Center of Technology and Systems

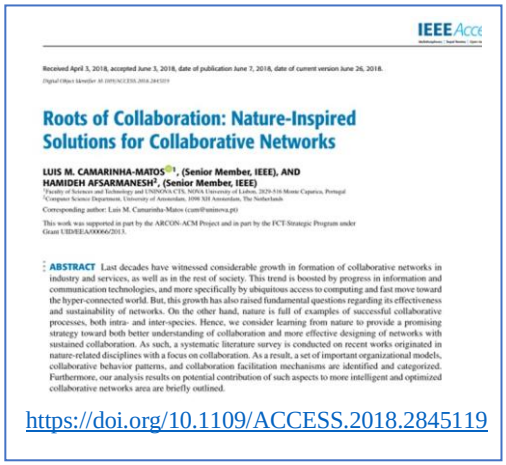
NEWSLETTER

November 2023

Sustaining Excellence in Research Ecosystems

The metaphor of "ecosystem", borrowed from living ecosystems, has become prevalent in various contexts. Initially introduced by James F. Moore in 1993 for the business realm as the concept of business ecosystem, the idea has since expanded to include innovation ecosystems, technology (platform) ecosystems, and research ecosystems. All these variations draw inspiration from natural ecosystems, seeking to glean insights on how to thrive, survive, evolve, and prosper, particularly in challenging and disruptive environments.

CTS is a **research and innovation ecosystem**, engaging a multitude of stakeholders, including researchers and students across diverse knowledge areas, various organizations (employer institutions, funding agencies, and support institutions), and connections to stakeholders from industry and society at large.


IEEE Access

Roots of Collaboration: Nature-Inspired Solutions for Collaborative Networks

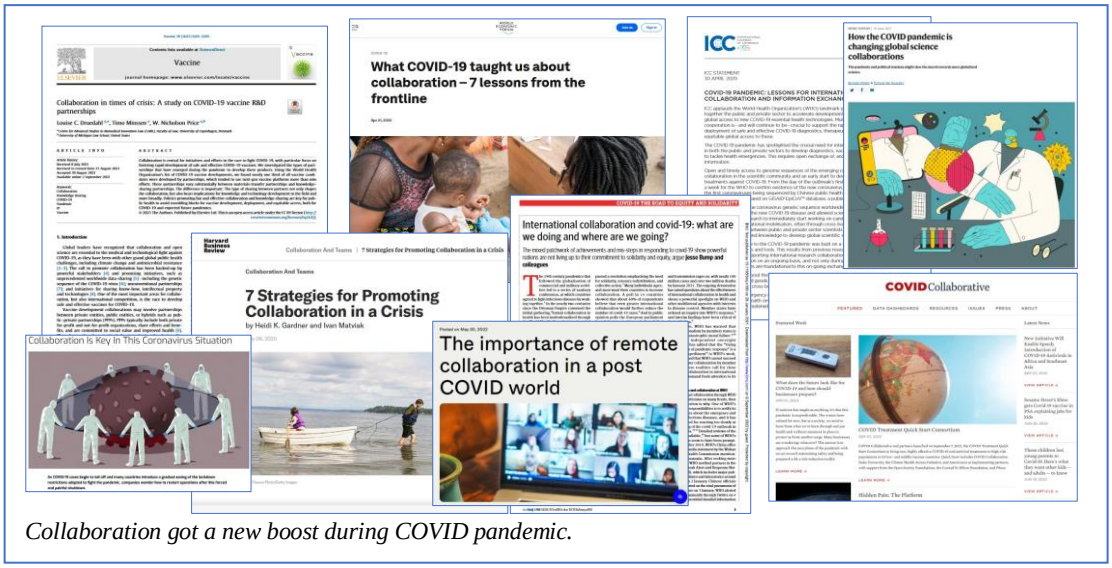
LUIS M. CAMARINHA-MATOS, (Senior Member, IEEE), AND HAMIDEH AFSARMANESH, (Senior Member, IEEE)

ABSTRACT Last decades have witnessed considerable growth in formation of collaborative networks in industry and services, as well as in the rest of society. This trend is boosted by progress in information and communication technologies, and more specifically by ubiquitous access to computing and fast move toward the hyper-connected world. But, this growth has also raised fundamental questions regarding its effectiveness and sustainability of networks. On the other hand, nature is full of examples of successful collaborative processes, both intra- and inter-species. Hence, we consider learning from nature to provide a promising strategy toward both better understanding of collaboration and more effective designing of networks with sustained collaboration. As such, a systematic literature survey is conducted on recent works originated in nature-related disciplines with a focus on collaboration. As a result, a set of important organizational models, collaborative behavior patterns, and collaboration facilitation mechanisms are identified and categorized. Furthermore, our analysis results on potential contribution of such aspects to more intelligent and optimized collaborative networks area are briefly outlined.

https://doi.org/10.1109/ACCESS.2018.2845119

In the face of considerable uncertainty marked by frequent disruptive events, resource scarcity, and inadequate support infrastructures, CTS must not only endure but also sustain excellence and continually improve. Embracing the notion of **antifragility**, which involves identifying and exploiting new opportunities amidst disruption, requires learning from the resilience of natural ecosystems.

A pivotal aspect of this adaptation is the enhancement of **internal collaboration** across all levels. Operating in isolated "microgroups" hinders synergy, impedes the ability to confront external challenges, and fosters a lack of community and belonging. The power of collaboration, as exemplified by numerous global initiatives during the COVID pandemic, underscores the need for increased collaboration within CTS.



Collaboration got a new boost during COVID pandemic.

While healthy competition has its merits, effective collaboration proves indispensable when facing formidable challenges. To foster a culture of collaboration, mechanisms and performance indicators supporting collaboration need to be implemented. **Collaboration, not isolation**, will fortify CTS against disruptive events and external threats.

Isolated "microgroups" will die.

Effective collaboration serves as the foundation for creating a new culture that can also enlighten the managers of host institutions about the significance of maintaining a vibrant research and innovation ecosystem. This cultural shift is essential to help our institutions to co-evolve and even prevent basic mistakes (such as the ill-conceived idea of canceling email addresses of CTS members).

Let us transition to a new phase of collaboration and co-evolution. Seizing the opportunity presented by the integration of new members from COPELABS, let us forge a new collaborative culture within CTS, ensuring its resilience and sustained excellence.

Luis Camarinha-Matos, Director of CTS

Editorial

The November 2023 edition of the CTS newsletter explores the complexities of maintaining excellence in research ecosystems, particularly within the CTS community. The metaphorical concept of an "ecosystem" extends its reach beyond the business realm, encompassing innovation, technology, and research. Navigating this intricate network at CTS involves a diverse array of stakeholders, including researchers, students, institutions, and industry partners.

A step forward in collaboration is highlighted with the integration of COPELABS researchers into CTS, facilitated by a scientific collaboration protocol. This partnership encompasses joint research projects, methodological and technological development, researcher interchange, and the organization of events.

Within our community, we celebrate, amongst other achievements, the successful conclusion of the ZDMP Project and the imminent fabrication of the QUAD-ADC IC for ESA's LISA mission, exemplifying our unwavering commitment to cutting-edge research with practical applications.

Furthermore, we applaud the recognition of CTS researchers among the world's most influential, as evidenced by Scopus data, reaffirming our steadfast dedication to impactful research.

In essence, this edition echoes the themes of collaboration and resilience. As we extend a warm welcome to new members and fortify partnerships, let us collectively fosterage a collaborative culture within CTS, ensuring its enduring excellence and resilience in the face of challenges.

João Martins
CTS Communication Officer

CONTENTS

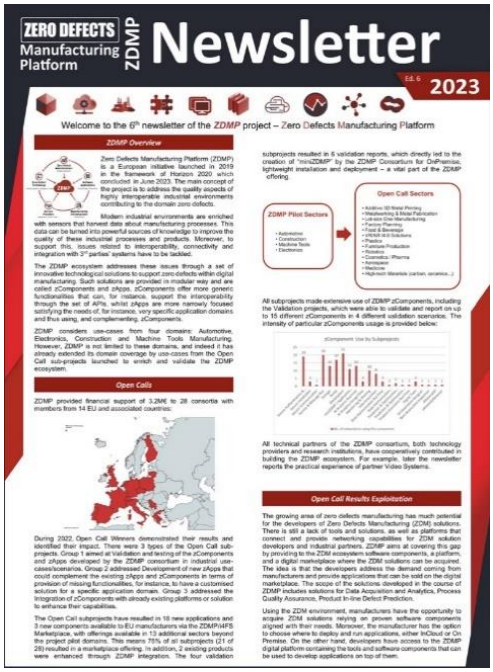
Agreement CTS – COFAC/COPELABS

In order to proceed with the inclusion of COPELABS researchers in CTS (for the next period), a scientific collaboration protocol was established between CTS and COPELABS.
As a result, the collaboration will involve:

- Joint participation in research projects, with joint publications.
- Promotion of the development of research methodologies and technologies.
- Interchange of researchers.
- Promotion of synergies through exploratory activities.
- Organization of seminars, conferences, and webinars.
- Training human resources.


PROTOCOLO DE COLABORAÇÃO CIENTÍFICA

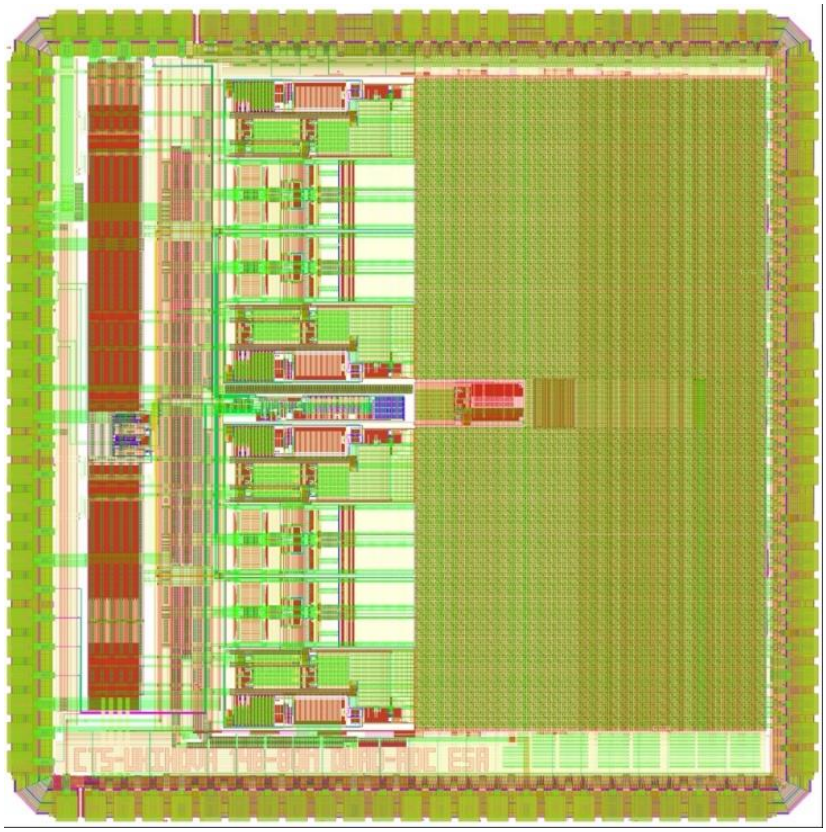
ZDMP Project



We've reached the end of an incredible journey with our project, ZDMP - Zero Defects Manufacturing Platform! Although the project has concluded, the legacy lives on. Please, check out the final newsletter, which is available here for you to explore!
Discover the achieved outcomes, including the results of our open calls and the advancements made within the ZDMP platform itself. Check it at: https://www.zdmp.eu/
Even though the project has come to an end, you can continue to follow its results through the i4FS, which is a new company formed by ZDMP partners and which will help to exploit its results - https://i4fs.com.
Thank you for being a part of this incredible journey!

João Sarraipa

QUAD-ADC for ESA's Laser Interferometer Space Antenna (LISA) successfully tapped-out for fabrication at TSMC



The microelectronics design group of our technical research center (CTS) at UNINOVA has been responsible for the design, layout, fabrication, and testing of a high-speed high-resolution QUAD-ADC Integrated Circuit (IC) under ESA contract no. 40001139457/22/NL/CRS.
The goal of this project, with a partnership with ALTER TUV NORD and with the Max-Planck-Institute, is the qualification for space (this is a CTS-UNINOVA project reaching TRL-9) of an energy-efficient ASIC in 28-nm Bulk-CMOS (TSMC). This ASIC will be used in Space Science Instruments in several ESA missions, such as ESA's Laser Interferometer Space Antenna (LISA) the ultimate target (to be launched in 2024).
The chip samples (100) will be packaged at ALTER UK and experimentally evaluated by ALTER Spain. After IEEE 1241 Standard tests, 50 prototyped IC samples will fully be qualified for space, by measuring their robustness and tolerance against radiation effects (TID, SEE and SEU). The squared chip occupies 4 mm^2 of silicon and it has been tapped-out to TSMC (in Taiwan) in October 25.

João Goes / Luis Oliveira

Synergies – Joint Cluster event

The Synergies – Joint Cluster event marked a significant milestone for eleven research projects benefiting from European Funding within the H2020 program, within the cybersecurity domain. Held on October 16th and 17th, 2023, the event, hosted and supported by UNINOVA in Portugal, showcased a commendable array of achievements.

Commencing the first day's proceedings, Project Officer Juuso STENFORS delivered a compelling presentation on the European contextual landscape of research, focused on the cybersecurity and data protection domains. Subsequently, each project presented its current status and attained results in the ongoing research and development phase. The 1st day of the event, concluded with the social dinner, aiming promote ice-breaking and networking among participants.

The second day's agenda proved to be highly fruitful. The first morning session "Leveraging Synergies for Joint Cybersecurity Solutions: A Collaborative Approach to Exploitation, Dissemination, and Policy Priorities for Cybersecurity for Europe," was moderated by Monica Caballero from the SECANT Project. This session took a dynamic practical approach, encouraging interactive contributions to identify joint collaboration activities among projects and analyze potential collaborative endeavors. The outcome of this session will be translated into a policy briefing document, highlighting the main important drivers, motivations and barriers enabling joint communication and dissemination activities among EU R&D projects.

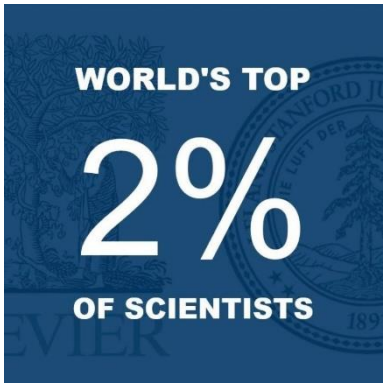
Following this, the second session, moderated by Ruben Costa from the SENTINEL Project, delved into Research Topics for 2024. The group engaged in discussions concerning the future trajectory of projects and contemplated new perspectives within the research universe. In parallel, an open-to-the-public Training Session, skillfully moderated by Valentin Popescu from the ARCADIAN-IOT Project, took place. This session, which saw both online and physical participants, provided an opportunity for projects to disseminate tools and showcase how their developments are already contributing to the community.

As a concluding remark, the "Synergies" event was great success. It was a very important milestone achieved by all the different 11 (eleven) projects involved. Several discussions took place in person, such as new joint dissemination activities for 2024, future collaborations on upcoming EU calls for proposals and joint training activities.

The main highlights of the event can be found in this short video: https://youtu.be/2oOVyQmb8nw

Projects: ERATOSTHENES, ARCADIAN-IoT, Secant, TRUSTaWARE, IRIS, Electron, KRAKEN, IDUNN, CROSSCON, SPATIAL, Sentinel.

Ruben Costa



CTS members among the best researchers in the world according to a Stanford study

Since 2021, a study coordinated by John Ioannidis, a professor at Stanford University, has identified the world's most influential researchers (known as the "World's Top 2% Scientists list") and CTS has been represented since the first edition.

In this latest update, CTS has 3 names on the list, among the most cited researchers throughout their career and researchers with the most impact in the last year: **Luís Camarinha-Matos, João Martins and Manuel D. Ortigueira.**

The ranking was based on Scopus, an international online database of scientific articles and their respective citations, in various types, for academic journals and magazines.

The work can be consulted here.

IEEE PT Seminar

The Director of CTS was one of the invited contributors to the IEEE Portugal Section seminar "**From Digitalization to Digital Transformation: The Impact on SMEs**", 26 Oct 2023.

http://webinars.ieee-pt.org/da-digitalizacao-a-transformacao-digital-o-impacto-nas-pmes/ (in Portuguese)

Participation in REPMUS 23

On September 19, 2023, the Operational Test of the 'WAVING' technology was carried out for the Navy by the Signal Analysis and Processing Group of CTS. The test, which was a complete success, took place in the Technological Free Zone of Tróia and was conducted as part of the NATO REPMUS23 exercise organized by the Portuguese Navy. REPMUS is the world's largest exercise for the experimentation and control of unmanned vehicles.
https://www.marinha.pt/pt/media-center/Noticias/Paginas/Exercicio-REPMUS-2023.aspx
In this test, the operational proof of concept for the WAVING technology was conducted. This technology is quantum in nature and ensures the security of tactical communications at the physical channel level for UAVs and other devices, while also maintaining electromagnetic spectrum dominance. It is designed to be user-friendly, robust, versatile, and compatible with off-the-shelf equipment.
The demonstration was very well executed, with industrial support from the company BeyondVision for the HEIFU Class 3 Hexacopter drones and from the company EID for the tactical radios HR5000. Both companies are suppliers to the Navy. As a result of this successful exchange of know-how and technical capabilities, future collaborations between the University, Defense, and Industry are foreseen, not only in this important specific area but also in all other considered priority domains.

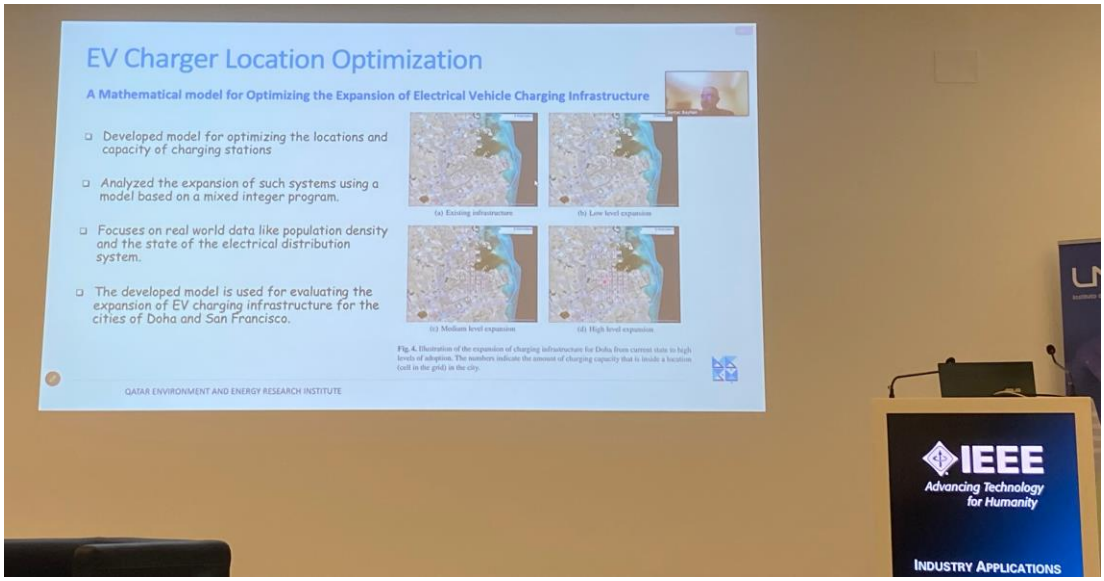
Participation in the Innovation Day 2023

On October 11, 2023, the Signal Analysis and Processing Group of CTS participated in the Innovation Day held at the Navy's facilities at the Guia Lighthouse. A presentation titled "Applications of the Quantum Perspective" was given, showcasing the features of the quantum technology "WAVING," along with the most recent results. These results suggest a very concrete possibility of developing computers with significantly disruptive computational capabilities compared to the current state of the art.
In addition to the Navy personnel, representatives from various industry companies, including EID, Chess, ELAC SONAR, MASS, MCL, and SEA, were also in attendance. Academic presentations were delivered by members of the Lisbon Superior Technical Institute (IST) and the Aveiro Telecommunications Institute (IT). At the end of the event, we were informed by Navy representatives that our presentation would be delivered to the Navy General Staff at a later date, a prospect we gladly accepted.

Workshop IEEE PT

The IEEE Portuguese Industry Applications / Industrial Electronics / Power Electronics Joint Chapter and the IEEE Qatar Industrial Electronics Chapter in Power Electronics organized a joint workshop on **November 16th** at the UNINOVA / FCT NOVA facilities, with collaboration of CTS/LASI.
The workshop was dedicated to the topic of power electronics and integration of electric vehicles and included 2 keynotes:

- Prof. Sertac Bayhan: "Electric Vehicle Integration in Hot Climates"
- Prof. Armando Cordeiro: "Multilevel inverters based on the nine-switch converter for dual or six-phase motors".



Doctoral Summer School

The 3rd Doctoral School of the European Training Network project SMARTGYsum was organized in our campus in the same week and in association with DoCEIS 2023/YEF-ECE 2023.

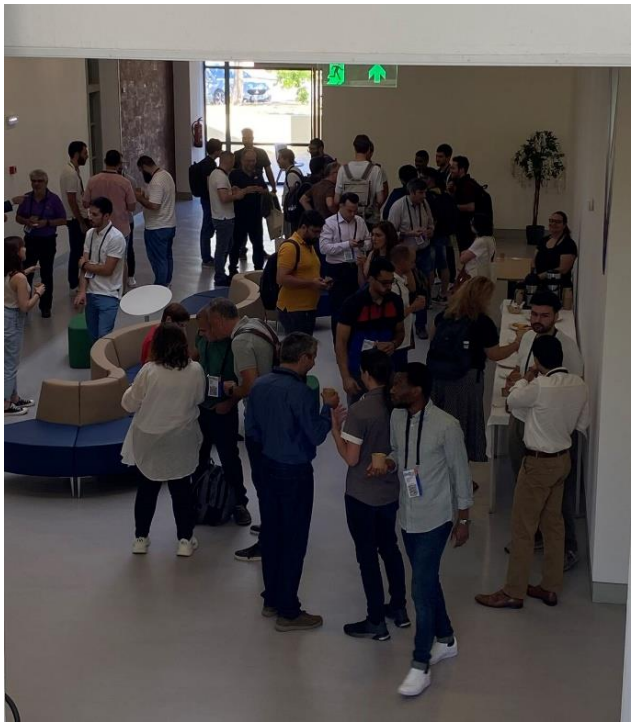
CTS members contributed with 2 modules for this summer school:

- Collaborative Networks (Luis Camarinha-Matos, Ana Inês Oliveira), 3 Jul 2023, 8:45-19:00
- Research Ethics and Proposal Writing (Luis Camarinha-Matos, Filipa Ferrada), 5 Jul 2023, 14:00-19:00.

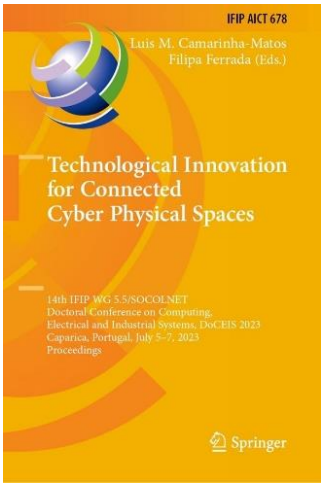
https://smartgysum.eu/Home/TThirdSchool

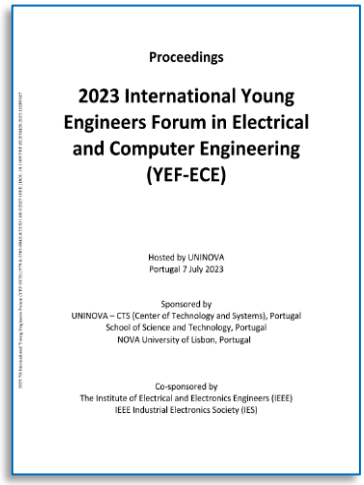
DoCEIS 2023 – 14th Advanced Doctoral Conference on Computing, Electrical and Industrial Systems

Devoted to the theme "Technological Innovation for Connected Cyber-Physical Spaces", the 14th edition of DoCEIS, the Advanced Doctoral Conference on Computing, Electrical and Industrial Systems, co-sponsored by CTS, was organized at the Caparica Campus from 5 to 7 July 2023. Digital technologies have been boosting the integration and intertwining of these spaces with profound impact in all sectors of society including industry, energy, healthcare, services, etc. These include a large variety of technologies, e.g., Internet of Things, Cyber-Physical Systems, Sensing, Data Analytics and Machine Learning, Human-Machine Interfaces, Energy Harvesting, Smart Communications, among others. As systems become smarter, with increasing levels of cognition and autonomy there is a growing need to properly design and govern innovative collaborative environments populated by heterogeneous intelligent systems oriented to tackle societal challenges from a human-centric perspective.



In association with DoCEIS, also the YEF-ECE young engineers forum had its 7th edition. A total of 46 papers (22 from DoCEIS and 24 from YEF-ECE) were presented. Proceedings of DoCEIS 2023 were published by Springer and proceeding of YEF-ECXE 2023 by IEEE Xplore.



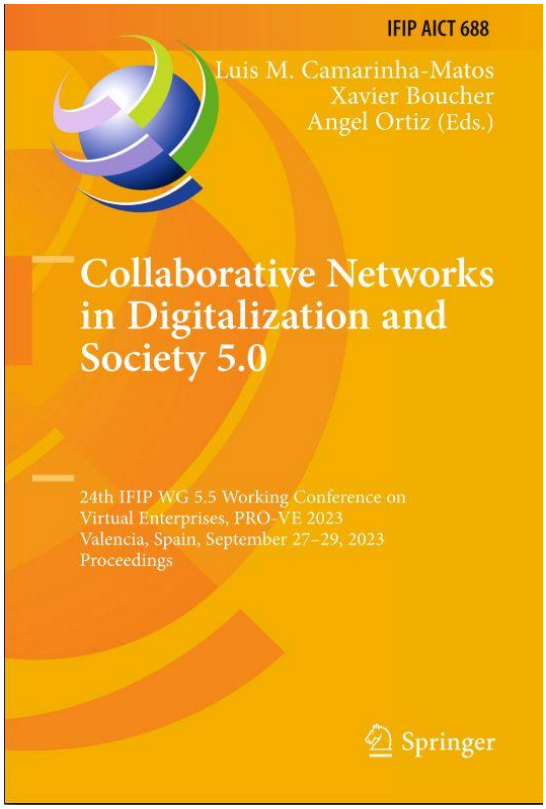


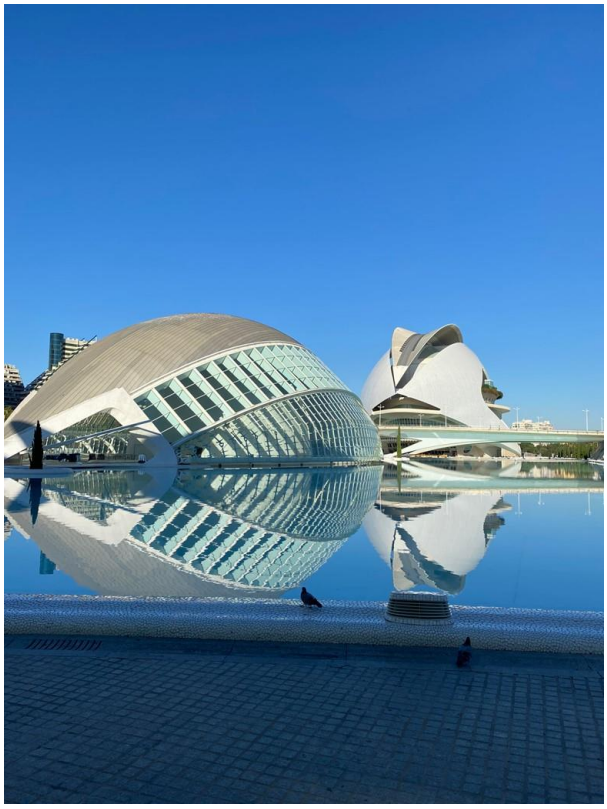
PhD program – Inaugural session 2023/2024

The inaugural session of the PhD program of Electrical and Computer Engineering of the School of Science and Technology of NOVA University of Lisbon, supported by CTS, took place on 14 Nov 2023.
For the edition of this academic year we have 18 new PhD candidates.
Slides here.

PRO-VE 2023 - 24th IFIP/SOCOLNET Working Conference on Virtual Enterprises

Devoted to the theme "Resilient and Responsible Collaborative Networks", the 24th edition of PRO-VE (www.pro-ve.org), the IFIP/SOCOLNET Working Conference on Virtual Enterprises, co-sponsored by CTS, was organized at the Campus of Polytechnic University of Valencia, Spain, from 27 to 29 Sep 2023.
Collaborative networks are now crucial for success in our dynamic and interconnected world. They play a vital role in various domains, including science, business, and social initiatives, showcasing their effectiveness through remarkable achievements and progress. However, to effectively address the intricate and unpredictable challenges ahead, we must move beyond traditional collaboration and embrace a new approach that is both resilient and responsible.
This edition included the presentation of 59 technical papers and the Proceedings were published by Springer.





IEEE ESSCIRC-ESSDERC 2023

The ESSCIRC-ESSDERC 2023 Conference (https://www.esscirc-essderc2023.org) has been held in Lisbon from September 11 to 14, which was organized jointly by the UNINOVA Institute & NOVA School of Science (Lisbon) and by the University of Seville (US). This event is the most important scientific-technical forum in the field of microelectronics, being the main European conference of the IEEE Solid-State Circuits Society and IEEE Electron Devices Society. This year's edition was very successful since it had a record participation of more than 900 attendees from the main academic institutions, research Institutes and industrial companies active in the semiconductor and microelectronics sectors, not only at European but global level. We had attendees from 40 different countries.

The Iberian edition of Lisbon in 2023 has been held at a very important moment in the history of the microelectronics industry in Europe, with financing programs, such as, the EU Chips Act at the European level, which aim promote this key sector for the economy and society. For this reason, the organizing committee of this edition, chaired by Prof. João Goes (Professor at NOVA University of Lisbon and Researcher of CTS at UNINOVA Institute, Portugal), Dr. Andreia Cathelin (Director of Advanced R&D Design at ST Microelectronics, France) and Prof. José M. of the Rosa (Professor of the Electronics Area at the University of Seville and Researcher of the Seville Institute of Microelectronics, Spain), invited various personalities from the European academic, business and political world to participate in a round table to discuss the actions that are being carried out in Europe in general and some countries, in particularly Portugal and Spain, to attract and provide advanced training to talent in a driving sector of the economy and modern society, such as microelectronics.
A group of 80 MSc and over 20 PhD students, from CTS-UNINOVA, in micro/nano-electronics area, have participated, in this European forum, dedicated to the presentation and discussion of recent advances in solid-state devices and circuits.

AWARDS

DoCEIS 2023 best paper award

A CTS PhD students got one of best paper awards at DoCEIS 2023:

"A Bio-inspired and Altruistic-based Framework to Support Collaborative Healing in a Smart Manufacturing Shop-Floor"
Luis A. Estrada-Jimenez, Sepideh Kalateh, Sanaz Nikghadam Hojjati, Jose Barata

YEF-ECE 2023 best paper award

A master student supervised by Prof. João P. Oliveira, member of CTS, got the best paper award at YEF-ECE 2023:

"Design of an RF-CMOS Switched-Capacitor Power Amplifier for NB-IoT RF Transceivers"
Ana Santos, João P. Oliveira

PRO-VE 2023 Best paper award

Paula Graça, a PhD student at CTS, got a best paper award at PRO-VE 2023, Valencia, Spain, 27-29 Sep 2023:

> Graça, P., Camarinha-Matos, L.M. (2023). Influencing Collaboration in Sustainable Business Ecosystems. In: *Collaborative Networks in Digitalization and Society 5.0. PRO-VE 2023*. IFIP Advances in Information and Communication Technology, vol 688. Springer, Cham. https://doi.org/10.1007/978-3-031-42622-3_1

Faculty Advisor Award

Prof. António Abreu, member of CTS and Coordinator of the MSc in Industrial Engineering and Management of Department of Mechanical Engineering DEM ISEL, awarded by IEOM Society International with the "Outstanding Student Chapter Faculty Advisor Award".
IEOM Society International – *Industrial Engineering and Operations Management Society International*
IEOM Society's core purpose is to globally foster critical thinking and its effective utilization in the field of Industrial Engineering (IE) and Operations Management (OM) by providing means to communicate and network among diversified people, especially in emerging countries, motivated by similar interests.

Project from ISEL wins ACE Challenge 2023

The 2nd edition of the ACE Challenge ideas competition came to an end on 14 July with the presentation of the six candidate projects and the awarding of prizes to the winners. The Uripro project from the Instituto Superior de Engenharia de Lisboa was the winner. Reducing the impact of serious nephrological diseases using new technologies available on the market of the Cyber-Physical-System to act at the level of prevention is the aim.

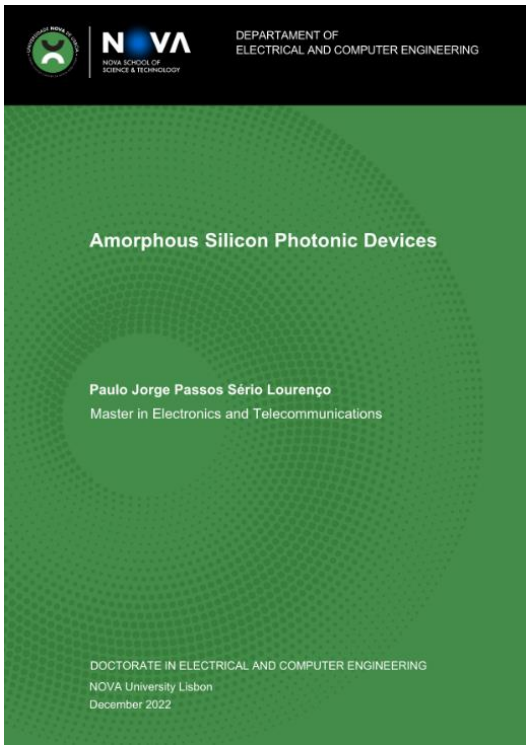
The winning team is composed of ISEL Biomedical Engineering master's students Ana Moreno, Ana Correia and Raquel Pedro and Karina Soto from the Setúbal Hospital Centre, Sofia Pereira from iNova4 Health and Alessandro Fantoni (DEETC/ISEL and researcher at the Centre for Technologies and Systems - CTS), a lecturer at the Lisbon Higher Institute of Engineering.

The winning team's proposal aims to pave the way for new Cyber-Physical-System technologies available on the market for the prevention of nephrological diseases. The aim of this project is to create a simple optoelectrical sensor that detects the presence of high levels of compounds in urine, depending on the absorbance or capacity of the compounds to absorb radiation with a wavelength of 280 nm. The Cyber physical system provides continuous and constant monitoring of the person's state of health, making it possible to prevent and/or control dehydration, in the military market, more specifically in special forces where it is difficult to access and monitor the individual's health.

https://www.isel.pt/noticias/projeto-do-isel-vence-ace-challenge-2023

Recent PhD theses

Thesis: **Amorphous Silicon Photonic Devices**
PhD Candidate: Paulo Lourenço
Supervisor: Manuela Vieira
Co-supervisor: Alessandro Fantoni
NOVA School of Science and Technology, 30 Oct 2023

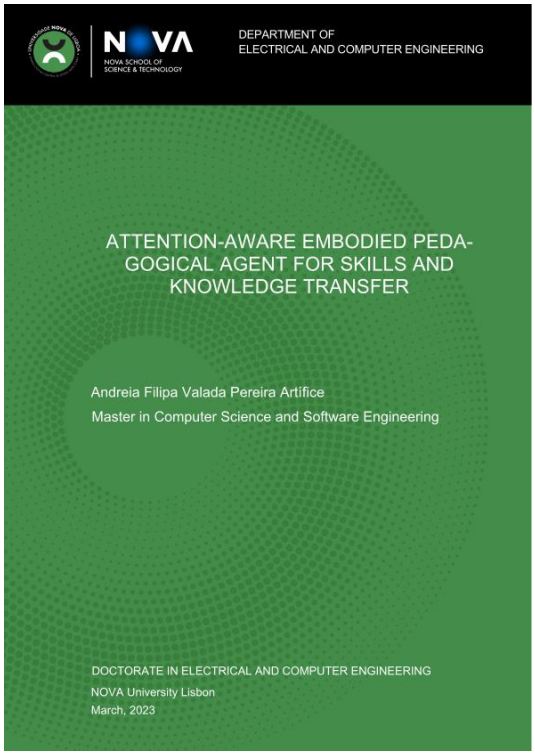


In the past few decades silicon photonics have experienced enormous evolution due to industry's large investments and a renovated interest in the research community, fuelled by promising capabilities of technological advancements similar to the ones we have witnessed since the 1960's up to the first decade of 21st century. Meanwhile, photonics has demonstrated that is able to overcome, if not all, some of the bottlenecks that are currently preventing technological progress. Photonic devices are power efficient, they are able to assure much wider bandwidth for data transfer and they tend to be cost effective.

In this dissertation, it will be investigated the design feasibility of implementing dielectric structures based in the amorphous silicon technology, when integrated in a single device – the Photonic Integrated Circuit. To that end, these issues will be approached based on state-of-the-art research literature, simulations of pertinent structures through adequate algorithms or methods and experimental verification, whenever possible.

The proof of concept will consist of simulations based on numerical methods, conducted over the individual structures of the device and experimental work regarding the characterization of the deposited materials. The architecture's viability will be assessed through the analysis of the obtained results, considering the relevant parameters of each individual structure. With this, it will be provided the main guidelines to design the involved structures and a comprehensive understanding of the phenomena supporting propagation, detection capabilities and coupling of the electromagnetic fields, which are all involved in the implementation of photonic devices developed with this technology.

Thesis: **Attention-Aware Embodied Pedagogical Agent for Skills and Knowledge Transfer**
PhD Candidate: Andreia Artífice
Supervisor: Ricardo Gonçalves
Co-supervisor: João Sarraipa
NOVA School of Science and Technology, 27 Oct 2023



The paradigm of Internet of Things (IoT), it is known to allow people and things to be connected anytime, anyplace, with anything, and anyone, and through any path or service. Embodied cognition can be inserted in that context, including Artificial Intelligence (AI). A form of implementation of AI is by using embodied agents, i.e., a soft ware agent that interacts with the environment through a body. An application scenario can be the learning environment in which students' attention is crucial since it is a facilitator of cognitive and behavioural performance. Embodied Pedagogical Agents, specifically might adapt according to student attentional states such as through attitudes and behaviours. Additionally, it enriches in social learning environment. It is known that there are conceptual frameworks representing the knowledge that teachers need to know to introduce technology. However, do not include the knowledge that teachers acquire when involved in technological research projects. Thus, there is a need of create a conceptual framework that involves an integration of those concepts allowing to develop arti facts that integrates specific issues such as student attention. This research work follows the traditional research method and focus on the following research question:

How to enhance student's attention in eLearning environment?

Concerning that it is argued by hypothesis. the following: Hypothesis 1: if it is possible to sense student attention based on biosignals, the learning environment can be adapted for each student profile. The definition of an embodied agent contextualized under the paradigm of internet of things could be an available solution. And, Hypothesis 2: if a process of creating an eLearning solution with dynamic reaction features to increase students' attention can be supported by pedagogical experts (teachers) then it can effectively be improved. In that context, it is proposed a case study scenario for attentional -aware pedagogical embodied agent for knowledge transference and skill performance. Taking into consideration what has been previously said, one may say that: H1 has been corroborated, since it has been created a prototype, with the following characteristics: Embodied Agent Architecture Design and Theoretical Fundament and correspondent prototype tool Sense student attention through EEG PA design for student attention: gestures Synthetic Perception Modelling using the Yerkes Dodson Neuroscience Law embedded with Q-Learning algorithm. H2 has been corroborated since it has been proposed a framework for technology integration and artefact development in education in which the embodied pedagogical agent is designed and implemented.

FUTURE EVENTS

Caparica, 3-5 Jul 2024

In an era of rapid technological progress, the relentless pursuit of efficiency and automation has often overshadowed our humanity. It is crucial to reassess the symbiotic relationship between humans and technology, giving due consideration to the human perspective in the design and development processes. This involves acknowledging and celebrating human qualities such as creativity and compassion.
This edition of DoCEIS invites doctoral students to s contribute insights on human-centered systems and Society 5.0 / Industry 5.0. This interdisciplinary forum aims to delve into the realm of human-centric systems, emphasizing sustainability and resilience through the transformative potential of cutting-edge technologies like Internet of Things, Cyber-Physical Systems, Sensing, Data Analytics and Machine Learning, Human-Machine Interfaces, Energy Harvesting, Smart Communications, among others. join us in this dynamic exchange of ideas and be part of a movement human-centric, sustainable, and flexible technology.

https://doceis.dee.fct.unl.pt/
Event co-sponsored by CTS.

YEF-ECE 2024 - 8th International Young Engineers Forum (July 5, 2024)

The YEF-ECE 2024 – 8th International Young Engineers Forum on Electrical and Computer Engineering, also co-sponsored by CTS, will be organized on 5 Jul 2024 in association with DoCEIS.

https://yef-ece.deec.fct.unl.pt/

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CTS Newsletter is a publication of CTS-UNINOVA

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