



After 2018-2022

It's Time to Reflect .

This is an important year. After the 5-year (2018-2022) period of the strategic program approved by FCT, it is time to collect and organize information on our achievements. We also need to do an internal assessment of these achievements. In this context, we will have a visit from our External Advisory Board to help us reflect on our successes, things that need improvement, and start developing the strategic research agenda for the next period. This is also the time to start preparing all the reports required for the next evaluation by the FCT

research agency.

One challenge is to face the misalignment between the strategic objectives / message promoted by FCT, government, European Commission, and society in general, and the vision of the evaluation panel appointed by FCT. While the “message” of government and science management entities emphasizes the importance of creating value and impact with research results, namely in alignment with the UN Agenda 2030 for sustainable development, the last panel nominated by FCT to evaluate our center was only concerned with basic research at very low TRL levels, which reflects a clear misalignment with the official national and European strategies.

Another challenge the research community faces these days is the urgency to pursue ethics and responsible research and innovation (RRI). In times of tough competition, we need to nurture the creation of a sound RRI culture and be on alert to prevent any form of research misconduct. The emergence of “criminal science publishing gangs”, formerly known as “paper mills”, is identified by the research community as one of the main threats of true science. While we don’t have any of those “toxic” cases of “researchers” who publish 1 paper a week (which is obviously not real science), we still need to be aware of other potential dangers. Other related forms of misconduct include ghost authorship, pressured authorship, honorary authorship, duplicate submission, plagiarism, salami publication, and fraud (fabrication and falsification), which responsible researchers need to avoid at all costs.

As a contribution to the implementation of sound RRI practices in CTS, a set of guidelines were produced and are available at <https://cts.uninova.pt/rri.html>. Certainly this is an issue that requires continuous attention from the research community.

Another issue of concern is the unclear landscape of open access. While research funding agencies insist on open access / open science, besides the high costs of open access publishing, researchers are confronted with the proliferation of predatory publishers and dubious journals. This requires continuous attention to the reviewing practices adopted by publishers and the prestige of journals. Researchers need to pay attention to the ongoing debates on the (lack of) prestige of various publishers / journals and make a careful selection of channels for submitting publications.

Sabel, B.A., Seifert, R. **How criminal science publishing gangs damage the genesis of knowledge and technology—a call to action to restore trust.** *Naunyn-Schmiedeberg's Arch Pharmacol* **394**, 2147–2151 (2021). <https://doi.org/10.1007/s00210-021-02158-3>

IEEE recommendation:

Authorship credit must be reserved for those who met each of the following conditions:

1. Made a significant intellectual contribution to the theoretical developments, system or experimental design, prototype development, and/or the analysis and interpretations of data associated with the work contained in the manuscript;
2. Contributed to drafting the article or reviewing and/or revising it for intellectual content;
3. Approved the final version of the manuscript, including references.

Luis Camarinha-Matos
Director of CTS

Editorial

This newsletter issue is extremely important because points out an important milestone in CTS life. After a pandemic period, that affected everyone's lives, it will be possible to meet in person with the CTS External Advisory Board. In this visit, prepared with the high commitment of all CTS members, is expected to demonstrate CTS high quality research while gathering the External Advisory Board Members point of view. This newsletter issue also presents a summary of the CTS researchers achievements, in the past five years, highlighting the good results obtained. It is with a gratification feeling that one acknowledges the continuous international recognition of CTS researchers and the continuous high-quality level of the doctoral thesis originated within the centre. Finally, it is important to highlight the set of upcoming international events that will be co-organized by CTS. In a word, CTS is in good health and the future looks promising.

João Martins

CTS Communication Officer

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Visit of the External Advisory Board

The External Advisory Board of CTS will visit the center on 16-17 March 2023.

On the occasion, we will discuss past achievements and our plans for the next 5 years.

The external Advisory Board of CTS includes the following experts:

Academia:

- Prof. Arturo Molina, Monterrey tech, Mexico
- Prof. Leopoldo Franquelo, University of Sevilla, Spain
- Prof. Weiming Shen, Huazhong University of Science and Technology, Wuhan, China

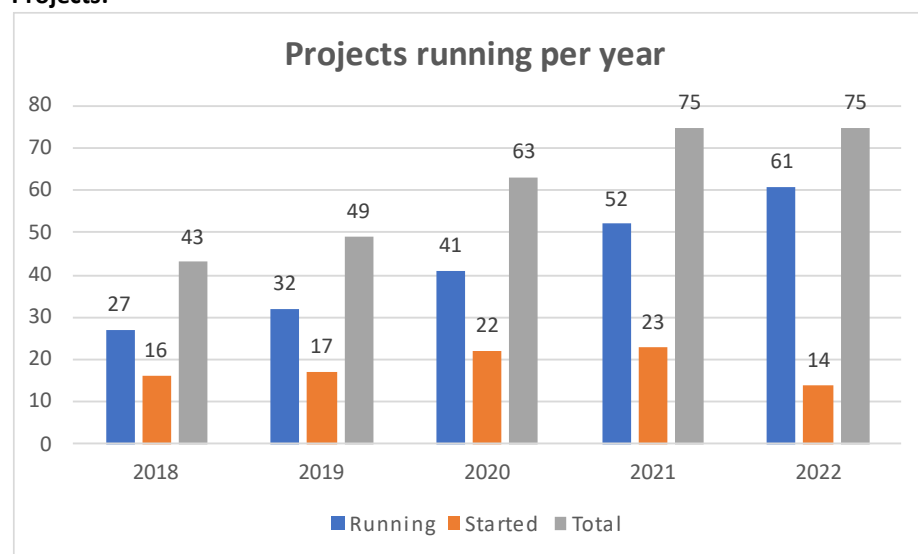
Industry:

- Christoph Hanisch (formerly at FESTO), Germany
- João Manuel Melo (formerly at CTT), Portugal

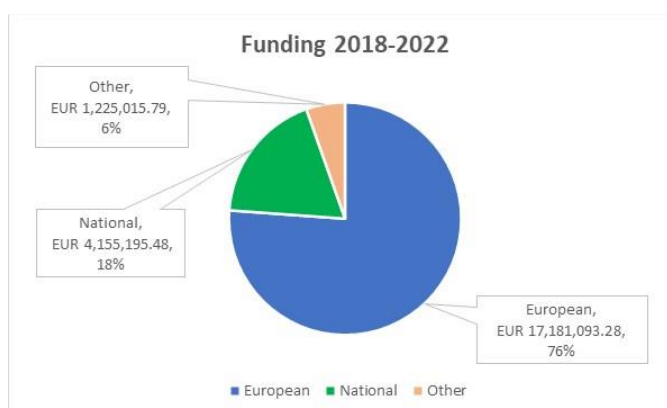
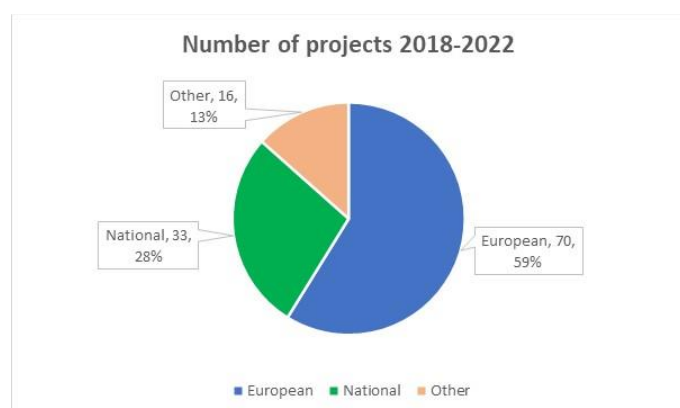
SUMMARY OF CTS ACHIEVEMENTS 2018-2022

The following diagrams summarize main indicators of CTS activity during the last 5 years:

Projects:

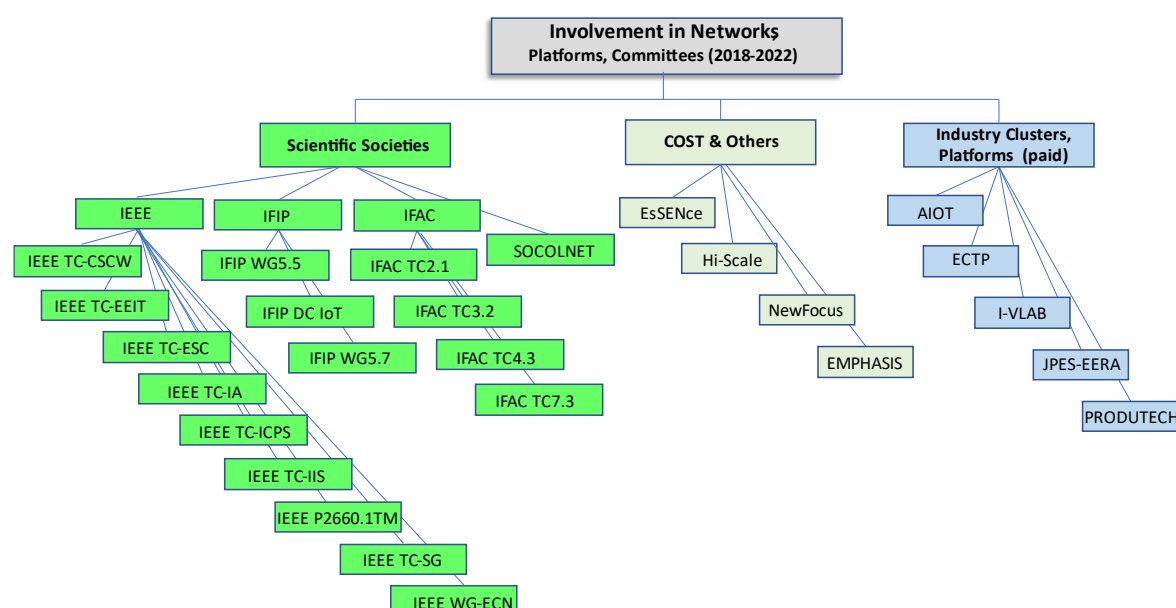


Even during the COVID-19 confinement period CTS was able to attract a large number of funded projects in competitive Calls.

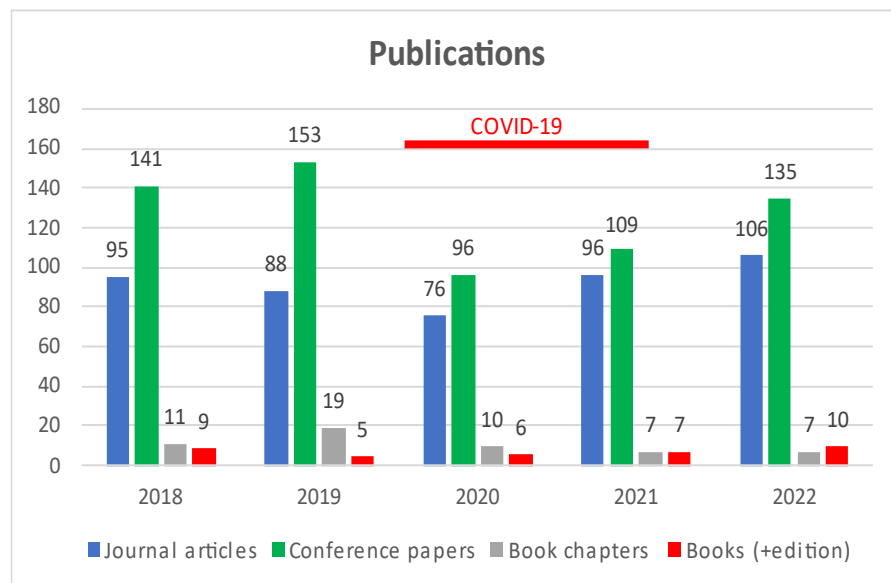


Participation in Networks:

CTS members are involved in the following international networks / societies:

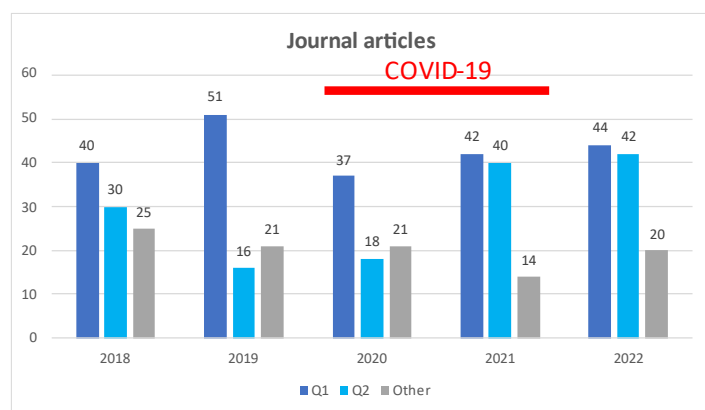


Publications:

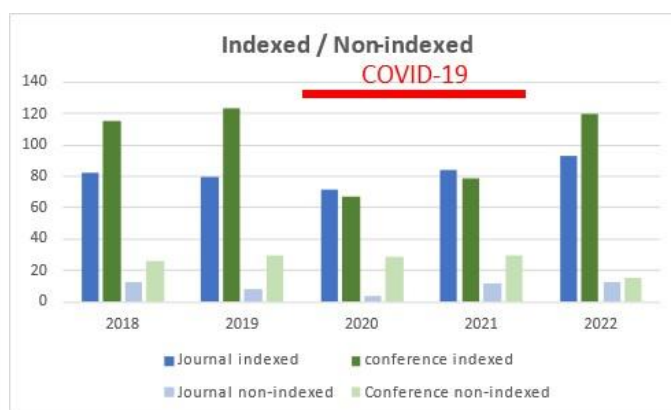


38.9% journal articles, 53.5 % conference papers, 4.5% book chapters, 3.1% books & edition

An average of 5 publications / year / integrated member

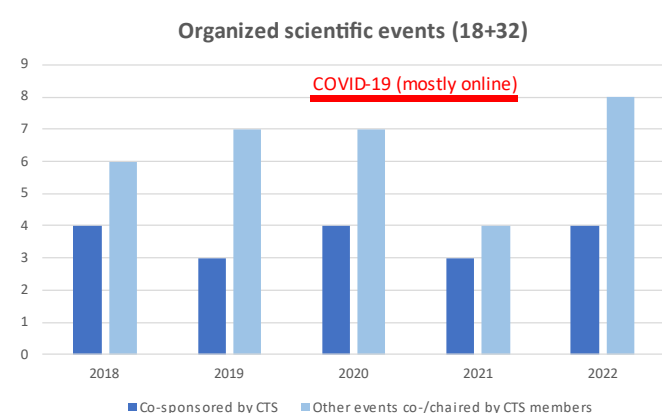


46.4% in Q1, 31.7% in Q2

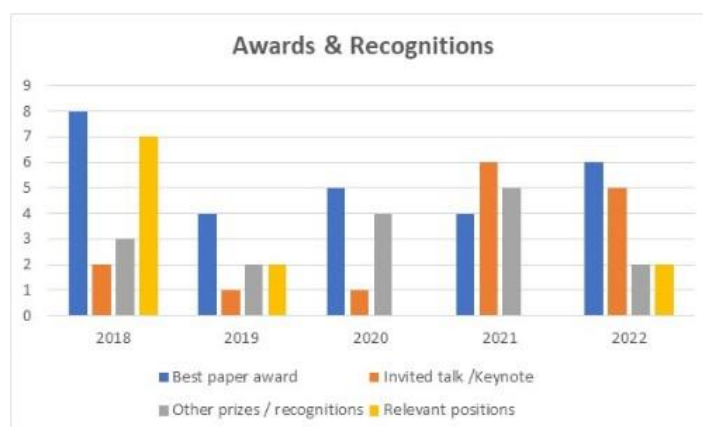


83.7% indexed

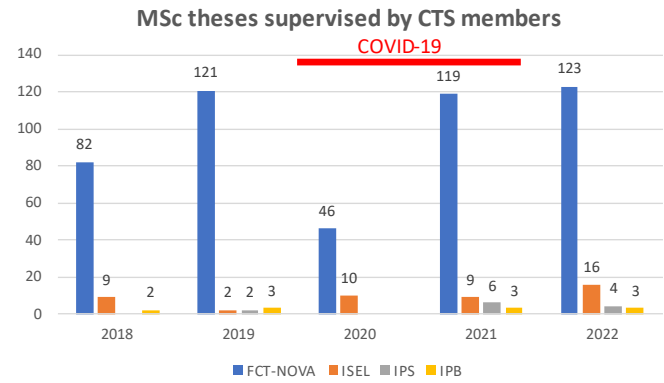
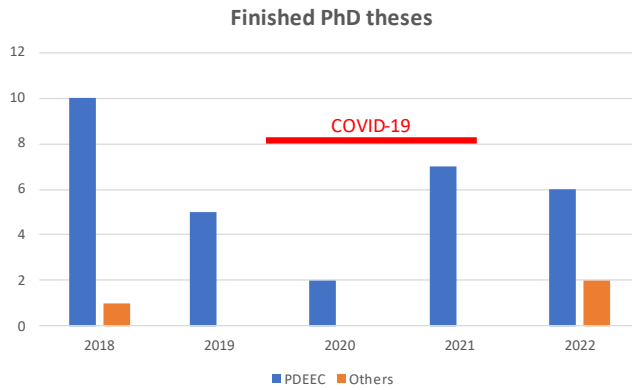
Organized events:



Awards & recognitions:

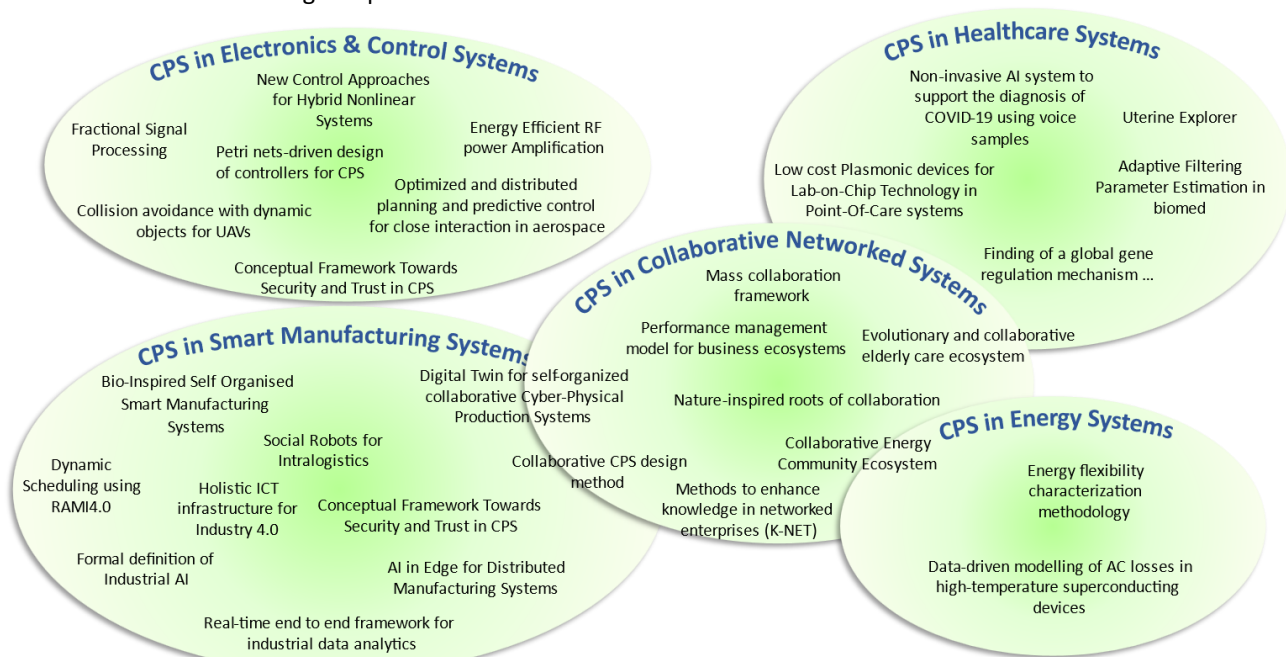


Theses:



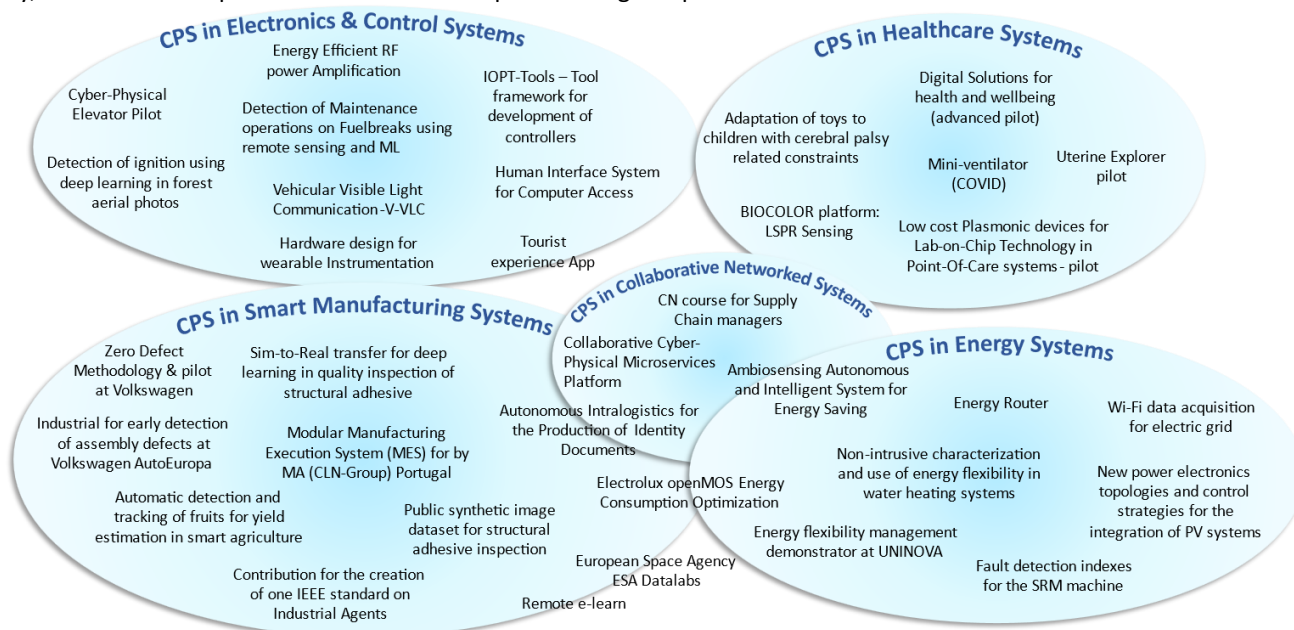
Sample of research achievements:

Main scientific contributions during this period are clustered around 5 main themes:



Sample of major developments and pilots:

Similarly, the main development contributions and pilots during this period can be clustered around 5 main themes:



DoCEIS: Advanced Doctoral Conference on Computing, Electrical and Industrial Systems

This important international event devoted to PhD students continued to be organized annually.



The conference was co-sponsored by Socolnet, IFIP and IEEE IES. Proceedings are published by Springer.

YEF-ECE: Young Engineers Forum on Electrical and Computer Engineering

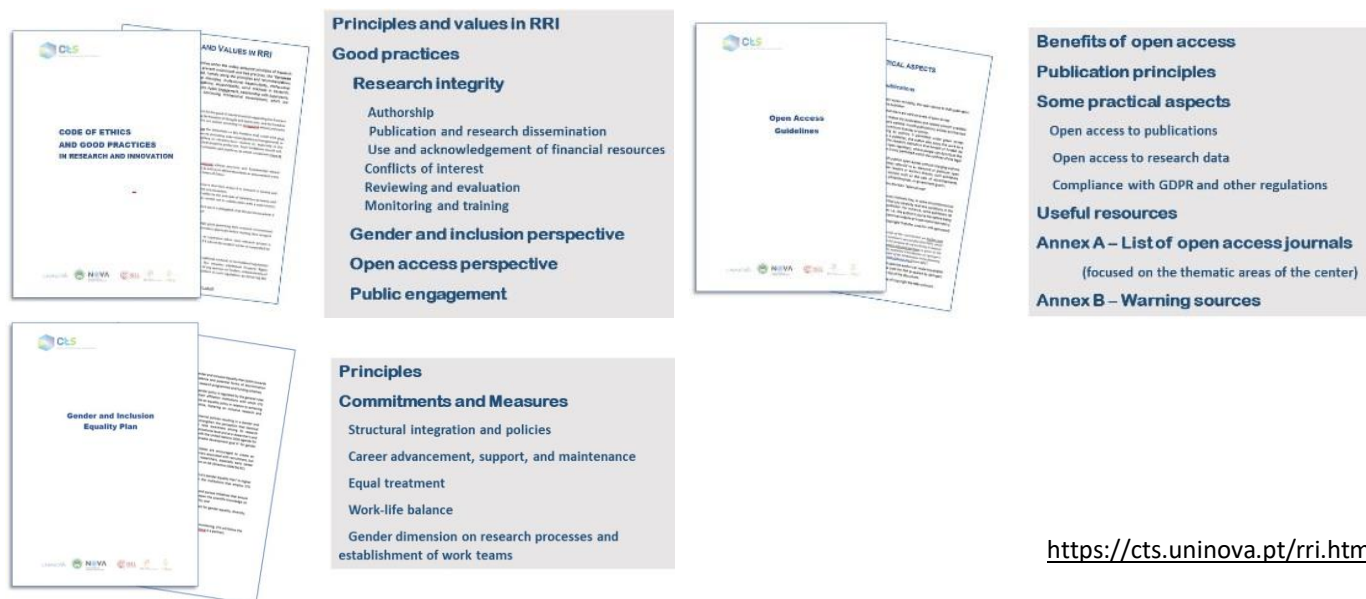
This international event devoted to recently graduated engineers continued to be organized annually.



The event was co-sponsored by IEEE IES. Proceedings are published by IEEE Xplore.

Responsible Research and Innovation

CTS is committed to pursue and promote RRI. During this period the following principles and guidelines were elaborated:



<https://cts.uninova.pt/rri.html>

RECENT PhD THESES



Thesis: **A paradigm shift in the design of analog circuits targeting nanoscale CMOS and large-scale TFT technologies**

PhD Candidate: Ana Paula Pinto Correia

Supervisor: João Carlos da Palma Goes

Co-supervisor: Pedro Miguel Cândido Barquinha

NOVA School of Science and Technology, 19 Dec 2022

Despite the strong developments in CMOS or non-CMOS technologies such as, in oxide thin-film transistors (TFTs), their nonidealities and constraints impact on the circuits performance. This aspect is even more relevant in complex circuits, such as in analog-to-digital converters (ADCs), where the design is thorough. Then, using techniques capable to attenuate the impact of these limitations such as, negative feedback, or recurring to almost passive or digital (synthesizable and scalable) circuitry, it is possible to design outstanding ADCs in different technologies.

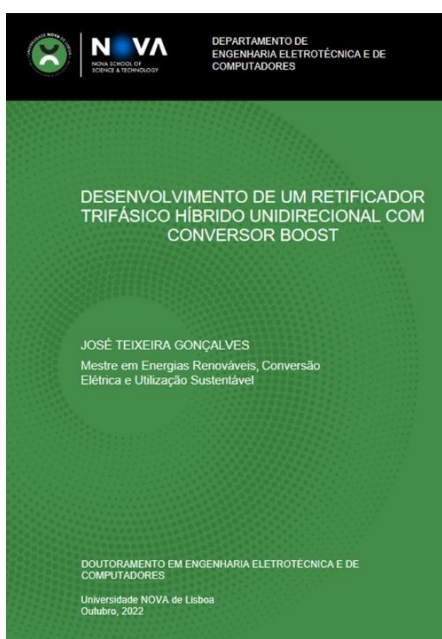
Therefore, two ADCs were designed in this work, using two



distinct technologies.

A Digital-delta-modulator (DM) with noise-shaping (NS) was designed using a deep-nanoscale CMOS technology. Simulations revealed a SNDR close to 74 dB, a 12-bit ENOB, with $\text{FoM}_{\text{Walden}}$ of 12.5 fJ/conv.-step.

Using oxide TFTs, a 2nd-order delta-sigma modulator (DSM) was designed. Given the technology limitations, an almost passive structure was considered, with a design that relied essentially on the comparator project. During schematic simulations, a SNDR close to 69 dB, corresponding to an ENOB of ≈ 11.3 -bit, was achieved ($\text{FoM}_{\text{Walden}}$ of 40 nJ/conv.-step).



Thesis: **Desenvolvimento de um retificador trifásico híbrido unidirecional com conversor boost (in Portuguese)**

PhD Candidate: José Teixeira Gonçalves

Supervisor: Stanimir Stoyanov Valtchev

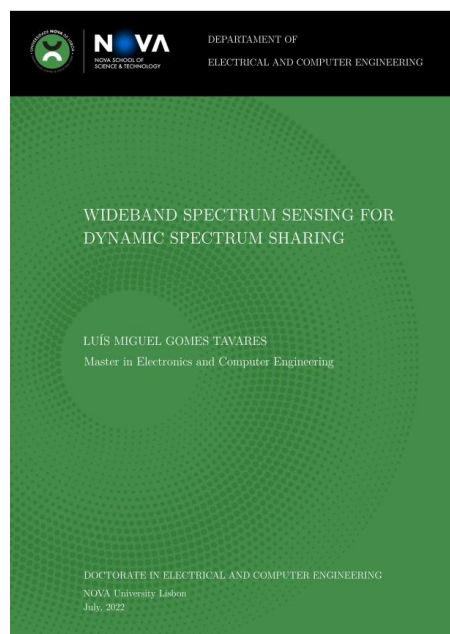
Co-supervisor: Mário Rui Melício da Conceição

NOVA School of Science and Technology, 22 Dec 2022

The work presented in this document focuses on the development of a three-phase unidirectional hybrid rectifier with Boost converter. The three-phase hybrid rectifier (RTH) with Boost converter is composed of two rectifiers (rectifier 1 and 2) and isolation transformer at the input of each phase of rectifier 2, to mitigate current interactions. The same configuration without isolation transformers is considered unfeasible due to current interactions between rectifier 2 modules. RTH allows combining the advantages of rectifier 1 (GRAETZ bridge) with the advantages of rectifier 2 (power factor correction), thus presenting advantages in several applications. Analyzing the RTH, based on Boost converter with an isolation transformer existing in the literature, it is proved that this "classic" solution presents a heavier weight, larger volume, and higher cost. Therefore, it turns up more interesting and challenging to design an RTH with Boost converter, without the isolation transformer. Thus, an RTH with a Boost converter, but without the isolation transformer, is here proposed. For this, it was necessary to replace the Boost inductor of

each module of rectifier 2, with a coupled inductor. The proposed RTH implementation was first simulated in PSIM software (20 kW). A prototype of the modular three-phase rectifier with Boost converter and power factor (PF) corrector, i.e., the rectifier 2 of the

proposed RTH of 3 kW, was also built, to validate the mitigation of current interaction. The proposed RTH results simulations show that there is no current interaction and work correctly, having presented a high power factor of 99.92% and low total harmonic distortion (THD) of 3.96%. Likewise, the modular three-phase rectifier prototype also is showing no current interaction between phases and equal to the previewed operation, having presented a high PF (99.8%) and low THD value (3.7%). Thus, it is proved that it is possible to implement an RTH with Boost converter and coupled inductor.



Thesis: **Wideband Spectrum Sensing for Dynamic Spectrum Sharing**

PhD Candidate: Luís Miguel Gomes Tavares

Supervisor: José António Beltran Gerald

Co-supervisor: João Carlos da Palma Goes

NOVA School of Science and Technology, 8 February 2023

The proliferation of wireless devices grows exponentially, demanding more and more data communication capacity over wireless links. Radio spectrum is a scarce resource, and traditional wireless networks deployed by Mobile Network Operators (MNO) are based on an exclusive spectrum band allocation. However, underutilization of some licensed bands in time and geographic domains has been reported, especially in rural areas or areas away from high population density zones. This coexistence of increasingly high data communication needs and spectrum underutilization is an incomprehensible scenario. A more rational and efficient use of the spectrum is the possibility of Licensed Users (known as Primary Users – PU) to lease the spectrum, when not in use, to Unlicensed Users (known as Secondary Users – SU), or allowing the SU to opportunistically use the spectrum after sensing and verifying that the PU is idle. In this latter case, the SU must stop transmitting when the PU becomes active.

This thesis addresses the spectrum sensing task, which is essential to provide dynamic spectrum sharing between PUs and SUs. We show that the Spectral Correlation Function

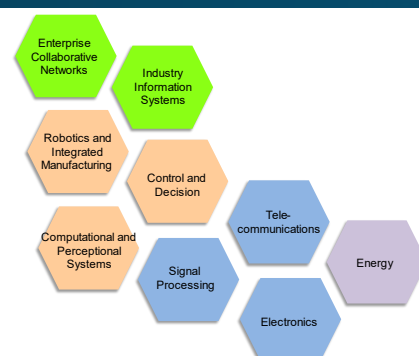
(SCF) and the Spectral Coherence Function (SCoF) can provide a robust signal detection algorithm by exploiting the cyclostationary characteristics of the data communication signal. We enhance the most used algorithm to compute the SCF – the FAM (FFT Accumulation Method) algorithm – to efficiently compute the SCF in a local/zoomed region of the support $(f; \alpha)$ plane (frequency/cycle frequency plane). This will provide the quick identification of spectral bands in use by PUs or free, in a wideband sampling scenario. Further, the characterization of the probability density of the estimates of the SCF and SCoF when only noise is present, using the FAM algorithm, will allow the definition of an adaptive threshold to develop a blind (with respect to the noise statistics) Constant False Alarm Rate (CFAR) detector (using the SCoF) and also a CFAR and a Constant Detection Rate (CDR) detector when that characterization is used to obtain an estimate of the background noise variance (using the SCF).



PhD Applications

The first phase of applications to the Doctoral Program in Electrical and Computer Engineering (PDEEC) for the year 2023/2024 is open until March 22, 2023.

The application is submitted online, at the FCT-NOVA website, at https://clip.unl.pt/candidatura/terceiro_ciclo.



Best paper awards



Amaral, T. G., Fernão Pires, V., **Foito, D.**, Cordeiro, A., Chaves, M., Rocha, J. I., **Pires, A. J., Martins, J. F.** (2022), A Fault Diagnosis Scheme Based on the Normalized Indexes of the Images Eccentricity for a Multilevel Converter of a Switched Reluctance Motor Drive
ICRERA 2022 – 11th International Conference on renewable Energy Research and Applications, 18-21 Sep 2022, Istanbul, Turkey

Paula Louro, Manuela Vieira, Manuel A. Vieira "Positioning using Visible Light Communication Footprints"
SENSORDEVICES 2022 – 13th International Conference on Sensor Device Technologies and Applications, 16-20 Oct 2022, Lisbon, Portugal

Manuela Vieira, Manuel A. Vieira, Paula Louro, Alessandro Fantoni, "VLC based Guidance System to be used by mobile users inside large buildings"
SENSORDEVICES 2022 – 13th International Conference on Sensor Device Technologies and Applications, 16-20 Oct 2022, Lisbon, Portugal

Invited talks by CTS members



Manuel D. Ortigueira: *How many fractional derivatives are there?*
II Brazilian Symposium on Fractional Calculus, 17-21 Jan 2022
<https://sites.google.com/view/bsfc2022en>

Manuel D. Ortigueira: *How Many Fractional Derivatives are There?*
5th Mexican Workshop on Fractional Calculus, October 5, 2022
<https://5mwfc.com/program/plenary-talks/>

Manuel D. Ortigueira: *Fractional Linear Time-invariant Systems*
Research and Technology, Iran University of Science and Technology, 20 Dec 2022

Helena Fino: *Nanoelectronic Challenges and Opportunities for Cyberphysical Systems*
MIXDES 2022, Jun 23, 2022, Wrocław, Poland
<https://www.mixdes.org/Mixdes3/yearSummary/viewConf/2022>

Course on Collaborative Networks

The Director of CTS, Prof. Luis Camarinha-Matos, was invited to deliver an advanced course on Collaborative networks to the **MSc Management of International Lean and Supply chain projects (MILES)** at Ecole des Mines Albi-Carmaux, France, 31 Jan – 2 Feb 2023.

Course modules:

1. Motivation and examples
2. Classes of collaborative networks
3. ICT infrastructures
4. Security
5. Virtual organizations breeding environments
6. Virtual organization creation
7. Virtual organization management
8. Customer interaction
9. E-Commerce
10. Reference models
11. Industry 4.0 and collaborative networks.



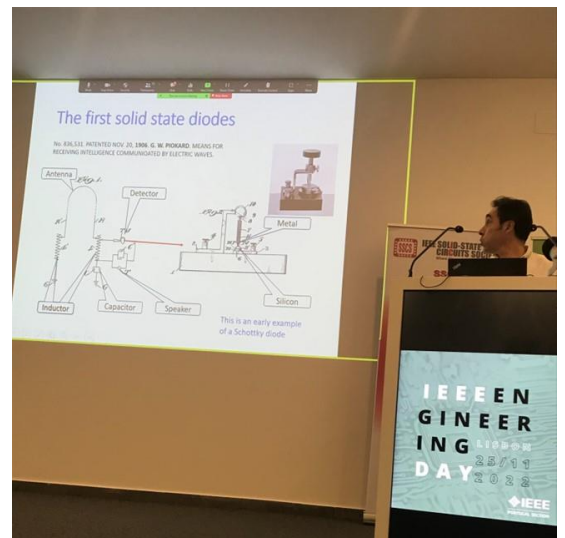
RECENT EVENTS

IEEE Engineering Day 2022

25 Nov 2022 – CTS-Uninova

Annual event promoted by the Portuguese section of IEEE. This edition was organized in collaboration with CTS by João P. Oliveira. Another member of CTS, Nuno Paulino, was one of the invited speakers:

- The Semiconductor Technology: An history of challenges and success
Nuno Paulino, CTS-UNINOVA, FCT NOVA
- Pandemic, Shortages, and Electronic Engineering
Salvatore Pennisi, Università degli Studi di Catania
- Is the Semiconductor Industry at a Crossroads Point?
Francisco Ibáñez, European Chips Act
- STMicroelectronics
Nuno Ramalho, Synopsys
- Beyond CMOS: A TFT perspective
Pedro Barquinha, CENIMAT



Workshop of the Research Centers of FCT-NOVA



Research and Development at FCT-NOVA – Challenges and Opportunities

1 Mar 2023 – Solar dos Zagalos, Sobreda

This event was organized by the Coordinating Council of the Research Units of FCT-NOVA as an opportunity for reflection on common challenges relevant to all research centers of our Campus.

The event addressed 4 main sessions:

1. The research and innovation system at FCT-NOVA
2. Collaboration between R&D units
3. Management and assessment of research impact
4. The research at FCT-NOVA: visibility and communication.

The event counted with the active participation of the Directors and Executive Committees of the 15 R&D units of FCT NOVA, in a total of 45 researchers, who, through an open debate, discussed the present and the future of research and innovation activities in the context of Faculty and NOVA University Lisbon, as well as its positioning in the social context.

CTS was represented by Luis Camarinha-Matos and Paula Louro.

FUTURE EVENTS



The 44th International Conference on Applications and Theory of Petri Nets and Concurrency, Petri nets'2023, will be organized in Lisbon, next 25 to 30 of June, 2023. This conference series is the annual event for the Petri nets community and returns to Lisbon area twenty five years after its first visit, which was also organized by CTS researchers.

During the main conference days, occurring from 28 to 30 of June, participants will benefit from enlightening presentations from three invited keynote speakers, Prof. Boudewijn van Dongen, Prof. Stefanie Rinderle-Ma, and Prof. Valeriy Vyatkin.

Other than the main conference, several workshops are planned for 26 and 27 of June. The annual "Petri net Course" will occur from 25 to 27 June. It offers a thorough introduction to Petri nets in four half-day modules on Sunday 25 and Monday 26, and a full-day tutorial module on Tuesday 27. For successful participation in the entire course, including preparation and examination, three credit points (ECTS) will be awarded. Following current practice in this conference series, a session on tools demos will occur on Wednesday 28.

The language of the conference is English, and its proceedings are expected to be published by Springer-Verlag in Lecture Notes in Computer Science.

Website: <https://petrinets2023.github.io/>



INTERNATIONAL WORKSHOP ON PETRI NETS FOR TWIN TRANSITION

PN4TT'2023 - INTERNATIONAL WORKSHOP ON PETRI NETS FOR TWIN TRANSITION

Members from CTS and from CeDRI (Bragança) will lead the organization of the Workshop on Petri nets for Twin Transition (PN4TT'2023), from 26 to 27 of June, as a satellite event of the 44th International Conference on Application and Theory of Petri Nets and Concurrency. The workshop aims to discuss topics related with the use of Petri nets to support digitalization and green transitions. This twin transition has a potentially big societal impact, in particular for future generations, not only while associated with the fourth industrial revolution (Industry 4.0 and Industry 5.0), but also associated with the decarbonized and environmentally friendly economy.

The language of the conference is English, and its proceedings are expected to be published by CEUR-WS.org.

Website: <http://gres.uninova.pt/pn4tt2023/>

DoCEIS 2023



The Advanced Doctoral Conference on Computing, Electrical and Industrial Systems is celebrating its 14th edition (DoCEIS 2023) with a focus on **Technological Innovation for Connected Cyber Physical Spaces**.

We increasingly live in environments that connect physical and cyber spaces. 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 solve societal problems with a human-centric perspective. We invite potential authors to present their research contributions to this area and to discuss and learn from other experts at this edition of the DoCEIS conference.

DoCEIS 2023 will target Technological Innovation for Connected Cyber Physical Spaces, providing a forum where Doctoral Students, Researchers, and Academicians have the opportunity to share and discuss their work and ideas in a multidisciplinary context, while creating collaborative opportunities for future work and research.

Proceedings are expected to be published by a Springer, IFIP AICT series (indexed in Web of Science, SCOPUS and DBLP). Best papers will be considered for possible inclusion in a special journal issue.

DoCEIS 2023 is co-sponsored by CTS.

<https://doceis.dee.fct.unl.pt/>

Submission of full paper:	4 Mar. 2023
(EXTENDED DEADLINE)	
Notification of authors:	17 Apr. 2023
Submission of camera ready:	28 Apr. 2023

YEF-ECE 2023



Following the success of the previous editions we are proud to announce the organization of the **7th edition of the International Young Engineers Forum on Electrical and Computer Engineering – YEF-ECE 2023**.

Accepted papers will be submitted for inclusion into IEEE Xplore subject to meeting IEEE Xplore's scope and quality requirements. Papers from previous editions are available on the IEEE Xplore digital library.

The **International Young Engineers Forum** looks for the latest developments and innovative applications in electrical and computer engineering, dealing with systems' design and utilization, looking forward to efficient devices and systems with appropriate control algorithms to meet the needs of business and industry in a global economy. This event will be a unique opportunity for young engineers to connect with each other enabling experience's sharing and to become internationally active.

YEF-ECE 2023 will be co-located with the doctoral conference **DoCEIS 2023** giving participants the opportunity to attend both events on the same day. The Conference will be held in Caparica (Lisbon region), PORTUGAL.

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

YEF-ECE is co-sponsored by CTS.

Full paper submission: April 4, 2023

Paper acceptance notification: May 5, 2023

Final paper submission: June 2, 2023



Resilient and Responsible Collaborative Networks

Trends in Industry 5.0 and Society 5.0 place the emphasis on human-centric systems and the need to address societal challenges in a responsible way. Instead of purely technocentric or even business-centric approaches that have characterized most past developments, we need a balanced approach between “automation” and human/society involvement contributing to well-being. On the other hand, we live in an era with more and more disruptive events, including natural and human-caused ones, which demands systems with a high degree of resilience. As frequent disruptive events become the “new normal”, we need advanced forms of transformative resilience and even antifragility. In other words, how to design and manage collaborative ecosystems that can strive and become better throughout a sequence of attacks/disruptions.

PRO-VE 2023 aims to analyze and discuss the contribution of Collaborative Networks to these challenges and to identify how these challenges can influence our research agenda.

- AI and digital transformation for collaborative systems
- Distributed cognition for resilient collaborative systems
- Collaboration in untrustworthy environments
- Collaborative cyber-physical systems
- Human-machine collaboration
- Collaborative risk management
- Ethics, security and trust
- Hybridization of collaboration
- Collaboration-Competition environments
- Collaborative innovation hubs
- Antifragility in business ecosystems
- Digital twins and collaboration

- Abstract submission: 27 Mar 2023
- Full paper submission: 24 Apr 2023
- Results notification: 5 Jun 2023
- Camera ready: 19 Jun 2023

<https://www.pro-ve.org/>

PRO-VE 2023 is co-sponsored by CTS.

ESSDERC / ESSCIRC 2023



11-14 SEPTEMBER 2023
ESSDERC
ESSCIRC

SSCS IEEE ELECTRONIC DEVICES SOCIETY

ESSDERC
53rd European Solid-State
Device Research Conference

ESSCIRC
49th European Solid-State
Circuits Conference

September 11-14, 2023
LISBON, Portugal

in STAY UPDATED CONTACT

HOME COMMITTEES CONFERENCE INFO

CTS at UNINOVA Institute and NOVA School of Science and Technology, together with the University of Seville and the Institute of Microelectronics of Seville (IMSE-CNM), will be the main (Iberian) organizers of the IEEE 49th European Solid-State Circuits (ESSCIRC) and 53rd European Solid-State Devices Research (ESSDERC) joint Conference (ESSxxRC'23). This flagship European event will be mainly focused on the thematic "Semiconductors for an Electric and Digital World" and it will occur during September 11th-14th 2023.

Student papers are welcome. A special student session will be organized by ESSxxRC in 2023. The venue of the conference events, including workshops and tutorials, will be in Lisbon Congress Center (CCL). The Congress Center is located close to the river Tagus and the historical and cultural heritage of Belem, just a few minutes from the city center, in a prime area with a vast transport supply.

The aim of ESSCIRC and ESSDERC is to provide an annual European forum for the presentation and discussion of recent advances in solid-state devices and circuits. The level of integration for system-on-chip design is rapidly increasing. This is made available by advances in semiconductor technology. Therefore, more than ever before, a deeper interaction among technologists, device experts, IC designers, system designers, MSc and PhD students in micro-and-nano electronics is of paramount importance.

Last but not the least, the recent health and supply crisis have demonstrated the importance of the Semiconductor sector for the EU Societal needs and Industrial base. The idea that their supply chain is just a commodity has finally shown its limit in case of major political or economic difficulties. However, the idea of a complete national or European autonomy in the electronics sector would have unbearable costs. The EU Chip Act is a response by the EU Commission and Member States to the current situation. This hot topic will be widely addressed during the ESSxxRC'23 Conference.

More info in: <https://www.esscirt-essderc2023.org>



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<http://www.cts.uninova.pt>
Director: Luis M. Camarinha-Matos

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