeting of application domains with a high societal impact will remain a priority (IoT, Health, Autonomous Vehicle) and efforts leading to the valorization of more theoretical work will be maintained in order to provide resources (maturation, patents, etc.) for the team's activities. Concerning the dynamics of project submission, these last two years have shown the interest of developing transverse actions with other teams of the laboratory (in this sense 2020 saw the submission of several collaborative projects with the ICI and MIDI teams); in connection with the national and international network of the team, this effort will also be maintained. Finally, particular attention will be paid to detect as early as possible very good candidates to present them to the CNRS competitions in the coming years. In 2019/2020, the application of Ozgun Yilmaz, supported by the team and the laboratory and although not retained by the CNRS, has shown that the accompaniment and the setting up of adapted research projects represent for the team particularly interesting opportunities for medium- and long-term structuring.

Publications 2020

Journals

1. *H. Cui,* ***F. Ghaffari****, K. Le, D. Declercq, J. Lin and Z. Wang, "Design of High-Performance and Area-Efficient Decoder for 5G LDPC Codes," in IEEE Transactions on Circuits and Systems I: Regular Papers, vol. 68, no. 2, pp. 879-891, Feb. 2021, doi: 10.1109/TCSI.2020.3038887.*

2. ***Pierre Jacob****,* ***David Picard****,* ***Aymeric Histace****, Edouard Klein, DIABLO: Dictionary-based attention block for deep metric learning, Pattern Recognition Letters, Elsevier, 2020, (10.1016/j.patrec.2020.03.020）*

3. *Omer Ahmad, Yuichi Mori, Masashi Misawa, Shin-Ei Kudo, John Anderson, Jorge Bernal, Tyler Berzin, Raf Bisschops, Michael Byrne, Peng-Jen Chen, James East, Tom Eelbode, Daniel Elson, Suryakanth Gurudu,* ***Aymeric Histace****, William Karnes, Alessandro Repici, Rajvinder Singh, Pietro Valdastri, Michael Wallace, Pu Wang, Danail Stoyanov, Laurence Lovat, Establishing key research questions for the implementation of artificial intelligence in colonoscopy - a modified Delphi method, Endoscopy, Thieme Publishing, Novembre 2020, (10.1055/a-1306-7590）*

4. ***Romain Leenhardt***, ***Marc Souchaud***, *Guy Houist, J.L. Lemouel, J.C. Saurin, Franck Cholet, Gabriel Rami, Chloé Leandri,* ***Aymeric Histace***, ***Xavier Dray*** *A Neural Network-based Algorithm for Assessing the Cleanliness of Small Bowel during Capsule Endoscopy, Endoscopy, Thieme Publishing, Novembre 2020, (10.1055/a-1301-3841)*

5. ***Romain Leenhardt***, *Cynthia Li, Jean-Philippe Le Mouel, Gabriel Rahmi, Jean Saurin, Franck Cholet, Arnaud Boureille, Xavier Amiot, Michel Delvaux, Clotilde Duburque, Chloé Leandri, Romain Gerard, Stéphane Lecleire, Farida Mesli, Isabelle Nion-Larmurier,* ***Olivier Romain***, *Sylvie Sacher-Huvelin, Camille Simon-Shane, Geoffroy Vanbiervliet, Philippe Marteau,* ***Aymeric Histace***, ***Xavier Dray***, *CAD-CAP: a 25,000-image database serving the development of artificial intelligence for capsule endoscopy, Endoscopy International Open, Georg Thieme Verlag KG, 2020, 8 (3), pp.E415-E420. (10.1055/a-1035-9088)*

6. ***Lylia Alouache***, ***Nga Nguyen***, *Makhlouf Aliouat,* ***Rachid Chelouah***. *HSDN-GRA: a Hybrid SDN-based Geographic Routing Protocol with Multi-agent Approach International Journal of Communication Systems, Wiley, In press*

7. ***Mehdi Terosiet***, *Eldar Zianbetov, Farouk Vallette, Marie-Minerve Louërat, Patrick Garda et al. A comprehensive in-depth study of tri-state inverter based DCO, Microelectronics Journal, Elsevier, 2020, 99, pp.104760. (10.1016/j.mejo.2020.104760)*

8. *Li, X., Li, Z., Fioranelli, F. , Yang, S. ,* ***Romain, O.*** *and* ***Le Kernec, J***. *(2020) Hierarchical radar data analysis for activity and personnel recognition.* Remote Sensing, *12(14), 2237. (doi: 10.3390/rs12142237)*

9. ***Mohamed Amine Khelif***, ***Jordane Lorandel***, ***Olivier Romain***, *Matthieu Regnery, Denis Baheux, Guillaume Barbu, Toward a hardware man-in-the-middle attack on PCIe bus, Microprocessors and Microsystems, Volume 77, 2020, 103198, ISSN 0141-9331, https://doi.org/10.1016/j.micpro.2020.103198.*

10. ***Mohamed Amine Khelif***, ***Jordane Lorandel***, ***Olivier Romain***, *Hardware Man-in-the-Middle Attacks on Smartphones, Forensic Science Today, Vol. 6(1), Pages 012-015, 10.17352/fst.000016*

11. ***Lahdhiri, H***.; ***Lorandel, J***.; *Monteleone, S.;* ***Bourdel, E***.*; Palesi, M. Framework for Design Exploration and Performance Analysis of RF-NoC Manycore Architecture. J. Low Power Electron. Appl. 2020, 10, 37. https://doi.org/10.3390/jlpea10040037*

12. *Y. Nasser,* ***J. Lorandel***, *J. -C. Prévotet and M. Hélard, "RTL to Transistor Level Power Modeling and Estimation Techniques for FPGA and ASIC: A Survey," in IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, vol. 40, no. 3, pp. 479-493, doi: 10.1109/TCAD.2020.3003276.*

Dissemination papers

13. ***Xavier Dray***, *Dimitris Iakovidis, Charles Houdeville, Jodrigo Jover, Dimitris Diamantis,* ***Aymeric Histace***, *Anastasios Koulaouzidis, Artificial intelligence in small bowel capsule endoscopy: Current status, challenges and future promise, Journal of Gastroenterology and Hepatology, Wiley, In press*

Patents

1. *Device and method for producing a numerical classifier of images, so as to determine the viewing quality of the endoscopic videocapsule images of a segment of the digestive tube,* ***Dray Xavier***, ***Histace Aymeric*** *- US Patent 10,980,404, 2021, 20/04/2020*

2. *Tactile sensor to analyse a given material, with Electrical Impedance Tomography (EIT),* ***Medhi Abdelwahed***, ***Alexandre Pitti***, ***Olivier Romain*** *and Fethi Ben Ouezdou, EUROPE - Patent application No. EP20214321.0 filed on 15 December 2020.*

Conference papers

1. ***Romain Leenhardt***, ***Marc Souchaud***, *Guy Houist, J.L. Lemouel, J.C. Saurin, Franck Cholet, Gabriel Rahmi, Céline Leandri,* ***Aymeric Histace***, ***Xavier Dray***, *A Highly Sensitive Neural Network-Based algorithm For Assessing the Cleanliness of Small Bowel During Capsule Endoscopy, UEG Week, Oct 2020, Virtual, France*

2. ***Romain Leenhardt***, ***Marc Souchaud***, *Aymeric Becq*, **Aymeric Histace**, **Xavier Dray**, *Artificial Intelligence Alleviates The Tedious Task of Reading Small Bowel Capsule Endoscopy Recordings, European Society of Gastrointestinal Endoscopy Days (ESGE Days), Apr 2020, Dublin, Ireland. pp.S235-S236, ⟨10.1055/s-0040-1704737⟩, DOI : 10.1055/s-0040-1704737*

3. *Valentine Wargnier-Dauchelle*, **Camille Simon Chane**, **Aymeric Histace**, *Saliency maps of video-colonoscopy images for the analysis of their content and the prevention of colorectal cancer risks, Biosignals 2020, INSTICC, Feb 2020, Valetta, Malta.*

4. ***Habiba Lahdhiri***, *Maurizio Palesi, Salvatore Monteleone, Davide Patti, Giuseppe Ascia et al. DNNZip: Selective Layers Compression Technique in Deep Neural Network Accelerators, Euromicro Conference on Digital System Design DSD, Aug 2020, Portorož, Slovenia*

5. ***Jordane Lorandel***, ***Habiba Lahdhiri***, ***Emmanuelle Bourdel***, *Salvatore Monteleone, Maurizio Palesi. Efficient Compression Technique for NoC-based Deep Neural Network Accelerators, Euromicro Conference on Digital System Design (DSD 2020), Aug 2020, Portoroz, Slovenia*

6. ***Nga Nguyen***, *Faida Mhenni, Jean-Yves Choley. A Study on SysML and AltaRica Models Transformation, 2020 IEEE International Systems Conference (SysCon), Aug 2020, Montreal, France. pp.1-6, ⟨10.1109/SysCon47679.2020.9275868⟩*

7. *Tongsheng Geng, Marcos Amaris, **Stéphane Zuckerman**, Alfredo Goldman, **Tarek Elouaret** et al. PDAWL: Profile-based Iterative Dynamic Adaptive WorkLoad Balance on Heterogeneous Architectures, Job Scheduling Strategies for Parallel Processing, May 2020, New Orleans, LO, United States*

8. ***M. Abdelwahed***, ***A. Pitti***, ***O. Romain*** *and F. B. Ouezdou, "Use of Multi-frequency Electrical Impedance Tomography as Tactile Sensor for Material Discrimination," 2020 5th International Conference on Advanced Robotics and Mechatronics (ICARM), 2020, pp. 588-594, doi: 10.1109/ICARM49381.2020.9195347.*

9. *Li, Z., Fioranelli, F. , Yang, S. , Zhang, L. , **O. Romain**., He, Q., Cui, G. and Le Kernec, J. (2020) Multi-domains based Human Activity Classification in Radar. In: IET International Radar Conference 2020, Chongqing City, China, 4-6 Nov 2020, (Accepted for Publication)*

10. *Li, X., Fioranelli, F. , Yang, S. , **Romain, O**. and Le Kernec, J. (2020) Radar-Based Hierarchical Human Activity Classification. In: IET International Radar Conference 2020, Chongqing City, China, 4-6 Nov 2020, (Accepted for Publication)*

11. *Jiang, H., Fioranelli, F. , Yang, S. , **Romain, O**. and Le Kernec, J. (2020) Human Activity Classification Using Radar Signal and RNN Networks. In: IET International Radar Conference 2020, Chongqing City, China, 4-6 Nov 2020, (Accepted for Publication)*

12. *Zhou, B., Le Kernec, J., Yang, S., Fioranelli, F. **, Romain, O**. and Zhao, Z. (2020) Interferometric Radar for Activity Recognition and Benchmarking in Different Radar Geometries. In: IET International Radar Conference 2020, Chongqing City, China, 4-6 Nov 2020, (Accepted for Publication)*

13. *Guo, J., Shu, C., Zhou, Y., Wang, K., Fioranelli, F. , **Romain, O**. and Le Kernec, J. (2020) Complex Field-based Fusion Network for Human Activities Classification With Radar. In: IET International Radar Conference 2020, Chongqing City, China, 4-6 Nov 2020, (Accepted for Publication)*

14. *M. Jia, S. Li, J. L. Kernec, S. Yang, F. Fioranelli and **O. Romain**, "Human activity classification with radar signal processing and machine learning," 2020 International Conference on UK-China Emerging Technologies (UCET), 2020, pp. 1-5, doi: 10.1109/UCET51115.2020.9205461.*

ICI

General presentation

The ICI team's research focus is on wireless communications, information theory, signal processing and imaging. The team has the unique characteristic to cover the whole scientific and technical spectrum behind theory, the conception and the system design of wireless systems as well as specialized signal processing topics in the area of imaging; the profile of the team ICI largely aligns with section 7 of the CNRS themes but also touches upon aspects of section 6.

There are two main interfaces between the research conducted by the team ICI and other teams in ETIS. First with the team CELL, there are common undergoing works in three topics, namely on Internet of things networks, on coding (LDPC and Polar) and finally on security. Secondly, there are topics on artificial intelligence of common interest with the team MIDI and this aspect could be strengthened in the future.

Overall, the research topics covered by the ICI group lie primarily on the following domain areas:

- Wireless communications, B5G and 6G, including:
    - machine learning for communications, resource allocation, low energy / latency, localization, mmWave, IoT, waveform design.

- Security for wireless communications and B5G, including:
    - physical layer security, covertness, physical unclonable functions / biometric authentication, lattice-based cryptography, privacy, intrusion detection in IoT networks.

- Coding and information theory:
    - graph codes (e.g., LDPC), polar codes and lattices, interplay between information theory and game theory, strategic communications.

- Networking and caching, including:
    - layer 2 scheduling, energy efficient protocols, enhanced mobile broadband (eMBB) and ultra-reliable low latency communications (URLLC) coexistence.

- Imaging and modelling.

Thanks to the international outreach of senior ICI members, the group managed to attract new members in 2020 with strong background in information theory as well as wireless communications, e.g., the recent recruitment of Dr. Sara Berri.

Highlights in 2020

The ICI group increased substantially its international visibility as well as its research output notably in terms of Q1 journal articles, primarily in IEEE. The number of first tier conference publications has decreased, but we believe this is

largely related to covid-19 and the fact that most conferences have turned virtual. Furthermore, ICI members participated actively in the INEX calls for funding and secured projects worth more than half a million Euros in 2020. Additionally, despite the travel restrictions due to covid-19, team members managed to host one Associate Professor as an international guest from Rutgers University (New Jersey, US), Dr. S. El Ruyaheb. Finally, one HDR thesis was successfully defended in 2020 along with 3 PhD theses.

Synthesis of the research activity in 2020

In 2020 the collaboration between team members has been evidenced in many joint research proposals and research papers. Notably, 5 team members (Wang, Le Treust, Chorti, Luzzi, Chafii) came together in a common research project funded by the INEX scheme Ambition, on the niche area of physical layer security; the related project PHEBE investigates TRL 1 topics such as covertness in communications and state masking, to TRL 2 and 3 topics including the implementation of practical codes for secrecy, biometric authentication etc. Furthermore, other state-of-the-art approaches in security such as mutli-factor authentication protocols leveraging high precision localization and statistical signal processing techniques for intrusion detection in IoT were pursued. Another important activity of the team concerned the development of learning algorithms using machine learning tools and re-enforcement learning approaches for demanding communication settings. Also, our activities extended to energy efficient systems, mmWaves, information centric networking, scheduling, vehicular networks, etc.

The ICI group produced 24 International Refereed Journals, 2 Book Chapters and 22 Refereed International and National Conference Papers, for which the detailed list is given below. Most of the team's research output was in top IEEE Journals, e.g., the IEEE Transactions on Wireless Communications, the IEEE Transactions on Signal processing, IEEE Transactions on Information Theory, IEEE Access, IEEE Wireless Communications Letters, IEEE Communication Letters, IEEE Transactions on Computational Imaging, IEEE Transactions on Radiation and Plasma Medical Sciences, and IEEE Conferences including IEEE-EMBC, IEEE-NSS/MIC, GLOBECOM, ICC, ISIT, ITW, PIMRC, WCNC, 5GWF, VTC, etc. Other notable activities of the ICI group in 2020 are summarized as below:

- Strengthening of international collaborations ;
- A wide range of activities in terms of research funding proposals;
- 1 successful HDR defended (A. Chorti);
- 1 PhD thesis defended successfully (details below), and a further 2 for which the students were registered at the ED of CYU Cergy Paris Université;
- Hosting of Salim El Ruyaheb ;
- Participation of group members to IEEE Committees, e.g., the ETI in Machine Learning (M. Chafii), the IEEE INGR in Security (A. Chorti), IEEE 1951.1 Standardization Groups (A. Chorti), etc.
- Organization of special sessions and workshops in top IEEE International Conferences such as at IEEE SSP (A. Chorti), IEEE ISWCS (A. Chorti and M. Chafii), etc.
- Outreach activities for women equality in engineering (A. Chorti and I. Fijalkow).

KPI of ICI in 2020

Members

As of 1st September 2020, the ICI Group has:

- 14 permanent members:
    - o 3 Full Professors
    - o 9 Assistant Professors

- o 2 Full CNRS Researchers – CR
- 19 non-permanent members:
  - o 2 associates (Rachid Chelouah, Astrid Jourdan)
  - o 14 PhD Students registered at the ED of CYU and a further 9 registered at other EDs but supervised by ICI members
  - o 3 postdocs

Publications

Journal	Conferences	National	Dissemination	Book	Chapter	Patent	Thesis	Others
26	22	-	-	-	2	-	3	1

Publications with others teams of ETIS

Journal Papers	Conferences	National	Dissemination	Book	Chapter	Patent	Thesis	Others
2 with CELL	-	-	-	-	-	-	-	-

Ongoing PhD

14 PhD students registered with the ED CYU and further 9 PhD students co-supervised by team members and registered in a different doctoral school.

Name	Supervisor	Partner	Type	Start	Title
ALI	ANDRIYANOVA	ECOBIOH2	ED – ADEME	11/02/2019	*Energy-aware Green Data Center Network and Job Scheduling*
BEN ATIA	BELMEGA, SAVART, NEGREL	IMT Lille ESIEE	ED	21/07/2020	*cooPeration, Optimization and arTificial Intelligence for future communicatiONs: interplay between model-based and data-driven approacheS*
BELLO	FIJALKOW CHORTI	-	ED	01/11/2019	*Meeting delay and security constraints in sixth generation (6G) wireless networks*
BOUSHAMA	CHELOUAH MAACHAOUI	Co-tutelle Algérie	MESR Algérien	01/09/2015	*Security in ubiquitous networks.*
DESPORTES	FIJALKOW ANDRY	ECOBIOH2	ED - ADEME	09/10/2018	*Learning, Forecasting and optimization of energy supply for a low environmental impact building*

EL HASSANI	BELMEGA SAVART	IMT Lille	ED – ANR Eliot	01/10/2019	Energy-efficient IoT networks
GIZZINI	HISTACE CHAFII	-	ED – ANR INEX	29/11/2018	Machine learning based channel estimation for high mobility vehicular communications
MOKNI	CHELOUAH NAZIH	-	MESR - Tunisie	01/09/2018	workflow scheduling on cloud-fog computing
REZGUI	FIJALKOW ANDRIYANOVA	-	ED – ANR MUSICO	01/10/2017	Coded Modulations for Optical Communication Under High-Throughput, Latency and Complexity Constraints
ROSSEEL	FIJALKOW SAVIN	CEA	ED - CEA	05/10/2020	POWER EFFICIENT AI-BASED IOT PHYSICAL LAYER
SALIBA	FIJALKOW LUZZI	-	ED - INEX	28/09/2017	Lattice hash functions for secret key generation.
TARPAU	NGUYEN-VERGER DUMAS	UVSQ	ED – Labex MME-DII	01/11/2018	A new modality of Compton Scattering Tomography: concept, modelling and associated inverse problems

PhD Defended

Name	Supervisor	Partner	Type	Start	Date of defended	Length	Title
MILI SAOUSSEN	RACHID CHELOUAH NGA NGUYEN	-	ED	01/10/2016	5/10/2020	45 months	Approach to formal verification of safety requirements for communicating embedded systems
SOTIRIS SKAPERAS	ARSENIA CHORTI	L. Mamatas University of Macedonia in Thessaloniki	H2020 Project Monroe	01/01/2017	5/10/2020	42 months	"Data analysis and forecasting models for flexible resource management in 5th generation networks"

| MIROSLAV MITEV | ARSENIA CHORTI | Prof. M.J. Reed, University of Essex, UK | Doctoral school of the university of Essex | 25/04/2017 | 26/09/2020 | 40 months | "Physical layer security for the Internet of things" |

HDR Defended

- Arsenia CHORTI, « Security Protocols and Resource Allocation for Fith Generation Networks", HDR thesis, Cergy Paris University, Defended the 5th October, 2020.

New contracts

Name	Sponsor	Type	PI	Start	Length	Budget	Budget (ETIS)
POTIONS	ALLOCATION DOCTORALE	PhD	BELMEGA	01/10/2020	3 years	93 000€	93 000€
ECOLE D'ÉTÉ	UNIV DRESDEN	Workshop	CHAFII	23/09/2020 - deferred	1 year	5 500€	5 500€
PROCOPE 2020-2021	PHC	Mobilité france allemagne	CHORTI	01/01/2020	24 months	14 000€	14 000€
CEA TECH	CEA	PhD	FIJALKOW	19/10/2020	3 years	0 €	0 €
COSI	ANR	PhD	WANG	30/11/2020	42 months	158 220€	158 220€
PHC MAIMONIDE	SUBVENTION AUTRE	Travels	WANG	27/03/2020	9 months	11 000€	11 000€
IDEX ENIGMA	ANR	Post Doc	CHORTI	01/01/2020	2 years	112 000 €	112 000 €
INEX PHEBE	INEX	PhD	WANG	01/07/2020	4 years	1 919 381 €	391 500 €
COVERT	AAP INS2I	Travels	WANG	02/03/2020	9 months	10 000€	10 000€

Ongoing contracts

Name	Sponsor	Type	PI	Start	Length	Budget	Budget

							(ETIS)
QCSP	ANR	Post-Doc	LUZZI	01/10/2019	4 years	787 608€	80 k€ (Cf CELL)
Security in Distributed Inference	PHC Maimonide	Travels	WANG	01/10/2019	2 years	130,000 €	64 000€
SAFEST	DIM RFSI	Post-Doc	CHORTI	19/03/2019	2.5 years	27 500€	27 500€
eNiGMA	INEX	Post-Doc	CHORTI	pending	2 years	287 137€	112 00€
COSA	INEX	Doctorant Roni Bou Rouphael	Le TREUST	01/10/2019	3 years	403 724 €	117 500 €
ELIOT	ANR + FAPESP	Thesis Post doc	BELMEGA	01/11/2018	4.5 years	390 420€	390 420€
ECOBIOH2	ADEME	Thesis	FIJALKOW	17/05/2018	4.5 years	580 149€	457 708€
INEX Lattice hash functions for secret key generation	ANR/PIA	Thesis	LUZZI	01/10/2017	3 years and 10 months	112 500€	112 500€
ECOMICENE	DigiCosme – INRIA	Thesis	WEIDMANN	01/11/2017	46 months	145 000€	0€
CHAIRE ASIA	INEX AAP CHAIRE	Thesis	CHAFII	01/09/2018	4 years	216 000€	216 000€
TARPAU	Labex MMEDII DIM Mathinnov	Thesis	NGUYEN	01/10/2018	30/09/2021	48 600€	48 600€

Scientific Dissemination

Event Organization

- Arsenia CHORTI, « Security Protocols and Resource Allocation for Fith Generation Networks", HDR thesis, Cergy Paris University, Defended the 5th of October, 2020.

GDR ISIS workshop	Enabling ultra-reliability, low latency and massive connectivity	Arsenia Chorti, Inbar Fijalkow	June 18 2020	virtual
European Conference on Artificial Intelligence (ECAI)	Organization of Women in AI Meeting	Marwa Chafii	September 2020	virtual
IEEE SPAWC Special Session	Machine Learning for Communications	Marwa Chafii	2020	Atlanta US

Invited Professors

- Salim El Ruyaheb, IEA International Fellow, hosted by I. Andriyanova and A. Chorti

Guest Editor

- A. Chorti is an Associate Editor IEEE Open Journal of the Signal Processing Society (OJSP) since 1/1/2020.
- V. Belmega - Executive Editor for the Transactions on Emerging Telecommunications Technologies
- M. Chafii is an associate Editor at IEEE Communications Letters
- M. Chafii is a Guest Editor at Frontiers in Communications and Networks
- L. Wang is an Associate Editor for Shannon Theory, IEEE Transactions on Information Theory (since Oct. 2019).

TPCs

- ICI members have served at many TPCs, indicatively: IEEE Globecom, IEEE ICC, IEEE WiOpt, IEEE PIMRC, European Wireless, IEEE 5G World Forum, 2020 International Zurich Seminar on Information and Communication, etc.

Prizes and Distinctions

- V. Belmega and A. Chorti became Senior Members of the IEEE
- A. Chorti was awarded a six months CNRS delegation
- A. Chorti became a member IEEE INGR Security and of the IEEE 1951.1 Standardization workgroup
- V. Belmega was qualified PR - CNU 61
- M. Chafii has been nominated in the top 10 Rising Stars in Computer Networking and Communications by N2Women in 2020

- M. Chafii has received the Best Editor Award for IEEE Communications Letters

National and local scientific responsibilities

- PhD juries : V. Belmega was rapporteur of 1 PhD thesis (Univ. Grenoble Alpes)

- PhD juries : Mai K. Nguyen was examiner of 1 PhD thesis (Univ. Paris-Saclay)

- PhD juries: A. Chorti was examiner of 2 PhD thesis (Telecom Paris and University of Macedonia GR)

- Associate Professor hiring committees (CoS) : V. Belmega participated in 4 CoS (1 ENSEA, 2 ESIEE-IT, 1 IMT Lille Douai)

- Associate Professor hiring committees (CoS): A. Chorti participated in 1 CoS (CYU)

- ETIS: V. Belmega DUA (Deputy Director)

- Mai K. Nguyen is a member of the Council of the Institute of Science and Technology (IST), CY Tech, CY Cergy Paris University

- M. Le Treust is elected member of the CoNRS - Secretary of the Scientific Council of Institut (CSI) INS2I, CNRS

Invited Talks

- A. Chorti gave a Tutorial on "What Physical Layer Security Can Do for 6G", IEEE Global Communications (GLOBECOM) 2020, A. Chorti and V. Poor, Taipei TW.

- A. Chorti was Invited Speaker at the Nokia Bell Labs University Day, Dec. 3 2020, "Context aware 6G security: the role of PHY".

- A. Chorti gave an Invited Talk in the Security Track 5G World Forum, Sep. 2020 Physical layer security in B5G low latency scenarios.

- A. Chorti gave an Invited Talk, live streaming session on YouTube Sep. 2020, "Security Issues in 5G", 5G Evolution

- S. Berri, "Content-Prefetching and Broadcast Scheduling in Vehicular Networks," GDR RSD, Jan. 2020, Nantes, France.

- Mai K. Nguyen « Some Generalized Radon Transforms inspired from Imaging Technology", The 10th International Conference "Inverse Problems: Modeling and Simulation" (IPMS), 2020 (Invited Talk).

- Le Treust, M. "Strategic communication and persuasion" (with Tomala, T.), GT Entropie, mots, stat, Département de Mathématique de l'université de Caen, Nov. 2020.

- Le Treust, M. "Strategic communication and persuasion" (with Tomala, T.), Relax workshop on Games, Chennai Institute of Mathematics, Chennai (Madras), India, March 2020.

Research perspectives for 2021

The team ICI is getting a very strong presence in many topics in wireless communications, additionally to its long-standing recognition in information theory, coding and signal processing topics. The team's strength on information theoretic security grows. Deep learning for communication applications seems to be one of the emerging topics in the team and is expected to be strengthened with applications exceeding standard topics (such as localization and channel estimation) to the design of low complexity decoding approaches, reaching context awareness in future networks, etc. Team members also start engaging in subTHz communications topics. All these activities fall under the general umbrella of beyond 5G and emerging 6G systems.

Publications 2020

Journals

1. Longguang Li, Stefan M. Moser, **Ligong Wang**, and Michèle Wigger, "On the Capacity of MIMO Optical Wireless Channels," IEEE Transactions on Information Theory, vol. 66, no. 9, pp. 5660–5682, Sept. 2020.

2. **Ligong Wang**, "Asymptotic Capacity Results on the Discrete-Time Poisson Channel and the Noiseless Binary Channel with Detector Dead Time," Entropy, vol. 22, no. 8, 846, Aug. 2020.

3. Cervia, G. and **Luzzi, L.** and **Le Treust, M.** and Bloch, M. Strong coordination of signals and actions over noisy channels with two-sided state information, IEEE Trans. on Information Theory, IEEE Trans. on Information Theory, Volume: 66, Issue: 8, Pages: 4681-4708, Aug. 2020.

4. **Cécilia Tarpau**, Javier Cebeiro, **Mai K. Nguyen**, Geneviève Rollet, Marcela A. Morvidone, « Analytic inversion of a Radon transform on double circular arcs with applications in Compton Scattering Tomography », IEEE Transactions on Computational Imaging, 2020, Vol.6, pp. 958-967. [doi : 10.1109/TCI.2020.2999672], <hal-02467912>.

5. **Cécilia Tarpau**, Javier Cebeiro, Marcela A. Morvidone and **Mai K. Nguyen**, « A new concept of Compton scattering tomography and the development of the corresponding circular Radon transform », IEEE Transactions on Radiation and Plasma Medical Sciences, Vol.4, Issue 4, pp. 433-440, July 2020. [doi :10.1109/TRPMS.2019.2943555], <hal-02922205>.

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7. Thanh Phuong Nguyen, Xuan Son Nguyen, Mohamed Anouar Borgi and **Mai K. Nguyen**, « A projection based method for shape measurement », Journal of Mathematical Imaging and Vision, **62,** 489–504 (2020), 08 January 2020. [https://doi.org/10.1007/s10851-019-00932-w]. < hal-02368681>.

8. M. Bello, **A. Chorti, I. Fijalkow,** W. Yu, L. Musavian, "Asymptotic Performance Analysis of NOMA Uplink Networks Under Statistical QoS Delay Constraints", IEEE Open J. Wireless Commun. (OJWC), Special Issue on NOMA for 5G and Beyond, vol.1 pp. 1691-1706, Oct. 2020.

9. M. Pischella, **A. Chorti, I. Fijalkow**, "On the Performance of NOMA-Relevant Strategies Under Statistical Delay QoS Constraints", IEEE Wireless Commun. Letters, vol. 9, no 8, pp. 1323-1326, Aug. 2020.

10. M. Miroslav, **A. Chorti**, M.J. Reed, L. Musavian, "Authenticated Secret Key Generation in Delay Constrained Wireless Systems", EURASIP Journal Wireless Commun. Networks, vo. 122, Jun. 2020.

11. S. Skaperas, L. Mamatas, **A. Chorti**, "Real-Time Algorithms for the Detection of Changes in the Variance of Video Content Popularity", IEEE Access, vol. 8, pp: 30,445-30,457, Feb. 2020

12. H. El Hassani, A. Savard, and **E. V. Belmega**, "Adaptive NOMA in time-varying wireless networks with no CSIT/CDIT relying on a 1-bit feedback", accepted paper IEEE Wireless Commun. Lett., Nov.2020.

13. I. Chafaa, **E.V. Belmega**, and M. Debbah, "One-bit Feedback exponential learning for beam alignment in mobile mmWave", IEEE Access, pp.194575-194589, Oct. 2020.

14. O. Bilenne, P. Mertikopoulos, and **E.V. Belmega**, "Fast Optimization with Zeroth-order Feedback in Distributed Multi-User MIMO Systems", IEEE Trans. on Signal Processing, vol. 68, pp.6085-6100, Oct. 2020.

15. A. Savard, and **E.V. Belmega**, "Full-duplex Relaying for Opportunistic Spectrum Access under an Overall Power Constraint", IEEE Access, pp. 168262-168272, Sep. 2020.

16. Ali Azim, Yannis Le Guennec, **Marwa Chafii**, and Laurent Ros. Filtered asymmetrically clipped optical-ofdm with index modulation for optical wireless systems. IEEE Communications Letters, pages 11, 2020.

17. *Ali Waqar Azim, Yannis Le Guennec, **Marwa Chafii**, and Laurent Ros. LACO-OFDM with Index Modulation for Optical Wireless Systems. IEEE Communications Letters, December 2020.*

18. *Roberto Bomn, Ahmad Nimr, **Marwa Chafii**, and Gerhard Fettweis. A Robust and Low-Complexity Walsh-Hadamard Modulation for Doubly-Dispersive Channels. IEEE Communications Letters, 2020.*

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20. *Muhammad Basit Shahab, Sarah J Johnson, Mahyar Shirvanimoghaddam, **Marwa Chafii**, Ertugrul Basar, and Mischa Dohler. Index Modulation Aided Uplink NOMA for Massive Machine Type Communications. IEEE Wireless Communications Letters, 9(12) :21592162, 2020.*

21. *Ali Waqar Azim, Yannis Le Guennec, **Marwa Chafii**, and Laurent Ros. Enhanced Optical-OFDM with Index and Dual-Mode Modulation for Optical Wireless Systems. IEEE Access, 8 :128664, 2020*

22. *Abdul Karim Gizzini, **Marwa Chafii**, Ahmad Nimr, and Gerhard Fettweis. Deep learning based channel estimation schemes for ieee 802.11 p standard. IEEE Access, 8 :113751113765, 2020*

23. *Shahab Ehsanfar, **Marwa Chafii**, and Gerhard Fettweis. On UW-based Transmission for MIMO Multi-Carriers with Spatial Multiplexing. IEEE Transactions on Wireless Communications, 2020*

24. *Ali Waqar Azim, **Marwa Chafii**, Yannis Le Guennec, and Laurent Ros. Spectral and Energy Efficient Fast-OFDM with Index Modulation for Optical Wireless Systems. IEEE Communications Letters, 2020.*

25. *H. Cui, F. Ghaffari, K. Le, **D. Declercq**, J. Lin and Z. Wang, "Design of High-Performance and Area-Efficient Decoder for 5G LDPC Codes," in IEEE Transactions on Circuits and Systems I: Regular Papers, vol. 68, no. 2, pp. 879-891, Feb. 2021, doi: 10.1109/TCSI.2020.3038887.*

26. ***Lylia Alouache**, Nga Nguyen, Makhlouf Aliouat, **Rachid Chelouah**. HSDN-GRA: a Hybrid SDN-based Geographic Routing Protocol with Multi-agent Approach International Journal of Communication Systems, Wiley, In press*

Conferences (1 invited, 1 spotlight talk)

1. *G.A. Nunez Segura, **A. Chorti**, C.B. Margi, "Multimetric Online Intrusion Detection in Software-Defined Wireless Sensor Networks", in Proc. LATINCOM 2020, Nov. 2020.*

2. *G. A. Nunez Segura, S. Skaperas, **A. Chorti**, C. B. Margi, L. Mamatas, "Real Time Detection of DDoS Attacks in SDN Wireless Sensor Networks", in Proc. IEEE Int. Conf. Commun. (ICC) Worskhop on SDN Security, 7-11 Jun. 2020, Dublin UK.*

3. *B. Mouktar, W. Yu, **A. Chorti**, L. Musavian, "Asymptotic Analyses of the Performance of NOMA Uplink Networks under Statistical QoS Delay Constraints", in Proc. IEEE ICC 2020, Dublin, UK.*

4. *Cécilia Tarpau, Javier Cebeiro, **Mai K. Nguyen**, Geneviève Rollet and Laurent Dumas, « A 3D imaging system based on scattered ionizing radiation », », International Conference of SPIE Photonics Europe, April 7-10, 2020, Proc. SPIE 11351, Unconventional Optical Imaging II, 1135107, (http://doi.org/10.1117/12.2556966).*

5. *Cécilia Tarpau and **Mai K. Nguyen**, " Nouvelles possibilités d'imagerie à partir de la Tomographie Compton Circulaire», 15e Journées Imagerie Optique Non-Conventionnelle (JIONC), GdR ISIS, GdR Ondes & SFO (Société Française d'Optique), Institut Langevin, Paris, 11-12 mars 2020.*

6. *H. El Hassani, A. Savard, and **E.V. Belmega**, "A closed-form solution for energy-efficiency optimization in multi-user downlink NOMA", IEEE PIMRC, Sep. 2020.*

7. *A. Savard, and **E.V. Belmega**, "Optimal Power Allocation Policies in Multi-hop Cognitive Radio Networks", IEEE PIMRC, Sep. 2020.*

8. O. Bilenne, P. Mertikopoulos, and **E.V. Belmega**, "Derivative-free optimization over multi-user MIMO networks", **invited paper** NetGCoop, 2020.

9. I. Chafaa, **E.V. Belmega**, and M. Debbah, "Exploiting Channel Sparsity for Beam Alignment in mmWave Systems via Exponential Learning", IEEE ICC, Open Workshop on Machine Learning for Communications (ML4COM), Dublin, Ireland, Jun. 2020.

10. K. Antonakopoulos, **E. V. Belmega**, and P. Mertikopoulos, "Online and stochastic optimization beyond Lipschitz continuity: A Riemannian approach", ICLR, 8th Intl. Conf. on Learning Representations, Jan. 2020 **[selected for spotlight talk]**, Addis Ababa, Ethiopia, Apr. 2020.

11. **S. Berri**, J. Zhang, B. Bensaou, and H. Labiod, "Privacy-Preserving Data-Prefetching in Vehicular Networks via Reinforcement Learning", in Proc. IEEE International Conference on Communications (ICC), 07-11 Jun. 2020, Dublin, UK.

12. Abdul Karim Gizzini, **Marwa Chafii**, Ahmad Nimr, and Gerhard Fettweis. Joint TRFI and Deep Learning for Vehicular Channel Estimation. In IEEE GLOBECOM 2020, 2020

13. Ivo Bizon Franco de Almeida, **Marwa Chafii**, Ahmad Nimr, and Gerhard Fettweis. In-phase and Quadrature Chirp Spread Spectrum for IoT Communications. IEEE Globecom, 2020

14. Abdul Karim Gizzini, **Marwa Chafii**, Ahmad Nimr, and Gerhard Fettweis. Adaptive Channel Estimation based on Deep Learning. In The 2020 IEEE 92nd Vehicular Technology Conference : VTC2020-Fall, 2020

15. Ana Belen Martinez, Atul Kumar, **Marwa Chafii**, and Gerhard Fettweis. A new approach for enhanced detection using chirp reference signals. In IEEE VTC2020-fall, Victoria, Canada, pages 15. IEEE, October 2020

16. Ana Belen Martinez, Atul Kumar, **Marwa Chafii**, and Gerhard Fettweis. A new approach for accurate time synchronization using chirp signals. In 2020 IEEE 91st Vehicular Technology Conference (VTC2020-Spring), pages 15. IEEE, 2020

17. Abdul Karim Gizzini, **Marwa Chafii**, Ahmad Nimr, and Gerhard Fettweis. Enhancing least square channel estimation using deep learning. In 2020 IEEE 91st Vehicular Technology Conference : VTC2020-Spring, 2020

18. Shahab Ehsanfar, **Marwa Chafii**, and Gerhard Fettweis. A study on unique-word based synchronization for mimo systems over time-varying channels. In 2020 IEEE Wireless Communications and Networking Conference (WCNC), pages 17. IEEE, 2020

19. Ana Belen Martinez, Atul Kumar, **Marwa Chafii**, and Gerhard Fettweis. A Chirp-Based Frequency Synchronization Approach for Flat Fading Channels. In 2020 2nd 6G Wireless Summit (6G SUMMIT), pages 15. IEEE, 2020

20. **Ligong Wang** and Gregory W. Wornell, "Communication Subject to State Obfuscation," 2020 International Zurich Seminar on Information and Communication, Zurich, Switzerland, 26–28 Feb. 2020.

21. **Le Treust, M.** and Tomala, T., Point-to-Point Strategic Communication, IEEE Information Theory Workshop (ITW), Riva del Garda, Italy, 2020.

22. Charpenay, N. and **Le Treust, M.**, Zero-Error Coding with a Generator Set of Variable-Length Words, IEEE Information Symposium on Information Theory (ISIT), Los-Angeles, June 2020.

Book chapters

1. R. Vehkalahti, **L. Luzzi**, "Algebraic Lattice Codes for Linear Fading Channels", in "Number Theory Meets Wireless Communications", Mathematical Engineering, Springer, 2020

2. Ahmad Nimr, Zhongju Li, **Marwa Chafii**, and Gerhard Fettweis. Generalized frequency division multiplexing : Unified multicarrier framework. Radio Access Network Slicing and Virtualization for 5G Vertical Industries. Wiley Online Library, pages 6382, December 2020.

Science and society

1. **S. Reynal**, *conference on ethic of transhumanism, UIA Pontoise, October 2nd and 9th 2020*

2. **S. Reynal** *and* **C. Weidmann**, *two art & science installations as part of the European Science Organisation Festival (ESOF 2020), Trieste, September 1-4 2020.*

Équipes Traitement de l'Information et Systèmes

CY Cergy Paris Université / ENSEA / CNRS UMR 8051

MIDI

General presentation

The MIDI team (Multimedia Indexing and Data Integration) was created in 2006 with the fusion of two previously existing teams, one working on databases and one working on image processing. The team consists of about a dozen of permanent faculty members (teachers-researchers) and includes the research activity of 3 Engineers (2 IR and 1 IE), members of the Pole Ingénierie in the new organization of ETIS. The team balances competences in different fields, since 4 of its teachers-researchers are in section 61, the other ones in section 27. The team is also distributed between ENSEA (4 permanent teachers-researchers), and University of Cergy Pontoise, site St. Martin. With the integration of the EISTI engineering school within CY Cergy Paris Université, effective in 2020, two associated members from EISTI have integrated the team and a new member was recruited by EISTI in 2019 in the MIDI team. Also, a few members of the team are participating to the IDHN research federation, composed of members of ETIS and of several social and human sciences laboratories of CY Cergy Paris Université. The goal of IDHN is to exploit diverse data corpuses (text, social media, multimedia) for various applications in social and human sciences.

The team, that was traditionally working around two distinct axes of research, (1) indexing and searching of multimedia data and (2) big data management and data analytics, is moving towards a more integrated team. This convergence process is based on the adoption of machine learning / artificial intelligence methods for massive data analytics for various types of data (from structured and semi-structured data to text, images and video), but also considering their combination in new multimodal approaches. In this more integrated perspective, the team activity can be divided in three main research areas:

1. *Data Integration and Analytics for multiple modalities*. This includes work on massive data integration, in particular of linked and streaming data, on analysis and mining of social networks, for both the text content and the graph structure, on analysis of mobility and spatiotemporal data, and on the indexing, analysis and content-based search of visual content.

2. *Distributed, Online and Deep Learning*. This includes the design of specific learning methods for data-driven automated decision making, for instance deep learning approaches for computer vision applications, learning for text understanding, graph-based learning and learning for streaming data.

3. *Responsible Data Science*. This corresponds to a new direction of research in the team, towards the explainability of machine learning algorithms, to tackle issues such as transparency and fairness of decision making based on this kind of algorithms. It also includes work on data quality and its impact on the results of machine learning algorithms, and various issues related to data privacy in the context of data integration.

In order to support the work of the team members in the long term, the team has invested in the creation of the following platforms:

- Platform RETIN, which is implementing in one compact way the work of the team around multimedia description and analysis, multimedia classification and indexing and machine learning for multimedia search.

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- Platform MIDI cloud, a new platform in the process of becoming operational that allows the team members to push to parallel and distributed architectures parts of their research around top-k queries, graph summarization and data privacy processing.

- Platform ARAV3D, which is supporting research around acquisition of 3D models and virtual and augmented reality experiments. It is used for experimentation in the areas of 3D modeling, facial recognition, etc.

Highlight in 2020

- Publication of 3 papers in A* journals (Core ranking)

  Vassilis Christophides, Vasilis Efthymiou, Themis Palpanas, George Papadakis, Kostas Stefanidis. An Overview of End-to-End Entity Resolution for Big Data. ACM Computing Surveys, 53(6): 1-42

  Diogo Luvizon, David Picard, Hedi Tabia. Multi-task Deep Learning for Real-Time 3D Human Pose Estimation and Action Recognition, IEEE Transactions on Pattern Analysis and Machine Intelligence, Institute of Electrical and Electronics Engineers, In press, ⟨10.1109/TPAMI.2020.2976014⟩

  Paumard, M.-M., Picard, D., Tabia, H., 2020. Deepzzle: Solving Visual Jigsaw Puzzles With Deep Learning and Shortest Path Optimization. IEEE TRANSACTIONS ON IMAGE PROCESSING 29, 3569–3581. https://doi.org/10.1109/TIP.2019.2963378

- Recruitment of a PR (Vassilis Christophides, PR ENSEA) and of an MCF (Xuan-Son Nguyen, MCF ENSEA)

- Successful applications for several projects in the field of cultural heritage:

  o ClasTer, PhD funded by Fondation des Sciences du Patrimoine, on the automatic classification of photographic images from the restoration site of Notre Dame de Paris.

  o Espadon, PIA/Equipex+ (starts in 2021)

  o ETISCloud, DIM MAP, 50 K€ co-funding for enhancing the MIDI cloud platform (starts in 2021)

- Second spin-off of ETIS: SEQUENCIA supported by the SATT Erganeo and CNRS (Rise program)

Synthesis of the research activity in 2020

The activity of the MIDI team continued along the existing projects the various research areas. In the area of Distributed, Online and Deep Learning, the work on deep learning methods for automated puzzle solving, with application to archeological objects reconstitution (PhD of Marie-Morgane Paumard [Phd1]) was concretized with a top journal publication [J3]. Also, the work on real-time action recognition in videos (PhD of Diogo Luvizon, ended in 2019) produced another top journal publication [J2] presenting a multi-task deep learning model. The work on learning image representations through metric learning (PhD of Pierre Jacob [Phd3]), in collaboration with the CELL team (A. Histace) and PJGN, was finalized with new results on deep learning of metrics [J8]. To notice also in this area the work on named entity extraction from old documents, based on various learning techniques [Ch1].

In the area of Data Integration and Analytics for multiple modalities, the work on entity resolution for big data, published in a top journal [J1], is to be outlined. The work on the analysis of personal social networks (PhD of Sarra Djemili [Phd2]) was finalized with a model for this type of network [C2]. In the close field of multilayer networks, new methods were proposed for both network analysis [J15] and visualization [J16]. The work on opinion mining in social media in collaboration with the Neuro team (C. Lavandier), in the context of the ANIMA European project, was presented in [J7] and [C5]. The work on linked web data integration and analysis continued with a focus on geo-referenced data [J10] [J12].

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Semantic / ontology models have been also used for automatic annotation, retrieval or reasoning of information in various application domains: medical [J4] [J13] [C3], image annotation [J5] [J14], satellite observations [J6], smart farming [C4]. In the field of visual data analysis, a new method for shape measurement was proposed [J9]. Finally, several contributions in the field of traditional databases [J11] [Ch4] and in that of data warehousing / data lakes [B1] [Ch2] are to be noticed.

In the emerging research area of Responsible data science, two PhD projects have started this year: one on the explainability of missing results in machine learning based recommender systems (H. M. Attoulou), with already published results [C1], and one on explainable data cleaning (N. Myrtakis). To be noticed also a nice vulgarization paper [V1] in the well-known KDnuggets site.

The work in connection with IDHN was materialized by several common publications, on the Verspera project seen from a social sciences perspective [Ch3], a presentation of the IDHN federation [C6] and a book [B2] with the best papers of the CMC-Corpora 2019 conference organized by IDHN.

Among the successful applications to various research project calls, we mention the ClasTer PhD project (FSP) on the automatic classification of photographic images from the restoration site of Notre Dame de Paris and the Muse-Med Emergence project (INEX CYU) on drug traceability. Also, two new projects in the field of cultural heritage have been accepted but will start in 2021: Espadon (PIA/Equipex+), an interoperable platform for cultural heritage objects analysis, and ETISCloud (DIM MAP) for enhancing the MIDI our cloud platform for its use in collaborative projects in the field of heritage sciences.

KPI of MIDI in 2020

Members

- 12 permanent members (10 members end of 2019)
    - 3 PU: D. Kotzinos (CYU), D. Vodislav (CYU), V. Chrisophides (ENSEA)
    - 1 PU Emeritus: D. Laurent (CYU)
    - 1 MCF HDR : D. Picard (ENSEA - disponibilité)
    - 5 MCF: T. Jen (CYU), T.T. Dang Ngoc (CYU), A. Tzompanaki (CYU), S. Vu (ENSEA), Xuan Son NGUYEN (ENSEA)
    - 2 MCF on contract: H. Baazoui (CYU-EISTI, CDI arrived in 2019), W. Swaileh (CYU, CDD arrived in 2019)
- 23 non-permanent members
    - 4 associated researchers: M. Malek (CYU-EISTI), S. Bornhofen (CYU-EISTI), N. Priniotakis (CYU), H. Tabia (IBISC)
    - 3 engineers from Pole Ingénierie: M. Jordan (CY, IGR), B. Borzic (CNRS, IGR), N. Cholewka (CNRS, IGE)
    - 11 PhD students
    - 1 postdoctoral student
    - 4 members in contract: 2 ATER, 1 IGE, 1 apprentice CNRS

Publications

Journal Papers	Conferences	National	Dissemination	Book	Chapter	Patent	Thesis	Others

16	6	0	0	2	4	0	3	1

Publications with others teams of ETIS

Journal Papers	Conferences	National	Dissemination	Book	Chapter	Patent	Thesis	Others
1 with NEURO *1 with CELL*	*1 with NEURO*	-	-	-	-	-	*1 with CELL*	-

Ongoing PhD

Name	Supervisor	Partner	Type	Start	Title
ATTOLOU	D. Kotzinos / A. Tzompanaki	-	ED	01/10/2020	*Explanations for missing recommendations provided by machine learning based recommendation systems*
BESBES	H. Tabia	Univ. Sfax	Co-tutelle	19/08/2018	*Vehicle identity recognition by deep learning*
BESNIER	D. Picard, A. Histace	Valeo	CIFRE	04/11/2019	*Functional safety of machine learning models in the automotive context*
BEN CHARRADA	H. Tabia	AUSY	CIFRE	06/05/2019	*3D reconstruction of real environment with deep learning*
CHOMEL	V. Chavalerias B. Borzic	PRIME80	ED	14/11/2019	*Fake news and information manipulation: how to model the propagation of false information (context, image or video) on several social networks*
KATSOMALLOS	D. Kotzinos / A. Tzompanaki	-	ED	01/10/2016	*Quality and privacy of user-generated data in the context of massive data: algorithms and techniques*
KISELEVA	D. Kotzinos, P. de Hert	VUB	Co-tutelle INEX	01/02/2020	*Balancing IA transparency in healthcare with safety and quality*
KONTARINIS	D. Kotzinos, K. Zeitouni, D. Vodislav / C. Marinica	David, Louvre	FSP	01/10/2016	*Mining and analysis of enriched trajectories - Application to museum visitor trajectories*

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JEZEQUEL	S. Vu	IDEMIA	CIFRE	01/08/2020		Fraud detection using semi-supervised deep learning
MAHMOUDI	D. Kotzinos, P. Triantafillou	Univ. Warwick	Co-tutelle INEX	01/02/2020		Artificial intelligence and machine learning for the optimisation of Big Data systems
ROSSI	R. Chelouah, D. Vodislav	Canton Consulting	Half-time	20/06/2019		Analysis of legal rules in a semantic web environment
ROUSSEAU	D. Kotzinos, D. Camara	PJGN	Collaboration	01/01/2020		Identification of weak signals in massive data sets

PhD Defended

Name	Supervisor	Partner	Type	Start	Date of defended	Length	Title
Sarra DJEMILI	D. Kotzinos / C. Marinica, M. Malek	-	ED	01/10/2014	04/12/2020	74	Analysis and Evolution for Online Personal Collaboration Networks
Pierre JACOB	A. Histace/ D. Picard, E. Klein	PJGN	ED	01/01/2017	08/09/2020	45	Statistiques d'ordres élevés pour la représentation des images en apprentissage de distance
Marie-Morgane PAUMARD	D. Picard, H. Tabia / V. Barrière	Agora, LRMH, C2RMF	FSP	01/10/2017	14/12/2020	39	Résolution automatique de puzzles par apprentissage profond

Contracts

Name	Sponsor	Type	PI	Start	Length	Budget	Budget (ETIS)
IDEMIA	CIFRE	PhD	VU	01/08/2020	3 years	147 000€	45 000€
PJGN	PJGN	PhD	KOTZINOS	01/01/2020	1 year	112 000 €	80 889 €

INEX MUSE MED	INEX	Travels	ZGHAL - BAZAOUI	01/07/2020	2 years	31 000€	31 000 €
FSP 2020 CLAST	Fondation des Sciences du Patrimoine	PhD	VODISLAV	01/11/2020	3 years	119 600 €	119 600 €
BIG DATA / BIGAI	PIA	PhD	KOTZINOS	01/02/2020	36 months	117 500 €	117 500 €

Ongoing Contracts

Name	Sponsor	Type	PI	Start	Length	Budget	Budget (ETIS)
FIR – Fellow In Residence	INEX	Mobility	KOTZINOS VODISLAV	1/10/2019	10 months	Budget IEA	0 €
DforDetection	INEX	Post-Doc	PICARD	1/10/2019	2 years	112k	112k
SoCoRe !	ANR Flash Science Ouverte	Post-Doc	VODISLAV	01/10/2019	2 years	96k	96k
MOSCCOW	CNRS 80 PRIME	PhD	BORZIC	01/10/2019	3 years	Budget Institut des systèmes complexes	0 €
BDBE	INEX	Post-Doc	KOTZINOS	01/09/2019	2 years	112 000 €	112 000 €
AUSY	CIFRE	PhD	TABIA	9/05/2019	3 years	481 678€	45 000€
OCTOPEEK	CIFRE	PhD	TABIA	01/02/2019	3 years	99 640€	45 000€

Scientific Dissemination

Highlight papers

1. **Vassilis Christophides**, Vasilis Efthymiou, Themis Palpanas, George Papadakis, Kostas Stefanidis. An Overview of End-to-End Entity Resolution for Big Data. ACM Computing Surveys, 53(6): 1-42 **(A* Core)**

2. **Diogo Luvizon**, **David Picard**, **Hedi Tabia**. Multi-task Deep Learning for Real-Time 3D Human Pose Estimation and Action Recognition, IEEE Transactions on Pattern Analysis and Machine Intelligence, Institute of Electrical and Electronics Engineers, In press, ⟨10.1109/TPAMI.2020.2976014⟩ **(A* Core)**

3. **Paumard, M**.-**M., Picard**, **D., Tabia**, H., 2020. Deepzzle: Solving Visual Jigsaw Puzzles With Deep Learning and Shortest Path Optimization. IEEE TRANSACTIONS ON IMAGE PROCESSING 29, 3569–3581. https://doi.org/10.1109/TIP.2019.2963378 **(A* Core)**

Research perspectives for 2021

The MIDI team has experienced a significant evolution in 2020, after the departure of 3 members of the former axis of indexing and searching multimedia data in 2019 (1 PU and 2 MCF HDR). The two recruitments in 2020 have followed the team strategy to move towards a more integrated team, with research profiles around the articulation between machine learning methods and data-specific problems. Vassilis Christophides, PR ENSEA, works on the explainability and transparency of machine learning algorithms for data-driven decision making and the impact of various data characteristics on the decision process. Xuan-Son Nguyen, MCF ENSEA, works on deep learning approaches for various computer vision issues. The recruitment of two positions open in the team in 2021 (1 PR and 1 MCF ENSEA) will continue this strategy.

The team will continue the effort in the field of cultural heritage data management, through various collaborative projects in the framework of the Fondation des Sciences du Patrimoine. In particular, several team members will participate to the Espadon project, highly structuring for the heritage science community, as part of the Data work package, co-led by Dan Vodislav. The team also prepares applications to the European and ANR calls, and to the local calls of CY Initiative, with a specific emphasis on the collaborations in the framework of the Eutopia alliance. Another important objective at the international level is the collaboration with the IPAL International Research Laboratory on Artificial Intelligence.

The team also targets an important valorization of research action, based on the work of Boris Borzic on multimodal video segmentation, indexing and search, with an objective of start-up creation, submitted to SATT Erganeo and to the CNRS Rise program.

Publications 2020

Journals

[J1] **Vassilis Christophides**, *Vasilis Efthymiou, Themis Palpanas, George Papadakis, Kostas Stefanidis. An Overview of End-to-End Entity Resolution for Big Data. ACM Computing Surveys, 53(6): 1-42*

[J2] **Diogo Luvizon**, **David Picard**, **Hedi Tabia**. *Multi-task Deep Learning for Real-Time 3D Human Pose Estimation and Action Recognition, IEEE Transactions on Pattern Analysis and Machine Intelligence, Institute of Electrical and Electronics Engineers, In press,* ⟨10.1109/TPAMI.2020.2976014⟩

[J3] **Paumard, M.-M., Picard, D., Tabia**, *H., 2020. Deepzzle: Solving Visual Jigsaw Puzzles With Deep Learning and Shortest Path Optimization. IEEE TRANSACTIONS ON IMAGE PROCESSING 29, 3569–3581. https://doi.org/10.1109/TIP.2019.2963378*

[J4] B**esbe**s, G., Lamine, S.B.A.B., **Baazaoui-Zghal**, **H.**,. *Personalized Retrieval in the Medical Domain: A NoSQL Solution Based on Ontology Building, Journal of Information & Knowledge Management, 2020, https://doi.org/10.1142/S0219649220500410*

[J5] *Filali, J.,* **Zghal, H.B**., *Martinet, J., 2020. OntoAnnClass: ontology-based image annotation driven by classification using HMAX features. Multimedia Tools and Applications, https://doi.org/10.1007/s11042-020-09864-9*

[J6] *Maroua Masmoudi, Mohamed-Hedi Karray, Sana Ben Abdallah Ben Lamine,* **Hajer Baazaoui Zghal**, *Bernard Archimède, MEMOn: Modular Environmental Monitoring Ontology to link heterogeneous Earth observed data. Environ. Model. Softw. 124: 104581 (2020)*

[J7]   Iheb Meddeb, **Catherine Lavandier**, and **Dimitris Kotzinos**. Using Twitter Streams for Opinion Mining: a case study on Airport Noise. Communications in Computer and Information Science, March 2020.doi: 10.1007/978-3-030-44900-110. https://hal.archives-ouvertes.fr/hal-03018998

[J8]   **Pierre Jacob**, **David Picard**, **Aymeric Histace**, and Edouard Klein. DIABLO: Dictionary-based attention block for deep metric learning. Pattern Recognition Letters, March 2020. doi: 10.1016/j.patrec.2020.03.020. https://hal.archives-ouvertes.fr/hal-02510473

[J9]   Thanh Phuong Nguyen, **Xuan Son Nguyen**, Mohamed Anouar Borgi, and M K Nguyen. A projection based method for shape measurement. Journal of Mathematical Imaging and Vision, January 2020. https://hal.archives-ouvertes.fr/hal-02368681.

[J10]   Bénédicte Bucher, Esa Tiainen, Thomas Ellett Von Brasch, Paul Janssen, **Dimitris Kotzinos**, Marjan Ceh, Martijn Rijsdijk, Erwin Folmer, Marie-Dominique Van Damme, and Mehdi Zhral. Conciliating Perspectives from Mapping Agencies and Web of Data on Successful European SDIs: Toward a European Geographic Knowledge Graph. ISPRS International Journal of Geo-Information, 9(2):62,2020. doi: 10.3390/ijgi9020062. https://hal.archives-ouvertes.fr/hal-02528394

[J11]   Jacques Chabin, Mírian Halfeld Ferrari, **Dominique Laurent**: Consistent updating of databases with marked nulls, Knowledge Information Systems. 62(4): 1571-1609 (2020)

[J12]   Vasilis Kopsachilis, Michail Vaitis, Nikos Mamoulis, **Dimitris Kotzinos**: Recommending Geo-semantically Related Classes for Link Discovery. Journal of Data Semantics. 9(4): 151-177 (2020)

[J13]   Runumi Devi, Deepti Mehrotra, **Hajer Baazaoui Zghal**, Ghada Besbes: SWRL reasoning on ontology-based clinical dengue knowledge base. Int. J. Metadata Semant. Ontologies 14(1): 39-53 (2020)

[J14]   Jalila Filali, **Hajer Baazaoui Zghal**, Jean Martinet: Ontology-Based Image Classification and Annotation. Int. J. Pattern Recognit. Artif. Intell. 34(11): 2040002:1-2040002:22 (2020)

[J15]   **Maria Malek**, Simone Zorzan, and Mohammad Ghoniem. A methodology for multilayer networks analysis in the context of open and private data: biological application. Applied Network Science,5(1), July 2020. doi: 10.1007/s41109-020-00277-z. https://hal.archives-ouvertes.fr/hal-02905392

[J16]   **Stefan Bornhofen** and Marten Düring. Exploring dynamic multilayer graphs for digital humanities. Applied Network Science, August 2020. doi: 10.1007/s41109-020-00295-x. https://hal.archives-ouvertes.fr/hal-03019519.

Conference papers

[C1]   Stratigi, M., **Tzompanaki**, K., Stefanidis, K., 2020. Why-Not Questions & Explanations for Collaborative Filtering, in: Huang, Z., Beek, W., Wang, H., Zhou, R., Zhang, Y. (Eds.), Web Information Systems Engineering – WISE 2020, Lecture Notes in Computer Science. Springer International Publishing, Cham, pp. 301–315. https://doi.org/10.1007/978-3-030-62008-0_21

[C2]   **Sarra Djemili**, **Claudia Marinica**, **Maria Malek**, and **Dimitris Kotzinos**. Un nouveau modèle pour l'évolution de réseaux sociaux personnels. In Modèles & Analyse des Réseaux : Approches Mathématiques & Informatiques, Montpellier, France, October 2020. https://hal.archives-ouvertes.fr/hal-03014640.

[C3]   Ibtihel Selmi, Nadia Kabachi, Sana Ben Abdallah, Chirine Ghedira Guegan, **Hajer Baazaoui Zghal**: Adaptive Multi-agent-based Alert System for Diseases' Detection. AINA 2020: 734-745

[C4]   Jérôme Dantan, **Hajer Baazaoui Zghal**, Yann Pollet: Decifarm: A Fuzzy Decision-support Environment for Smart Farming. ICSOFT 2020: 136-143

[C5]   Aalmoes, R., Bartels, S., Benz, S., Grossarth, S., Hauptvogel, D., Haubrich, J., Heyes, G., Hooper, P., **Kotzinos, D**., Kuhlmann, J., **LAVANDIER, C**., Marki, F., Müller, U., Ohlenforst, B., Quehl, J., Richard, I., Roosien, R., Schreckenberg, D., Reducing noise impact and improving quality of life by addressing annoyance, Forum Acusticum, Dec 2020, Lyon, France. pp.3419-3426, ⟨10.48465/fa.2020.0527⟩

[C6]   Marianne Froye, Olivier Belin, Julien Longhi, **Boris Borzic**, **Claudia Marinica**, **Michel Jordan**, and Basile Michel. L'IDHN : une structure innovante au service de la polysémie du numérique. In Humanistica 2020, Bordeaux, France, May 2020. URLhttps://hal.archives-ouvertes.fr/hal-02875614

Proceedings

[P1]   Giorgos Flouris, Dominique Laurent, Dimitris Plexousakis, Nicolas Spyratos, Yuzuru Tanaka: Information Search, Integration, and Personalization - 13th International Workshop, ISIP 2019, Heraklion, Greece, May 9-10, 2019, Revised Selected Papers. Communications in Computer and Information Science 1197, Springer 2020, ISBN 978-3-030-44899-8

Books

[B1] Anne Laurent, **Dominique Laurent**, Cédrine Madera. Data Lakes, Volume 2, Wiley Online, DOI:10.1002/9781119720430

[B2] Julien Longhi and **Claudia M**arinica. CMC Corpora through the prism of digital humanities. May 2020. https://hal.archives-ouvertes.fr/hal-03083968

Chapters

[Ch1] **Wassim Swaileh**, Thierry Paquet, Sébastien Adam, and Andres Rojas Camacho. A Named Entity Extraction System for Historical Financial Data. In Lecture Notes in Computer Science. August 2020.doi: 10.1007/978-3-030-57058-323. https://hal.archives-ouvertes.fr/hal-03066304.

[Ch2] Anne Laurent, **Dominique Laurent**, Cédrine Madera, Introduction to Data Lakes: Definitions and Discussions (chapter), Data Lakes, Volume 2, Wiley Online 2020.

[Ch3] **Michel Jordan** and Benjamin Ringot. Le projet VERSPERA. In Les enjeux du numérique en sciences sociales et humaines, pages 145–158. Editions des archives contemporaines, December 2020. doi:10.17184/eac.3432. https://hal.archives-ouvertes.fr/hal-03194808

[Ch4] **Dominique Laurent**. 4-Valued Semantics Under the OWA: A Deductive Database Approach. In Information Search, Integration, and Personalization - 13th International Workshop, (ISIP) 2019, Heraklion, Greece, May 9-10, 2019, Revised Selected Papers, pages 101–116. March 2020. doi: 10.1007/978-3-030-44900-17. https://hal.archives-ouvertes.fr/hal-02986209

Vulgarization papers

[V1] I. Tsamardinos, I. Xanthopoulos, V. Christophides. "Can you trust AutoML?", Kdnuggets, Dec 2020. https://www.kdnuggets.com/2020/12/trust-automl.html

PhD Thesis Defended

[Phd1] Marie-Morgane Paumard..Solving Jigsaw Puzzles with Deep Learning for Heritage. Theses, CY Cergy Paris Université, December 2020. https://tel.archives-ouvertes.fr/tel-03095670

[Phd2] Sarra Djemili. Analysis and Evolution for Online Personal Collaboration Networks. Theses, CY Cergy Paris Université, December 2020. http://www.theses.fr/s119123

[Phd3] Pierre Jacob. Statistiques d'ordres élevés pour les représentations d'images en apprentissage de distance. September 2020. http://www.theses.fr/s174567

NEURO

General presentation

The Neurocybernetics team is part of an enactive approach to cognitive sciences. We seek to model a number of cognitive processes ranging from isolated neurons to social interactions. We are interested in understanding what properties can emerge from the different dynamics involved: dynamics of local circuits, dynamics between brain structures, dynamics with the physical but also social environment.

In this framework, robots become a simulation tool for the emerging properties of neural networks. Robotic experiments thus make it possible to show the coherence of the developed models (challenges of integration both at the modelling level and at the technological mastery level with applications for engineering sciences) but especially the limitations of the models used (proof by failure allowing in certain cases to demonstrate the importance of changing paradigm or to show the importance of previously neglected structures).

The NEURO team designs bio-inspired Artificial Intelligence (AI) models to understand human intelligence and creates AI and cognitive architectures to make robotic learning more efficient, autonomous and adaptive in social, affective and physical interactions. Themes are cognitive architectures, robotic learning, brain, perception and action modelling, sensorimotor control.

Applications are on autonomous, learning and interactive robots, autonomous vehicles, modelling the brain as a complex system, smart homes, sensors and bio-inspired robots.

We emphasize the importance of the body and action, the enactive approach, to model human intelligence and interact with people.

4 emblematic projects of our team (but not only) are

- the art-loving Berenson robot

- Neuromimetic architectures for autonomous vehicle navigation

- Neurorobotic modelling for motion generation and motor control learning

- The Sensory Platform of the International Research House

In 2020, the team is organized into two research areas: (i) the brain-inspired neural networks architectures for efficient coding, control, perception, and decision making and (ii) robots, autonomous vehicles and smart devices for autonomous learning, and multimodal human-machine interactions, perceptually, socially and emotionally. Each of these makes it possible to create a core of expertise around a common theme and to organize the interaction at the scientific strategy level of each of them within the team and with the other ETIS teams.

Highlights in 2020

Two new research professors have arrived: Lola Canamero (PU and INEX Chair in Robotics and Neuroscience) and Laura Cohen (MCF), who have strengthened our team in interactive and developmental robotics, robotic learning, affective and social cognition, and embedded robotics,

Several local and regional projects have been accepted (Ensea call, DIM RFSI collaboration with the Collège de France) and a reflection on new platforms has been made with the purchase of the humanoid robot Reachy and the new mobile platforms Thymeo and Khepera.

Synthesis of the research activity in 2020

Despite the COVID situation, 4 PhD students graduated. We managed mostly well the situation for most of the 10 PhD, although 2 PhD students found difficulties during the year, Paul Valentin and Julien Abrossimoff, who suspended their PhD, unfortunately.

This year showed a strong research activity with 16 journal articles and international conference papers, 12 funded projects and several thematic workshops and seminars that were organized, as well as several invited oral presentations. This contributed to the strong influence of our team.

KPI of Neurocybernetic in 2020

The year was very difficult also in terms of conference/journal papers published in comparison to 2019 with only 6 journal papers and 11 conferences papers.

Besides, the team concentrated on projects' submissions, with high acceptance rate with 16 projects accepted, showing the vitality of the team.

Members

At the date of 31th december 2020, the NEURO Group has:

- 13.5 permanent members:
  - 4 Full Professors
  - 2 MCF with HDR
  - 6 MCF
  - 1.5 CNRS Engineers.
- 11 non-permanent members:
  - 1 associated member
  - 10 PhD students

Ongoing PhD

Name	Supervisor	Partner	Type	Start	Title
ABDELWAHED	*PITTI ROMAIN*	*VEDECOM*	*CIFRE*	*18/10/2018*	*Adaptive Impedance Spectroscopy for Characteristic Extraction and Exploitation of Artificial Skin: Application to Mobile Robotics*

					as autonomous vehicule
ABROSSIMOF	GAUSSIER PITTI	-	ED	29/08/2017	*Neurocomputational models of a working memory by predictive coding*
ANNABI	PITTI QUOY	Gipsa-lab LORIA	ED	16/11/2018	*Spiking neural architecture based on predictive coding for memory sequences*
COLOMER	CUPERLIER BRESSON ROMAIN	VEDECOM	CIFRE	05/11/2019	*Integrated neuro-robotic approaches for autonomous vehicle localization and navigation.*
DEDIEU	LAVANDIER BERGER	St Gobain	CIFRE	01/01/2017	*Evaluation of acoustic comfort in buildings: study of the link between acoustic performance and sound perception*
ELEY	LAVANDIER KATZ	-	ED – LABEX Patrima	24/09/2019	*Virtual Experience in Archaeological Acoustics: Multimodal study of the influence of halls on the playing techniques of musicians on wind instruments in the 17th and 18th centuries in Versailles*
ESPADA	CUPERLIER BRESSON ROMAIN	VEDECOM	CIFRE	03/10/2016	*Visual ocalization by neuromimetic approach in a context of delegated driving*
GONTIER	LAVANDIER PETIOT LAGRANGE	-	ANR CENSE	01/09/2017	*Analysis and synthesis of environmental sounds by deep convolutional approaches*
MOUALLA	GAUSSIER BOUCENNA VIDAL	-	ED – FSP	01/10/2014	*A robot in a museum: Cognitive learning and aesthetic driving*
REGRAGUI	LAVANDIER CAN	-	ED 602	10/2018	*Modelling and perceptive characterization of rare events in urban environmental acoustics*
REYNAUD	QUOY	-	-	23/11/2016	*Insertion of robots in the world of work*

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PhD Defended

Name	Supervisor	Partner	Type	Start	Date of defended	Length	Title
ESPADA	CUPERLIER ROMAIN	VEDECOM	CIFRE	03/10/2016	16/11/2020	47 months	*Visual geolocalization by neuromimetic approach in a context of delegated driving*
MOUALLA	GAUSSSIER BOUCENNN A VIDAL	-	ED - FSP	01/10/2014	17/02/2020	74 months	*A robot in a museum: Cognitive learning and aesthetic driving*
GONTIER	LAVANDIER PETIOT LAGRANGE	Centrale Nantes	ANR CENSE	01/09/2017	15/12/2020	40 months	*Analysis and synthesis of environmental sounds by deep convolutional approaches*
DEDIEU	LAVANDIER BERGER	St Gobain	CIFRE	01/01/2017	10/06/2020	41 months	*Evaluation of acoustic comfort in buildings: study of the link between acoustic performance and sound perception*

Publications

Journal Papers	Conferences	National	Dissemination	Book	Chapter	Patent	Thesis	Others
6	10	-	16	-	-	1	4	-

Publications with others teams of ETIS

Journal Papers	Conferences	National	Dissemination	Book	Chapter	Patent	Thesis	Others
-	1 with CELL 1 with MIDI	-	-	-	-	1 with CELL	1 with MIDI 1 with CELL	-

New contracts

Name	Manager	Sponsor	Type	PI	Start	Length	Budget	Budget (ETIS)
DIM RFSI	CNRS	Région	DIM	BOUCENNA	15/09/2020	2 years	58 000€	58 000€
ONERA	CYU	ONERA	Prestation	LAVANDIER	01/01/2020	3 years	6 200 €	6 200 €
ARTEAC	CYU	ARTEAC LAB	Presta ARTEAC/SNCF	LAVANDIER	01/10/2020	2 months	6 000 €	6 000 €
Chaire Neurobot	CYU	INEX	Contrat de subvention	QUOY	01/09/2020	5 years	408 990 €	277 000 €
INEX SCIENCES COGNITIVES	PIA	INEX	Workshop	GAUSSIER	16/06/2019	4 years	55 000 €	55 000 €
Facebook	UCP	Facebook	Thesis	QUOY/PITTI	01/11/2019	3 years	147 000 €	147 000 €
SRV	ENSEA	ENSEA	Stage	CUPERLIER PITTI	05/2020	1 years	4 000 €	4 000 €
TREMPLIN	CNRS INS2I	CNRS	Workshop	CUPERLIER	04/2020	1 year	7588 €	7588 €

Contracts on going

Name	Manager	Sponsor	Type	PI	Start	Length	Budget	Budget (ETIS)
Facebook	UCP	Facebook	Thesis	QUOY	01/09/2018	3 years	147 000 €	147 000 €

MRTE Lieux de culte	UCP	IDF PATRIMA	Subvention avec condition	LAVANDIER	01/01/2017	3 years	2 915 €	2 000 €
CENSE	UCP	ANR	Subvention avec condition	LAVANDIER	01/10/2016	5 years	75 000 €	69 444 €
ARTEM	UCP	INEA Union Européenne	Contrat Européen	LAVANDIER	01/12/2017	4 years	4 000 €	4 000 €
ARTEM overheads	UCP	INEA Union Européenne	Contrat européen	LAVANDIER	01/12/2017	4 years	21 000 €	18 000 €
ANIMA	UCP	INEA Union Européenne	Contrat Européen	LAVANDIER	19/09/2017	4 years	174 000 €	174 000 €
ANIMA overheads	UCP	INEA Union Européenne	Contrat Européen	LAVANDIER	19/09/2017	4 years	122 000 €	86 680 €
SPACE CODE	UCP	Inex	Doctorant	GAUSSIER	01/10/2018	36 months	188 436 €	117 500 €
Cifre St Gobain	CNRS	ST Gobain	Thesis	LAVANDIER	21/06/2017	3 years	45 000 €	45 000 €
Cifre THALES	CNRS	THALES	Thesis	GAUSSIER	28/03/2018	3 years	45 000 €	45 000€
ROBOCOL	CNRS	ROBOCOL	Convention de collaboration	GAUSSIER	26/03/2019	1 year	5 000,00 €	5 000,00 €
CIGALE	CYU	DGAC	RTE CORAC	LAVANDIER	18/03/2019	48 months	796 000 €	15 000€
Chaire Neuroscience	CYU	INEX	Chaire	QUOY	1/10/2019	4 years	380 000 €	380 000 €
SRV	ENSEA	ENSEA	Travels	BOUCENNA	01/10/2019	1 year	2 500 €	2 500 €

INEX SCIENCES COGNITIVES	PIA	INEX	Subvention HAPP	GAUSSIER	16/06/2019	1 year	87 811 €	55 000€
Bioanim	CYU	Contrat de prestation de service	Contrat Industriel (RIAM (CNC) 2minutes SAS)	MOSTAFAOUI	02/01/2019	16 months	20 000 €	20 000 €
PhD U. Pompeu FabraBarcelone	CYU	EUTOPIA	Thesis	Quoy	01/11/2020	3 years	119 000 €	59 500 €
PhD	CYU	Labex MME-DII	Thesis	Quoy	01/10/2020	3 years	114 000 €	0 €

Scientific Dissemination

Invited conference

?	Autisme et Outils Numériques	Sofianne Boucenna	Date ?	virtual
Ro-MAN 2020 workshop on Lifelong Learning for Long-term Human-Robot Interaction (LL4LHRI)	The Role of Embodied Affect in Life-Long Learning for HRI	Lola Canamero	4th September 2020	Virtual Naples Italy
2nd symposium on Symbiotic Intelligent	Machine Learning for Communications	Alexandre Pitti	January 2020	Virtual Osaka Japan

Systems				

Invited seminar / internal talks:

- Lola Cañamero, 2020. "Affective Cognition in Autonomous and Social Robots", ETIS "Fil Rouge: IA" Research Seminar Series, November 19, 2020 (online).

- Lola Cañamero, 2020. Invited Presentation and Round Table on Social Robotics at the 2020 Social Robotics Conference of the e-Tonomy Hub, September 30, 2020 (held online).

- Alexandre Pitti, 2020. Laboratoire CERSM, Nanterre Université, février 2020.

- Nicolas Cuperlier, 2020. Neurorobotic navigation, Journée Véhicules Autonomes et Robotique, GDR ISIS, 22 juin 2020.

- Nicolas Cuperlier, Journée Véhicules Autonomes et Robotique Terrestre GT9-2RM/GT2, Cergy.

- Nicolas Cuperlier, entreprise Ixblue, dec 2020.

Event Organization

None

Others KPI

- Chair INEX Robotic and Neurosciences.

- Catherine Lavandier , Tribune of May 12, 2020, published in Le Monde, edited by Jérôme Sueur and co-signed by Olivier Adam, Paul Avan, Marion Burgess, David Ecotière, Catherine Lavandier, Christian Lorenzi, Fanny Mietlicki, Jean-Dominique Polack, "This crisis owes us learn to protect the other from any sound intrusion. "

  https://ear.cnrs.fr/wp-content/uploads/2020/09/Sueur_etal_LeMonde_20200512.pdf

- Catherine Lavandier, Interview with Catherine Lavandier broadcast on May 15, 2020 on France Inter (Le 5-7) https://www.franceinter.fr/emissions/le-5-7/le-5-7-15-mai-2020

- Catherine Lavandier, Participation in CNRS events "Meet the public" on October 7, 2020, reception of the public in the apartment laboratory (sensory platform) of the Maison de la Recherche:https://www.cnrs.fr/fr/cnrsinfo/le-cnrs-la-rencontre-du-public

  https://twitter.com/search?q=%23CNRSinsolite&src=typed_query&f=image

- Alexandre Pitti, Nov 2020. Interview by Alex Pitti on Blog PNAS to comment one paper on working memory network based on chaos

  http://blog.pnas.org/2020/11/new-technique-builds-animal-brain-like-spontaneity-into-ai/

- Alexandre Pitti, Nov 2020. event Elsa International, Moot Court Competition de CYU, workshop "AI and the law". Alexandre Pitti

- Alexandre Pitti, Feb 2020. workshop Robot, Art & Science, high school students, Emergence & Robotics, high school Lycée du Bois d'Amour, Poitiers. Alexandre Pitti

  Philippe Gaussier, Sofiane Boucenna, Oct 2020. participation à FuturRobot, Toulouse. Demonstration Berenson

Research perspectives for 2021

We have put in place a new team strategy based on the "helping hand" for the setting up of individual and collective national and international projects for the year 2021 and following, rethinking the needs of the team in terms of new robotic platforms for science (purchase of a humanoid mobile robot in 200, with the Reachy mobile platform and robot, project to purchase a multi-articulated robotic head in 2021), promoting at the level of supervisors new tools to facilitate the life of doctoral students and to help them in their research; offer the possibility for PhD students to choose their programming language in consultation with the supervisor, such as Python or Matlab, which is not currently the case for all PhD supervisors.

An internal strategy in the ETIS laboratory on various inter-disciplinary subjects: grouping around sound perception (with the MIDI team), grouping around mobility (CELL and MIDI teams, springboard 2020), grouping around the subject of tomography (planned for 2021), grouping around spike neuron modelling (CELL team, springboard 2020).

In 2021, we would like to start a cycle of internal reflections to understand the reasons for the non-acceptance of ANR projects and to work as a group to correct the projects, which has not been the case before. A consultation also for the team's strategies for future Horizon Europe projects and contact with European colleagues, notably with EIC Pathfinder2021 submitted.

Upstream contacts have been made between national laboratories, with LAAS among others to get closer to the national project TIRREX (submission of ANR2020 project refused), to strengthen our interaction with ISIR (submission of DIM2020 PostDoc not accepted, acceptance of INEX 2021 project) and also the babylab of the University of Nanterre (submission of ANR2020 not accepted, but experiments and joint paper in progress).

Strengthening of interactions with the neural modelling laboratory of Pompeu Fabra (INEX PhD2020 project) and submission of projects in 2021.

Contacts and rapprochement with the AI and robotics laboratories of the Free University of Brussels have begun with the submission of international projects that were not accepted in 2020 (INEX Project Post-Doc2020) but were accepted in 2021 (2 INEX Projects PhD2021).

A rapprochement with TU Munich on neurorobotic projects and project submission (project submitted and rejected to the Human Brain Project2020), with a possible thesis co-supervision for 2021 and resubmission of future projects.

Through the Singaporean consortium CNRS IPAL/CNRS/CYU, a rapprochement with the A-STAR institute (thesis accepted 2020) and a rapprochement is underway with the NUS University (thesis project 2021 in progress).

Publications 2020

Journals

1. **Pitti A., Quoy M., Lavandier C., Boucenna S.**, *"Gated spiking neural network using Iterative Free-Energy Optimization and rank-order coding for structure learning in memory sequences (INFERNO GATE)", Neural Networks, Vol. 121, pp. 242-258, (2020). Doi.org/10.1016/j.neunet.2019.09.023*

2. *Asensio C., Aumond P., Can A., Gascó L., Lercher P., Wunderli J.M., **Lavandier C**., De Arcas G., Ribeiro C., Muñoz P. and Licitra G.: "A taxonomy proposal for the assessment of the changes in soundscape resulting from the COVID-19 lockdown." International Journal of Environmental Research and Public Health, Vol. 17, n°4205, (2020). doi.org/10.3390/ijerph17124205 https://www.mdpi.com/1660-4601/17/12/4205/pdf*

3. *Banquet JP, **Gaussier P**, **Cuperlier N**, Hok V, Save E, Poucet B, **Quoy M**, Wiener SI. Time as the fourth dimension in the hippocampus. Prog Neurobiol. 2021 Apr;199:101920. doi: 10.1016/j.pneurobio.2020.101920. Epub 2020 Oct 12. PMID: 33053416.*

4. *Hoang, K. **Pitti, A**. Goudou, J.F. Dufour, J.Y. and **Gaussier, P**. (2020) Active Vision : on the relevance of a Bio-inspired approach for object detection. BioInspiration & Biomimetics, 15(2), 025003.*

5. *Guellaï, B. Callin, A. and Bevilacqua, F. and Schwarz, D. and **Pitti, A**., **Boucenna, S**. and Gratier, M. (2019) Sensus Communis: Some Perspectives on the Origins of Non-synchronous Cross-Sensory Associations, Frontiers in Psychology, 10:523 DOI: 10.3389/fpsyg.2019.00523*

6. *Tanevska, A., Rea, F., Sandini, G., **Cañamero, L**., and Sciutti, A. (2020). A Socially Adaptable Framework for Human-Robot Interaction. Frontiers in Robotics and AI, vol. 7, October 19, 2020. https://doi.org/10.3389/frobt.2020.00121*

Patents

1. *Tactile sensor to analyse a given material, with Electrical Impedance Tomography (EIT), **Medhi Abdelwahed**, **Alexandre Pitti**, **Olivier Romain** and Fethi Ben Ouezdou, EUROPE - Patent application No. EP20214321.0 filed on 15 December 2020.*

Conference papers

1. *Gontier F., Lagrange M**., Lavandier C**., Petiot J.F., "Privacy aware acoustic scene synthesis using deep spectral feature inversion", Papier accepté à l'International Conference on Acoustics, Speech, and Signal Processing" IEEE International Conference on Acoustics, Speech and Signal Processing ICASS 2020, Barcelona (Espagne), may 2020. https://hal.archives-ouvertes.fr/hal-02478866*

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